PATENT
Attorney Docket No. 10494.0003-03000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Prior Application Art Unit: 3785 Prior Application Examiner: RUBY, Travis C.

Commissioner: This is a request for filing a

☒ Continuation ☐ Continuation-in-Part ☐ Divisional Application under 37 C.F.R. § 1.53(b) of pending prior Application No. 11/919,974 filed January 6, 2009 of André Sloth ERIKSEN for COOLING SYSTEM FOR A COMPUTER SYSTEM

1. ☒ Enclosed is a complete copy of the application and drawings.

2. ☐ Enclosed is an AIA Transition Application Statement under 1.55(j), 1.78(a)(6), and/or 1.78(c)(6).

3. ☐ Enclosed is a Request for Non-Publication of Application and Certification Under 35 U.S.C. § 122(b)(2)(B)(i).

4. ☐ A Preliminary Amendment is enclosed.

5. ☒ The filing fee is calculated on the basis of the claims existing in the prior application as amended in the Preliminary Amendment filed herewith.

6. ☐ A new oath or declaration and power of attorney is enclosed.

7. ☒ An Application Data Sheet is enclosed.

Basic Utility Application Filing Fee					$280	$ 280.00
Search Fee					$600	600.00
Examination Fee					$720	720.00
	Number of Claims		Basic	Extra		
Total Claims	1	-	20	0	x $ 80	0
Independent Claims	1	-	3	0	x $420	0
☐ Presentation of Multiple Dep. Claim(s)					+ $780	0
Size Fee: Paper Filing Total Application Pages (specification, drawings, printed sequence or computer listing, preliminary amendment)	___ - 100 ÷ 50 = 0* x $400 *Rounded up to next whole number					0
Additional Fee for Paper Filing New Application $400 (DELETE if filing new application via EFS Web - fee not required for EFS new application submissions)						0
Size Fee: EFS-Web Filing Total Application Pages (specification, drawings, printed sequence or computer listing, preliminary amendment)	79 X .75 - 100 ÷ 50 = 0* x $400 *Rounded up to next whole number					0
[Surcharge under § 1.16(f) $140 for postponing filing of oath or declaration]						140.00
Subtotal						$ 1740.00
Reduction by 1/2 if small entity **[for e-filing ONLY: small entity fee for Basic filing fee - $70)**						- 0
TOTAL FEES DUE						$ 1740

8. ☒ The fee of $1,740 is submitted herewith.

9. ☒ The Commissioner is hereby authorized to charge any fees which may be required including fees due under 37 C.F.R. § 1.16 and any other fees due under 37 C.F.R. § 1.17, or credit any overpayment during the pendency of this application to Deposit Account No. 06-0916.

10. ☐ New acceptable drawings are enclosed.

11. ☒ The prior application is assigned of record to: ASETEK A/S, SALTUMVEJ 27, DK-970, BRONDERSLEV, DENMARK (Reel/Frame: 028525/0059)

12. ☐ ☐ Small entity status is appropriate and applies to this application.

13. ☒ The power of attorney in the prior application is to FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P., Customer No. 22,852.

14. ☐ A **Listing Under 37 C.F.R. § 1.32(c)(3) of Ten or Fewer Practitioners to be Recognized by the PTO as Being of Record** is attached.

15. ☐ The power appears in the original declaration of the prior application.

16. ☐ Since the power does not appear in the original declaration, a copy of the power in the prior application is enclosed.

17. ☒ Please address all correspondence to FINNEGAN, HENDERSON, FARABOW, GARRETT and DUNNER, L.L.P., **Customer Number 22,852**.

18. ☐ A new power of attorney is enclosed.

19. ☐ Also enclosed is _____

PETITION FOR EXTENSION. If any extension of time is necessary for the filing of this application, including any extension in parent Application No. 11/919,974, filed January 6, 2009, for the purpose of maintaining copendency between the parent application and this application, and such extension has not otherwise been requested, such an extension is hereby requested, and the Commissioner is authorized to charge necessary fees for such an extension to Deposit Account 06-0916. A duplicate copy of this paper is enclosed for use in charging the deposit account.

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: April 12, 2013

By: _____

Biju I. Chandran
Reg. No. 63,684
(202) 408-4000

Cooler Master Co., Ltd. Exhibit 1006, Page 3 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

COOLING SYSTEM FOR A COMPUTER SYSTEM

[001] This application is a continuation of U.S. Application No. 11/919/974, filed January 6, 2009, which is a U.S. National Phase Application of PCT/DK2005/000310, filed May 6, 2005, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[002] The present invention relates to a cooling system for a central processing unit (CPU) or other processing unit of a computer system. More specifically, the invention relates to a liquid-cooling system for a mainstream computer system such as a PC.

[003] During operation of a computer, the heat created inside the CPU or other processing unit must be carried away fast and efficiently, keeping the temperature within the design range specified by the manufacturer. As an example of cooling systems, various CPU cooling methods exist and the most used CPU cooling method to date has been an air-cooling arrangement, wherein a heat sink in thermal contact with the CPU transports the heat away from the CPU and as an option a fan mounted on top of the heat sink functions as an air fan for removing the heat from the heat sink by blowing air through segments of the heat sink. This air-cooling arrangement is sufficient as long as the heat produced by the CPU is kept at today's level, however it becomes less useful in future cooling arrangements when considering the development of CPUs since the speed of a CPU is said to double perhaps every 18 months, thus increasing the heat production accordingly.

[004] Another design used today is a CPU cooling arrangement where cooling liquid is used to cool the CPU by circulating a cooling liquid inside a closed system by means of a pumping unit, and where the closed system also comprises a heat exchanger past which the cooling liquid is circulated.

[005] A liquid-cooling arrangement is more efficient than an air-cooling arrangement and tends to lower the noise level of the cooling arrangement in general. However, the liquid-cooling design consists of many components, which increases the total installation time, thus making it less desirable as a mainstream solution. With a trend of producing smaller and more compact PCs for the end-users, the greater amount of components in a typical liquid-cooling arrangement is also undesirable. Furthermore, the many components having to be coupled together incurs a risk of leakage of cooling liquid from the system.

SUMMARY

[006] It may be one object of the invention to provide a small and compact liquid-cooling solution, which is more efficient than existing air-cooling arrangements and which can be produced at a low cost enabling high production volumes. It may be another object to create a liquid-cooling arrangement, which is easy-to-use and implement, and which requires a low level of maintenance or no maintenance at all. It may be still another object of the present invention to create a liquid-cooling arrangement, which can be used with existing CPU types, and which can be used in existing computer systems.

[007] This object may be obtained by a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal

energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump, said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

[008] By providing an integrate element, it is possible to limit the number of separate elements of the system. However, there is actually no need for limiting the number of elements, because often there is enough space within a cabinet of a computer system to encompass the different individual elements of the cooling system. Thus, it is surprisingly that, at all, any attempt is conducted of integrating some of the elements.

[009] In possible embodiments according to this aspect of the invention, the entire pump is placed inside the reservoir with at least an inlet or an outlet leading to the liquid in the reservoir. In an alternative embodiment the pump is placed outside the reservoir in the immediate vicinity of the reservoir and wherein at least an inlet or an outlet is leading directly to the liquid in the reservoir. By placing the pump inside the reservoir or in the immediate vicinity outside the reservoir, the integrity of the combined reservoir, heat exchanger and pump is obtained, so that the element is easy to employ in new and existing computer systems, especially mainstream computer systems.

[010] In a preferred embodiment, the pumping member of the pump and a driven part of the motor of the pump, such as a rotor of en electrical motor, is placed inside the reservoir embedded in the cooling liquid, and wherein a stationary part of the motor of the pump, such as a stator of an electrical motor, is placed outside the reservoir. By having the driven part of the motor placed inside the reservoir submerged in the cooling liquid and the stationary part of the motor outside the reservoir, there is no need for encapsulating the stationary part in a liquid-proof insulation. However, problems may occur having then stationary part driving the driven part. However, the present invention provide means for obtaining such action, although not at all evident how to solve this problem.

[011] The object may also be obtained by a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said cooling system being intended for thermal contact with the processing unit by means of existing fastening means associated with the processing unit, and said heat radiating means intended for radiating from the cooling liquid thermal energy, dissipated to the cooling liquid, to surroundings of the heat radiating means.

[012] The use of existing fastening means has the advantage that fitting of the cooling system is fast and easy. However, once again there is no problem for the person skilled in the art to adopt specially adapted mounting means for any element of the cooling system, because there are numerous possibilities in existing cabinets of computer systems for mounting any kind of any number of elements, also elements of a cooling system.

[013] In preferred embodiments according to this aspect of the invention, the existing fastening means are means intended for attaching a heat sink to the processing unit, or the existing fastening means are means intended for attaching a cooling fan to the processing unit, or the existing fastening means are means intended for attaching a heat sink together with a cooling fan to the processing unit. Existing fastening means of the kind mentioned is commonly used for air cooling of CPUs of computer systems, however, air cooling arrangements being much less complex than liquid cooling systems. Nevertheless, it has ingeniously been possible to develop a complex and effective liquid cooling system capable of utilizing such existing fastening means for simple and less effective air cooling arrangements.

[014] According to an aspect of the invention, the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. By adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

[015] According to another aspect of the invention, driving means for driving the pump is selected among the following driving means: electrically operated rotary motor, piezo-electrically operated motor, permanent magnet operated motor, fluid-operated motor, capacitor-operated motor. As is the case when selecting the pump to pump the liquid, by adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

[016] The object may also be obtained by a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, and said cooling system further comprising a pump wherein the pump is driven by an AC electrical motor by a DC electrical power supply of the computer system, where at least part of the electrical power from said power supply is intended for being converted to AC being supplied to the electrical motor.

[017] It may be advantageous to use an AC motor, such as a 12V AC motor, for driving the pump in order to obtain a stabile unit perhaps having to operate 24 hours a day, 365 days a year. However, the person skilled in the art will find it unnecessary to adopt as example a 12V motor because high voltage such as 220V or 110V is readily accessible as this is the electrical voltage used to power the

voltage supply of the computer system itself. Although choosing to use a 12V motor for the pump, it has never been and will never be the choice of the person skilled in the art to use an AC motor. The voltage supplied by the voltage supply of the computer system itself is DC, thus this will be the type of voltage chosen by the skilled person.

[018] In preferred embodiments according to any aspect of the invention, an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, or an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means, or an electrical motor is intended both for driving the pump for pumping the liquid, and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means.

[019] By utilizing a single electrical motor for driving more than one element of the cooling system according to any of the aspects of the invention, the lesser complexity and the reliability of the cooling system will be further enhanced.

[020] The heat exchanging interface may be an element being separate from the reservoir, and where the heat exchanging interface is secured to the reservoir in a manner so that the heat exchanging interface constitutes part of the reservoir when being secured to the reservoir. Alternatively, the heat exchanging interface constitutes an integrate surface of the reservoir, and where the heat exchanging surface extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for the

close thermal contact with the processing unit. Even alternatively, the heat exchanging interface is constitutes by a free surface of the processing unit, and where the free surface is capable of establishing heat dissipation between the processing unit and the cooling liquid through an aperture provided in the reservoir, and where the aperture extends along an area of the surface of the reservoir, said surface being intended for facing the processing unit.

[021] Possibly, an uneven surface such as pins or fins extending from the copper plate provide a network of channels across the inner surface of the heat exchanging interface. A network of channels ensure the cooling liquid being passed along the inner surface of the interface such as a copper plate in a way that maximizes the retention time of the cooling liquid along the heat exchanging interface and in a way that optimizes the thermal exchange between the heat exchanging interface and the cooling liquid as long as the cooling liquid is in thermal contact with heat exchanging interface.

[022] Possibly, the cooling system may be provided with a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pumping means being intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means, said heat exchanging interface constituting a heat exchanging surface being manufactured from a material suitable for heat conducting, and with a first side of the heat exchanging surface facing the central processing unit being substantially plane and with a second side of the heat exchanging surface facing the cooling liquid being substantially plane and said reservoir being manufactured from plastic, and channels or

segments being provided in the reservoir for establishing a certain flow-path for the cooling liquid through the reservoir.

[023] Providing a plane heat exchanging surface, both the first, inner side being in thermal contact with the cooling liquid and the second, outer side being in thermal contact with the heat generating processing unit, results in the costs for manufacturing the heat exchanging surface is reduced to an absolute minimum.

[024] According to the above possible solution, an inlet of the pumping means is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

[025] Alternatively, or additionally, an outlet of said pumping means being positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchange interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

[026] However, a plane first, inner surface may also result in the cooling liquid passing the heat exchanging surface too fast. This may be remedied by providing grooves along the inner surface, thereby providing a flow path in the heat exchanging surface. This however results in the costs for manufacturing the heat exchanging surface increasing.

[027] The solution to this problem has been dealt with by providing channels or segments in the reservoir housing instead. The reservoir housing may be manufactured by injection molding or by casting, depending on the material which the reservoir housing is made from. Proving channels or segments during molding or casting of the reservoir housing is much more cost-effective than milling grooves along the inner surface of the heat exchanging surface.

[028] Possibly, the cooling system may be provided with at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, said cooling system being adapted such as to provide transfer of said heat from a heat dissipating surface to a heat radiating surface where said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

[029] Heat dissipation from the processing unit to the cooling liquid must be very efficient to ensure proper cooling of the processing unit, Especially in the case, where the processing unit is a CPU, the surface for heat dissipation is limited by the surface area of the CPU. This may be

remedied by utilizing a heat exchanging surface being made of a material having a high thermal conductivity such as copper or aluminum and ensuring a proper thermal bondage between the heat exchanging interface and the CPU.

[030] However, in a possible embodiment according to the features in the above paragraph, the heat dissipation takes place directly between the processing unit and the cooling liquid by providing an aperture in the reservoir housing, said aperture being adapted for taking up a free surface of the processing unit. Thereby, the free surface of the processing unit extends into the reservoir or constitutes a part of the boundaries of the reservoir, and the cooling liquid has direct access to the free surface of the processing unit.

[031] A possible heat exchanging interface may be the direct contact between the heat generating unit such as a CPU and the cooling liquid, where at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit comprising at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, said cooling system being adapted such as to provide transfer of said heat from a heat dissipating interface to a heat radiating surface where said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

[032] The aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a the processing unit, said boundaries being liquid-proof when attached to the free surface of the processing unit so that the liquid may flow freely across the free surface without the risk of the liquid dissipating through the boundaries. Alternatively, but posing the same technical effect, the aperture of the reservoir is intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of the processing unit.

[033] If a heat sink is provided as an aid in dissipating heat from the heat generating unit such as a CPU, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a heat sink. Alternatively, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of a heat sink. Alternatively, possibly, the heat exchanging interface may be provided as a first reservoir intended for being closed by attaching boundaries of an aperture in the first reservoir to, alternatively along, a free surface of a said processing unit, and a second reservoir intended for being closed by attaching boundaries of an aperture in the second reservoir to, alternatively along, a free surface of a to a free surface of a heat sink, and liquid conducting means provided between the first reservoir and the second reservoir.

[034] The first reservoir may be closed by attaching said first reservoir to a heat exchanging surface element being in close thermal contact with the processing unit, said heat exchanging surface intended for dissipating heat from the processing unit to cooling liquid in the first reservoir, and wherein a second reservoir is closed by attaching said second reservoir to a surface of a heat sink,

said heat sink intended for radiating heat from cooling liquid in the second reservoir to the exterior surroundings.

[035] Also, the first reservoir and said second reservoir may be provided as a monolithic structure comprising both the first reservoir and the second reservoir and where both a heat dissipation from the processing unit to the cooling liquid in the first reservoir and heat radiation from the cooling liquid in the second reservoir to exterior surrounding is provided by the monolithic structure. The said monolithic structure may preferably be manufactured at least partly from plastic, preferably being manufactured fully in plastic, and said monolithic structure thus being manufactured by injection molding.

[036] Transfer of said cooling liquid from an outlet of the first reservoir to an inlet of the second reservoir, and from an outlet of the second reservoir to an inlet of the first reservoir, and circulating the cooling liquid within said liquid conducting means is provided by a pumping means being intended for pumping the cooling liquid. One of said reservoirs of said monolithic structure may comprise said pumping means.

[037] An inlet and/or an outlet and/or a pumping member of said pumping means, may be provided in the vicinity of said substantially plane side in order to provide a turbulence of flow and hereby improve the exchange of heat between said cooling liquid and substantially plane side, and the inlet of the pumping means may be provided within the first reservoir and the outlet may be provided within the second reservoir.

[038] According to one aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilizing a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface and a pumping means, said method of cooling comprising the steps of establishing, or defining, or selecting an operative status of the pumping means; controlling the operation of the motor of the pumping means in response to the following parameters; the necessary direction of movement for obtaining a pumping action of a pumping member of the pumping means, the possible direction of movement of a driving part of the motor of the pumping means; and in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve the necessary direction of movement of the driving part of the motor for establishing the necessary direction of movement for obtaining he pumping action of the pumping member.

[039] There may be pumping means, where the pumping member is only operable in one direction but where the motor driving the pumping member is operable in two directions. The solution to this problem is to either choose a pumping member operable in both directions or to chose a motor being operable in only one direction. According to the invention, a solution is provided where a one-way directional pumping member may be operated any a two-way directional motor. Despite the contradictory nature of this solution, advantages may however be present.

[040] As example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of

the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and where said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor before applying a full-wave AC power signal.

[041] As an alternative example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor after having applied the full-wave AC power signal.

[042] In both the above examples, the advantages of the one-way impeller from a traditional DC pump together with the advantages of a motor from a traditional AC pump is obtained in the solution mentioned. The performance of an impeller of a DC pump is much better than the performance of an impeller from an AC pump. The motor from an AC pump is more reliable than a motor from a DC pump. The advantageous obtained is thus of synergetic nature, seeing that different advantages of the impeller of the DC pump and of the motor of the AC pump are different in nature.

[043] According to another aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilizing a cooling system for cooling the at least one processing

unit and, said cooling system comprising a reservoir, at least one heat exchanging interface, an air blowing fan, a pumping means, said method of cooling comprising the steps of applying one of the following possibilities of how to operate the computer system: establishing, or defining, or selecting an operative status of the computer system; controlling the operation of at least one of the following means of the computer system; the pumping means and the air blowing fan in response to at least one of the following parameters; a surface temperature of the heat generating processing unit, an internal temperature of the heat generating processing unit, or a processing load of the CPU; and in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve at least one of the following conditions; a certain cooling performance of the cooling system, a certain electrical consumption of the cooling system, a certain noise level of the cooling system.

[044] Applying the above method ensures an operation of the computer system being in accordance with selected properties during the use of the computer system. For some applications, the cooling performance is vital such as may be the case when working with image files or when downloading large files from a network during which the processing units is highly loaded and thus generating much heat. For other applications, the electrical power consumption is more vital such as may be the case when utilizing domestic computer systems or in large office building in environments where the electrical grid may be weak such as in third countries. In still other applications, the noise generated by the cooling system is to be reduced to a certain level, which may be the case in office buildings with white collar people working alone, or at home, if the domestic computer perhaps is situated in the living room, or at any other location where other exterior considerations have to be dealt with.

[045] According to another aspect of the invention, a method is envisaged, said method being employed with cooling system further comprising a pumping means with an impeller for pumping the cooling liquid through a pumping housing, said pumping means being driven by an AC electrical motor with a stator and a rotor, and said pumping means being provided with a means for sensing a position of the rotor, and wherein the method comprises the following steps: initially establishing a preferred rotational direction of the rotor of the electrical motor; before start of the electrical motor, sensing the angular position of the rotor; during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor; said selection being made according to the preferred rotational direction; and said application of the AC signal, such as an AC voltage, being performed by the computer system for applying the AC signal, such as an AC voltage, from the electrical power supply of the computer system during conversions of the electrical DC signal, such as a DC voltage, of the power supply to the AC signal, such as an AC voltage, for the electrical motor.

[046] Adopting the above method according to the invention ensures the most efficient circulation of cooling liquid in the cooling system and at the same time ensures the lowest possible energy consumption of the electrical motor driving the impeller. The efficient circulation of the cooling liquid is obtained by means of an impeller being designed for rotation in one rotational direction only, thus optimizing the impeller design with regard to the only one rotational direction as opposed to both rotational directions. The low energy consumption is achieved because of the impeller design being optimized, thus limiting the necessary rotational speed of the impeller for obtaining e certain amount of flow of the cooling liquid through the cooling system. A bonus effect of the lowest

possible energy consumption being obtained is the lowest possible noise level of the pump also being obtained. The noise level of the pump is amongst other parameters also dependent on the design and the rotational speed of the impeller. Thus, an optimized impeller design and impeller speed will reduce the noise level to the lowest possible in consideration of ensuring a certain cooling capacity.

BRIEF DESCRIPTION OF THE FIGURES

[047] The invention will hereafter be described with reference to the drawings, where

[048] FIG. 1 shows an embodiment of the prior art. The figure shows the typical components in an air-cooling type CPU cooling arrangement.

[049] FIG. 2 shows an embodiment of the prior art. The figure shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. 1 when assembled.

[050] FIG. 3 shows an embodiment of the prior art. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement.

[051] FIG. 4 is an exploded view of the invention and the surrounding elements.

[052] FIG. 5 shows the parts shown in the previous figure when assembled and attached to the motherboard of a computer system.

[053] FIG. 6 is an exploded view of the reservoir from the previous FIGS. 4 and 5 seen from the opposite site and also showing the pump.

[054] FIG. 7 is a cut-out view into the reservoir housing the pump and an inlet and an outlet extending out of the reservoir.

[055] FIG. 8 is a view of the cooling system showing the reservoir connected to the heat radiator.

[056] FIG. 9-10 are perspective views of a possible embodiment of reservoir housing providing direct contact between a CPU and a cooling liquid in a reservoir.

[057] FIG. 11-13 are perspective views of a possible embodiment of heat sink and a reservoir housing constituting an integrated unit.

[058] FIG. 14 is a perspective view of the embodiment shown in FIG. 9-10 and the embodiment shown in FIG. 11-13 all together constituting an integrated unit.

[059] FIG. 15-16 are perspective view of a possible embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit

[060] FIG. 17 is a perspective view of a preferred embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit,

[061] FIG. 18 is a plane view of a possible, however preferred embodiment of an AC electrical motor for a pumping means of the cooling system according to the invention, and

[062] FIG. 19 is a graph showing a method for starting a rotor of the electrical AC motor, said AC motor driving an impeller selected from a pump driven by a DC motor.

[063] FIG. 20 is a is a simplified schematic showing a cross-sectional view of the reservoir along plane 20-20 of Fig. 17.

DETAILED DESCRIPTION

[064] FIG. 1 is an exploded view of an embodiment of prior art cooling apparatus for a computer system. The figure shows the typical components in an air-cooling type CPU cooling arrangement. The figure shows a prior art heat sink 4 intended for air cooling and provided with segments intersected by interstices, a prior art air fan 5 which is to be mounted on top of the heat sink by use of fastening means 3 and 6.

[065] The fastening means comprises a frame 3 provided with holes intended for bolts, screws, rivets or other suitable fastening means (not shown) for thereby attaching the frame to a motherboard 2 of a CPU 1 or onto another processing unit of the computer system. The frame 3 is also provided with mortises provided in perpendicular extending studs in each corner of the frame, said mortises intended for taking up tenons of a couple of braces. The braces 6 are intended for enclosing the heat sink 4 and the air fan 5 so that the air fan and the heat sink thereby is secured to the frame. Using proper retention mechanisms, when the frame is attached to the motherboard of the CPU of other processing unit, and when the tenons of the braces are inserted into the mortises of the frame, the air fan and heat exchanger is pressed towards the CPU by using a force perpendicular to the CPU surface, said force being provided by lever arms.

[066] FIG. 2 shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. 1, when assembled. The parts are attached to each other and will be mounted on top of a CPU on a motherboard (not shown) of a computer system.

[067] FIG. 3 shows another embodiment of a prior art cooling system. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement. The figure shows a prior art heat exchanger 7, which is in connection with a prior art liquid reservoir 8, a prior art liquid pump 9 and a heat radiator 11 and an air fan 10 provided together with the heat radiator. The prior art heat exchanger 7, which can be mounted on a CPU (not shown) is connected to a radiator and reservoir, respectively. The reservoir serves as a storage unit for excess liquid not capable of being contained in the remaining components. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid. The heat radiator 11 serves as a means for removing the heat from the liquid by means of the air fan 10 blowing air through the heat radiator. All the components are in connection with each other via tubes for conducting the liquid serving as the cooling medium.

[068] FIG. 4 is an exploded view of a cooling system according to an embodiment of the invention. Also elements not being part of the cooling system as such are shown. The figure shows a central processing unit CPU 1 mounted on a motherboard of a computer system 2. The figure also shows a part of the existing fastening means, i.e. amongst others the frame 3 with mortises provided in the perpendicular extending studs in each corner of the frame. The existing fastening means, i.e. the frame 3 and the braces 6, will during use be attached to the motherboard 2 by means of bolts, screws, rivets or other suitable fastening means extending through the four holes provided in each corner of

the frame and extending through corresponding holes in the motherboard of the CPU. The frame 3 will still provide an opening for the CPU to enable the CPU to extend through the frame.

[069] The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminum, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU. The reservoir may as example be made of plastic or of metal. The reservoir or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[070] If the reservoir is made of metal or any other material having a relative high heat conductivity compared to as example plastic, the heat exchanging interface as a separate element may be excluded because the reservoir itself may constitute a heat exchanger over an area, wherein the reservoir is in thermal contact with the processing unit. Alternatively to having the heat exchanging interface constitute part of the liquid reservoir housing, the liquid reservoir housing may be tightly attached to the heat exchanging interface by means of screws, glue, soldering, brazing or the like means for securing the heat exchanging interface to the housing and vice versa, perhaps with a sealant 5 provided between the housing and the heat exchanging interface.

[071] Alternatively to providing a heat exchanging interface integrate with the reservoir containing the cooling liquid, it will be possible to exclude the heat exchanger and providing another means for dissipating heat from the processing unit to the cooling liquid in the reservoir, The other means will be a hole provided in the reservoir, said hole intended for being directed towards the processing unit. Boundaries of the hole will be sealed towards boundaries of the processing unit or will be sealed on top of the processing unit for thereby preventing cooling liquid from the reservoir from leaking. The only prerequisite to the sealing is that a liquid-tight connection is provided between boundaries of the hole and the processing unit or surrounding of the processing unit, such as a carrier card of the processing unit.

[072] By excluding the heat exchanger, a more effective heat dissipation will be provided from the processing unit and to the cooling liquid of the reservoir, because the intermediate element of a heat exchanger is eliminated. The only obstacle in this sense is the provision of a sealing being fluid-tight in so that the cooling liquid in the reservoir is prevented from leaking.

[073] The heat exchanging surface 4 is normally a copper plate. When excluding the heat exchanging surface 4, which may be a possibility not only for the embodiments shown in FIG. 4, but for all the embodiments of the invention, it may be necessary to provide the CPU with a resistant surface that will prevent evaporation of the cooling liquid and/or any damaging effect that the cooling liquid may pose to the CPU. A resistant surface may be provided the CPU from the CPU producer or it may be applied afterwards. A resistant surface to be applied afterwards may e.g. be a layer, such as an adhesive tape provided on the CPU. The adhesive tape may be made with a thin

metal layer e.g. in order to prevent evaporation of the cooling liquid and/or any degeneration of the CPU itself.

[074] Within the liquid reservoir, a liquid pump (not shown) is placed for pumping a cooling liquid from an inlet tube 15 connection being attached to the housing of the reservoir through the reservoir and past the heat exchanger in thermal contact with the CPU to an outlet tube connection 16 also being attached to the reservoir housing. The existing fastening means comprising braces 6 with four tenons and the frame 3 with four corresponding mortises will fasten the reservoir and the heat exchanger to the motherboard of the CPU. When fastening the two parts of the existing fastening means to each other the fastening will by means of the lever arms 18 create a force to assure thermal contact between the CPU 1 mounted on the motherboard and the heat exchanger 4 being provided facing the CPU.

[075] The cooling liquid of the cooling system may be any type of cooling liquid such as water, water with additives such as anti-fungicide, water with additives for improving heat conducting or other special compositions of cooling liquids such as electrically non-conductive liquids or liquids with lubricant additives or anti-corrosive additives.

[076] FIG. 5 shows the parts shown in FIG. 4 when assembled and attached to the motherboard of a CPU of a computer system 2. The heat exchanger and the CPU is in close thermal contact with each other. The heat exchanger and the remainder of the reservoir housing 14 is fastened to the motherboard 2 by means of the existing fastening means being secured to the motherboard of the CPU and by means of the force established by the lever arms 18 of the existing fastening means. The

tube inlet connection 15 and the tube outlet connection 16 are situated so as to enable connection of tubes to the connections.

[077] FIG. 6 is an exploded view of the reservoir shown in previous FIG. 4 and FIG. 5 and seen from the opposite site and also showing the pump 21 being situated inside the reservoir. Eight screws 22 are provided for attaching the heat exchanging surface 4 to the remainder of the reservoir. The heat exchanging surface is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see FIG. 4). However, also the inner surface (not shown, see FIG. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the octagonal shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

[078] A sealant in form of a gasket 13 is used for the connection between the reservoir housing 14 and the heat exchanging surface forming a liquid tight connection. The pump is intended for being placed within the reservoir. The pump has a pump inlet 20 through which the cooling liquid flows from the reservoir and into the pump, and the pump has a pump outlet 19 through which the cooling liquid is pumped from the pump and to the outlet connection. The figure also shows a lid 17 for the reservoir. The non-smooth inner walls of the reservoir and the fact that the pump is situated inside the reservoir will provide a swirling of the cooling liquid inside the reservoir.

[079] However, apart from the non-smooth walls of the reservoir and the pump being situated inside the reservoir, the reservoir may be provided with channels or segments for establishing a

certain flow-path for the cooling liquid through the reservoir (see FIG. 9-10 and FIG. 15). Channel or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. By providing channels or segments inside the reservoir, a flow will be provided forcing the cooling liquid to pass the heat exchanging surface, and the amount of time increased of the cooling liquid being resident inside the reservoir, thus enhancing heat dissipation. If channels or segments are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

[080] The cooling liquid enters the reservoir through the tube inlet connection 15 and enters the pump inlet 20, and is pumped out of the pump outlet 19 connected to the outlet connection 16. The connection between the reservoir and the inlet tube connection and the outlet tube connection, respectively, are made liquid tight. The pump may not only be a self-contained pumping device, but may be made integrated into the reservoir, thus making the reservoir and a pumping device one single integrated component. This single integrated element of the reservoir and the pumping device may also be integrated, thus making the reservoir, the pumping device and the heat exchanging surface one single integrated unit. This may as example be possible if the reservoir is made of a metal such as aluminum. Thus, the choice of material provides the possibility of constituting both

the reservoir and a heat exchanging surface having a relatively high heat conductivity, and possibly also renders the possibility of providing bearings and the like constructional elements for a motor and a pumping wheel being part of the pumping device.

[081] In an alternative embodiment, the pump is placed in immediate vicinity of the reservoir, however outside the reservoir. By placing the pump outside, but in immediate vicinity of the reservoir, still an integrate element may be obtained. The pump or the inlet or the outlet is preferably positioned so as to obtain a turbulence of flow in the immediate vicinity of the heat exchanging interface, thereby promoting increased heat dissipation between the heat exchanging interface end the cooling liquid. even in the alternative, a pumping member such as an impeller (see FIG. 15-16) may be provided in the immediate vicinity of the heat exchanging surface. The pumping member itself normally introduces a turbulence of flow, and thereby the increased heat dissipation is promoted irrespective of the position of the pump itself, or the position of the inlet or of the outlet to the reservoir or to the pump.

[082] The pump may be driven by an AC or a DC electrical motor. When driven by an AC electrical motor, although being technically and electrically unnecessary in a computer system, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the pump. The pump may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. However, in the embodiment shown, the pump is driven by a 12V AC electrical motor.

[083] Control of the pump in case the pump is driven by an AC electrical motor, preferably takes place by means of the operative system or an alike means of the computer system itself, and where the computer system comprises means for measuring the CPU load and/or the CPU temperature. Using the measurement performed by the operative system or alike system of the computer system eliminates the need for special means for operating the pump. Communication between the operative system or alike system and a processor for operating the pump may take place along already established communication links in the computer system such as a USB-link. Thereby, a real-time communication between the cooling system and the operative system is provided without any special means for establishing the communication.

[084] In the case of the motor driving the pump is an AC electrical motor, the above method of controlling the pump may be combined with a method, where said pumping means is provided with a means for sensing a position of the rotor of the electrical motor, and wherein the following steps are employed: Initially establishing a preferred rotational direction of the rotor of the electrical motor, before start of the electrical motor, sensing the angular position of the rotor, during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor, said selection being made according to the preferred rotational direction, and said application of the AC voltage being performed by the computer system for applying the AC voltage from the electrical power supply of the computer system during conversion of the electrical DC voltage of the power supply to AC voltage for the electrical motor. By the operative system of the computer system itself generating the AC voltage for

the electrical motor, the rotational direction of the pump is exclusively selected by the computer system, non-depending on the applied voltage of the public grid powering the computer system.

[085] Further control strategies utilizing the operative system or alike system of the computer system may involve balancing the rotational speed of the pump as a function of the cooling capacity needed. If a lower cooling capacity is needed, the rotational speed of the pump, may be limited, thereby limiting the noise generating by the motor driving the pump.

[086] In the case an air fan is provided in combination with a heat sink as shown in FIG. 1, of the air fan is provided in combination with the heat radiator, the operative system or alike system of the computer system may be designed for regulating the rotational speed of the pump, and thus of the motor driving the pump, and the rotational speed of the air fan, and thus the motor driving the air fan. The regulation will take into account the cooling capacity needed, but the regulation will at the same time take into account which of the two cooling means, i.e. the pump and the air fan, is generating the most noise. Thus, it the air fan generally is generating more noise than the pump, then the regulation will reduce the rotational speed of the air fan before reducing the rotational speed of the pump, whenever a lower cooling capacity is needed. Thereby, the noise level of the entire cooling system is lowered as much as possible. If the opposite is the case, i.e. the pump generally generating more noise than the air fan, then the rotational speed of the pump will be reduced before reducing the rotational speed of the air fan.

[087] Even further control strategies involve controlling the cooling capacity in dependence on the type of computer processing taking place. Some kind of computer processing, such as word-

processing, applies a smaller load on the processing units such as the CPU than other kinds of computer processing, such as image processing. Therefore, the kind of processing taking place on the computer system may be used as an indicator of the cooling capacity. It may even be possible as part of the operative system or similar system to establish certain cooling scenarios, depending on the kind of processing intended by the user. If the user selects as example word-processing, a certain cooling strategy is applied based on a limited need for cooling. If the user selects as example image-processing, a certain cooling strategy is applied based on an increased need for cooling. Two or more different cooling scenarios may be established depending on the capacity and the control possibilities and capabilities of the cooling system and depending on the intended use of the computer system, either as selected by a user during use of the computer system or as selected when choosing hardware during build-up of the computer system, i.e. before actual use of the computer system.

[088] The pump is not being restricted to a mechanical device, but can be in any form capable of pumping the cooling liquid through the system. However, the pump is preferably one of the following types of mechanical pumps: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. Similarly, the motor driving the pumping member need not be electrical but may also be a piezo-electrically operated motor, a permanent magnet operated motor, a fluid-operated motor or a capacitor-operated motor. The choice of pump and the choice of motor driving the pump id dependent on many different parameters, and it is up to the person skilled in the art to choose the

type of pump and the type of motor depending on the specific application. As example, some pumps and some motors are better suited for small computer systems such as lab-tops, some pumps and some motors are better suited for establishing high flow of the cooling liquid and thus a high cooling effect, and even some pumps and motors are better suited for ensuring a low-noise operation of the cooling system.

[089] FIG. 7 is a cut-out view into the reservoir, when the reservoir and the heat exchanging surface 4 is assembled and the pump 21 is situated inside the reservoir. The reservoir is provided with the tube inlet connection (not seen from the figure) through which the cooling liquid enters the reservoir. Subsequently, the cooling liquid flows through the reservoir passing the heat exchanging surface and enters the inlet of the pump. After having been passed through the pump, the cooling liquid is passed out of the outlet of the pump and further out through the tube outlet connection 16. The figure also shows a lid 17 for the reservoir. The flow of the cooling liquid inside the reservoir and trough the pump may be further optimized in order to use as little energy as possible for pumping the cooling liquid, but still having a sufficient amount of heat from the heat exchanging surface being dissipated in the cooling liquid. This further optimization can be established by changing the length and shape of the tube connection inlet within the reservoir, and/or by changing the position of the pump inlet, and/or for instance by having the pumping device placed in the vicinity and in immediate thermal contact with the heat exchanging surface and/or by providing channels or segments inside the reservoir.

[090] In this case, an increased turbulence created by the pumping device is used to improve the exchange of heat between the heat exchanging surface and the cooling liquid. Another or an

additional way of improving the heat exchange is to force the cooling liquid to pass through specially adapted channels or segments being provided inside the reservoir or by making the surface of the heat exchanging surface plate inside the reservoir uneven or by adopting a certain shape of a heat sink with segments. In the figure shown, the inner surface of the heat exchanging surface facing the reservoir is plane.

[091] FIG. 8 is a perspective view of the cooling system showing the reservoir housing 14 with the heat exchanging surface (not shown) and the pump (not shown) inside the reservoir. The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir.

[092] According to the invention, the heat radiator 11 may be provided alternatively. The alternative heat radiator is constituted by a heat sink, such as a standard heat sink made of extruded aluminum with fins on a first side and a substantially plane second side. An air-fan may be provided in connection with the fins along the first side. Along the second side of the heat sink a reservoir is provided with at least one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the substantial plane side of the heat sink. When closing the reservoir in such a way a surface of the heat sink is in direct heat exchanging contact with an interior

of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the at least one aperture. This alternative way of providing the heat radiator may be used in the embodiment shown in FIG. 8 or may be used as a heat radiator for another use and/or for another embodiment of the invention.

[093] A pumping means for pumping the cooling liquid trough the reservoir may or may not be provided inside the reservoir at the heat sink. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir. Channels or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. If channels or segments in the reservoir are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

[094] By means of the alternative heat radiator, the heat radiator 11 is not provided as is shown in the figure with the rather expensive structure of channels leading the cooling liquid along ribs connecting the channels for improved surface of the structure. Instead, the heat radiator is provided as described as a unit constituted by a heat sink with or without a fan and a reservoir, and thereby providing a simpler and thereby cheaper heat radiator than the heat radiator 11 shown in the figure.

[095] The alternative heat radiator provided as an unit constituted by a heat sink and a reservoir, may be used solely, with or without a pump inside the reservoir and with or without the segments or channels, for being placed in direct or indirect thermal contact with a heat generating processing unit such as CPU or with the heat exchanging surface, respectively. These embodiments of the invention may e.g. be used for a reservoir, where the cooling liquid along a first side within the reservoir is in direct heat exchanging contact with the heat generating processing unit such as a CPU and the cooling liquid along a second side within the reservoir is in direct heat exchanging contact with a heat sink. Such a reservoir may be formed such as to provide a larger area of heat exchanging surface towards the heat generating processing unit such as a CPU than the area of the heat exchanging surface facing the heat sink. This may e.g. have the purpose of enlarging the area of the heat exchanging surface so as to achieve an improved heat dissipation form e.g. the CPU to the heat sink than that of a conventional heat sink without a reservoir attached. Conventional heat sinks normally only exchanges heat with the CPU through the area as given by the area of the top side of the CPU. A system comprising a liquid reservoir and a heat sink with a fan provided has been found to be a simple, cost optimized system with an improved heat dissipation than that of a standard heat sink with a fan, but without the reservoir. In another embodiment of the invention, which may be derived from FIG. 8, the air fan and the heat radiator is placed directly in alignment of the reservoir. Thereby, the reservoir housing 14, the air fan 10 and the radiator 11 constitute an integrate unit. Such an embodiment may provide the possibility of omitting the connection tubes, and passing the cooling liquid directly from the heat radiator to the reservoir via an inlet connection of the reservoir, and directly from the reservoir to the heat radiator via an outlet connection of the reservoir. Such an embodiment may even render the possibility of both the pumping device of the liquid pump inside

the reservoir and the electrical motor for the propeller of the air fan 23 of the heat radiator 11 being driven by the same electrical motor, thus making this electrical motor the only motor of the cooling system.

[096] When placing the heat radiator on top of the air fan now placed directly in alignment with the reservoir and connecting the heat radiator directly to the inlet connection and outlet connection of the reservoir, a need for tubes will not be present. However, if the heat radiator and the reservoir is not in direct alignment with each other, but tubes may still be needed, but rather than tubes, pipes made of metal such as copper or aluminum may be employed, such pipes being impervious to any possible evaporation of cooling liquid. Also, the connections between such pipes and the heat radiator and the reservoir, respectively, may be soldered so that even the connections are made impervious to evaporation of cooling liquid.

[097] In the derived embodiment just described, an integrated unit of the reservoir, the heat exchanging surface and the pumping device will be given a structure establishing improved heat radiating characteristics because the flow of air of the air fan may also be directed along outer surfaces of the reservoir. If the reservoir is made of a metal, the metal will be cooled by the air passing the reservoir after having passed or before passing the heat radiator. If the reservoir is made of metal, and if the reservoir is provided with segments on the outside surface of the reservoir, such cooling of the reservoir by the air will be further improved. Thereby, the integrated unit just described will be applied improved heat radiating characteristics, the heat radiation function normally carried out by the heat radiator thus being supplemented by one or more of the further

elements of the cooling system, i.e. the reservoir, the heat exchanging surface, the liquid pump and the air fan.

[098] FIG. 9-10 show an embodiment of a reservoir housing 14, where channels 25 are provided inside the reservoir for establishing a forced flow of the cooling liquid inside the reservoir. The channels 25 in the reservoir housing 14 lead from an inlet 15 to an outlet 16 like a maze between the inlet and the outlet. The reservoir housing 14 is provided with an aperture 27 having outer dimensions corresponding to the dimensions of a free surface of the processing unit 1 to be cooled. In the embodiment shown, the processing unit to be cooled is a CPU 1.

[099] When channels 26 are provided inside the reservoir, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps manufactured by injection molding, or is to be made of metal such as aluminum, perhaps manufactured by extrusion or by die casting.

[0100] The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0101] The CPU 1 is intended for being positioned in the aperture 27, as shown in FIG. 10, so that outer boundaries of the CPU are engaging boundaries of the aperture. Possibly, a sealant (not shown) may be provided along the boundaries of the CPU and the aperture for ensuring a fluid tight engagement between the boundaries of the CPU and the boundaries of the aperture. When the CPU 1

is positioned in the aperture 27, the free surface (not shown) of the CPU is facing the reservoir, i.e. the part of the reservoir having the channels provided. Thus, when positioned in the aperture 27 (see FIG. 10), the free surface of the CPU 1 is having direct contact with cooling liquid flowing through the channels 26 in the reservoir.

[0102] When cooling liquid is forced from the inlet 15 along the channels 26 to the outlet 16, the whole of the free surface of the CPU 1 will be passed over by the cooling liquid, thus ensuring a proper and maximized cooling of the CPU. The configuration of the channels may be designed and selected according to any one or more provisions, i.e. high heat dissipation, certain flow characteristics, ease of manufacturing etc. Accordingly, the channels may have another design depending on any desire or requirement and depending on the type of CPU and the size and shape of the free surface of the CPU. Also. other processing units than a CPU may exhibit different needs for heat dissipation, and may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the channels. If the processing unit is very elongate, such as a row of microprocessors, one or a plurality of parallel channels may be provided, perhaps just having a common inlet and a common outlet.

[0103] FIG. 11-13 show an embodiment of a heat sink 4, where segments 28 are provided at a first side 4A of the heat sink, and fins 29 for dissipating heat to the surroundings are provided at the other, second side 4B of the heat sink. An intermediate reservoir housing 30 is provided having a recessed reservoir at the one side facing the first side 4A of the heat sink. The recessed reservoir 30 has an inlet 31 and an outlet 32 at the other side opposite the side facing the heat sink 4.

[0104] When segments 28 are provided on the first side 4A of the heat sink, the shape of the segments may be decisive of whether the reservoir, which is made from metal such as aluminum or copper, is to be made by extrusion or is to be made by other manufacturing processes such as die casting. Especially when the segments 28 are linear and are parallel with the fins 29, as shown in the embodiment, extrusion is a possible and cost-effective means of manufacturing the heat sink 4.

[0105] The intermediate reservoir 30 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0106] The recessed reservoir is provided with a kind of serration 33 along opposite sides of the reservoir, and the inlet 31 and the outlet 32, respectively, are provided at opposite corners of the intermediate reservoir 30. The segments 28 provided at the first side 4A of the heat sink, i.e. the side facing the intermediate reservoir 30, are placed so that when the heat sink is assembled with the intermediate reservoir housing (see FIG. 13) the segments 29 run from one serrated side of the reservoir to the other serrated side of the reservoir.

[0107] When cooling liquid is forced from the inlet 31 through the reservoir, along channels (not shown) formed by the segments 29 of the heat sink 4 and to the outlet 32, the whole of the first side 4A of the heat sink will be passed over by the cooling liquid, thus ensuring a proper and maximized heat dissipation between the cooling liquid and the heat sink. The configuration of the segments on the first side 4A of the heat sink and the configuration of the serrated sides of the intermediate

reservoir housing may be designed and selected according to any provisions. Accordingly, the segments may have another design, perhaps being wave-shaped or also a serrated shape, depending on any desired flow characteristics of the cooling liquid and depending on the type of heat sink and the size and shape of the reservoir.

[0108] Also other types of heat sinks, perhaps circular shaped heat sinks may exhibit different needs for heat dissipation, may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the segments and the intermediate reservoir. If the heat sink and the reservoir are circular or oval, a spiral-shaped segmentation or radially extending segments may be provided, perhaps having the inlet or the outlet in the centre of the reservoir. If an impeller of the pump is provided, as shown in FIG. 15-16, the impeller of the pump may be positioned in the centre of a spiral-shaped segmentation or in the centre of radially extending segments.

[0109] FIG. 14 shows the reservoir housing 14 shown in FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 shown in FIG. 11-13 being assembled for thereby constituting an integrated monolithic unit. It is not absolutely necessary to assemble the reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 in order to obtain a properly functioning cooling system. The inlet 15 and the outlet 16 of the reservoir housing 14 of FIG. 9-10 may be connected to the outlet 32 and the inlet 31, respectively, of the intermediate reservoir of FIG. 11-13 by means of tubes or pipes.

[0110] The reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 may then be positioned in the computer system at different locations. However, by

assembling the reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 a very compact monolithic unit is obtained, also obviating the need for tubes or pipes. Tubes or pipes may involve an increased risk of leakage of cooling liquid or may require soldering or other special working in order to eliminate the risk of leakage of cooling liquid. By eliminating the need for tubes or pipes, any leakage and any additional working is obviated when assembling the cooling system.

[0111] FIG. 15-16 show a possible embodiment of a reservoir according to the invention. The reservoir is basically similar to the reservoir shown in FIG. 9-10. However, an impeller 33 of the pump of the cooling system is provided in direct communication with the channels 26. Also, in the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed between the channels 26 inside the reservoir and the CPU 1 as the processing unit.

[0112] The heat exchanging surface 4 is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU 1 (see FIG. 4). However, also the inner surface (not shown, see FIG. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

[0113] The provision of the heat exchanging surface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging surface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging surface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

[0114] In the embodiment shown, the heat exchanging surface 4 is secured to the reservoir by means of bolts 22. Other convenient fastening means may be used. The heat exchanging surface 4 and thus the reservoir housing 14 may be fastened to the CPU 1 or other processing unit by any suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging surface. One such means may be the fastening means shown in FIG. 4 and FIG. 5 or similar fastening means already provided as part of the computer system.

[0115] When channels 26 are provided inside the reservoir housing 14, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

[0116] The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0117] The impeller 33 (see FIG. 14) of the pump is positioned in a separate recess of the channels 26, said separate recess having a size corresponding to the diameter of the impeller of the pump. The recess is provided with an inlet 34 and an outlet 35 being positioned opposite an inlet 31 and an outlet 32 of cooling liquid to and from, respectively, the channels 26. The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

[0118] The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

[0119] The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. The power supply of the computer system converts the high

voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump. However, in the embodiment shown, the impeller of the pump is driven by a 12V electrical motor.

[0120] FIG. 17 shows a preferred possible embodiment of a reservoir according to the invention. The reservoir housing 14, as shown in FIGS. 17 and 20, is in the form of a double-sided chassis configured to mount an electrical motor. The reservoir housing 14 has basically the same features as the reservoir housing shown in FIG. 15-16. In the embodiment shown, the reservoir substantially has a conical, circular configuration and is provided with stiffening ribs 36 extending axially along the exterior of the reservoir housing 14.

[0121] Other shapes such as cylindrical, circular, or conical rectangular or cylindrical, rectangular or even oval or triangular shapes may be adopted, when designing and possibly injection molding or casting the reservoir. The dimension of the embodiment shown is approximately 55 mm in diameter and also 55 mm in axial extension.

[0122] The reservoir housing 14 has a recess 40 in the centre on the upper side of the reservoir. The recess 40 is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess

40 has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior (see FIG. 20) of the jacket 44 is intended for encompassing the rotor 39 of the pump. As shown in FIG. 20, the impeller 33 is housed in a recess on the underside of the reservoir housing 14, the recess being an extension of the interior of the jacket 44.

[0123] Thereby, a liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system.

[0124] Along an outer circumferential extension, the reservoir housing 14 is provided with protrusions 45 extending outwardly from the circumferential extension. The protrusions are intended for cooperating with a clip (see description below) for fastening the reservoir housing 14 to the CPU or other processing unit of the computer system. The protrusions 45 are shown as a plurality of singular protrusions. Alternatively, the protrusions may be only one continuous protrusion extending outwardly and around the circumferential extension.

[0125] The reservoir housing 14 may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and the outlet are provided along a surface of the reservoir

facing downward and inwards when seen in the perspective view of the drawing. The inlet and the outlet lead to a radiator (not shown) intended for cooling the cooling liquid after having been heated by the processing unit via a heat exchanging surface (see description below).

[0126] The radiator may be placed nearby or distant from the reservoir housing 14, depending on the set-up of the computer system. In one possible embodiment, the radiator is placed in the immediate vicinity of the reservoir, thereby possible excluding any tubing extending between the radiator and the inlet and the outlet, respectively. Such embodiment provides a very compact configuration of the entire cooling system, namely a monolithic configuration where all elements needed for the cooling system are incorporated in one unit.

[0127] In an alternative embodiment, the reservoir housing 14 itself also constitutes the radiator of the cooling system. In such embodiment, an inlet and an outlet are not needed. If the reservoir is made of a metal such as copper or aluminum or other material having a high thermal conductance, the cooling liquid, after having been heated by the processing unit via a heat exchanging surface 8 see description below) may radiate the heat via the exterior surface of the reservoir housing 14 itself. In such embodiment, the ribs 36 along the exterior surface of the reservoir housing 14 may also, or may instead, function as cooling fins. In such embodiment, the fins will have a smaller dimension than the transverse dimension of the ribs 14 shown in FIG. 17, and the number of fins will be greater than the number of fins shown in FIG. 17.

[0128] An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 formed by impeller cover 46A having an outlet 34 provided tangentially to the

circumference of the impeller 33. Thus, the pump functions as a centrifugal pump. The inlet of the pump chamber 46 is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir housing 14 as such. An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber 47A provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber 47A provided at the opposite of the intermediate member 47 to the interior of the reservoir housing 14. Thus, the area enclosed between the underside of the reservoir housing 14 and the heat exchange surface 4 constitutes an enclosed space for circulating the cooling liquid therethrough. The enclosed spaced is divided into two separate chambers by the impeller cover 46A and the intermediate member 47, as shown in FIG. 20. The impeller cover 46A interfaces with the recess on the underside of the reservoir 14 to define the pump chamber 46 which houses the impeller 33, while the intermediate member 47 and the heat exchange surface 4 together define the thermal exchange chamber 47A.

[0129] In the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47.

[0130] The heat exchanging interface 4 is preferably made from a copper plate having a plane outer surface (not shown) at the opposite side as the side shown in the figure, said outer surface being

intended for abutting the free surface of the heat generating component such as the CPU (see FIG. 4). The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47 is provided with pins 4A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate member 47. The pins 4A constitutes an uneven surface and may either be provided during casting of the copper plate or may be provided by means of milling or other machining process of a copper plate. The pins provide a network of channels across the inner surface of the heat exchanging interface, along which network the cooling liquid is intended to flow.

[0131] Alternatively, also the inner surface of the copper plate facing the reservoir is plane. In this alternative embodiment, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown. No milling or other machining process of the inner and/or the outer surface need be provided, when both the outer surface and the inner surface is plane.

[0132] The provision of the heat exchanging interface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging interface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging interface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

[0133] In the embodiment shown, the heat exchanging interface 4 is secured to the intermediate member 47 by means of gluing or other means ensuring a proper and liquid-tight fastening of the heat exchanging interface with the intermediate member. Any other suitable and convenient means (not shown) for securing the heat exchanging interface to the intermediate member may be envisaged.

[0134] The heat exchanging interface and thus the reservoir is fastened to the top of the CPU by means of a clip 50. The clip 50 has a circular configuration and has four legs 51 extending axially from the circular configuration. The four legs 51 are provided with footing 52 and the footings 52 are provided with holes 53. The clip 50 is intended for being displaced around the exterior of the reservoir housing 14 and further axially to the protrusions 45 of the reservoir housing 14.

[0135] The clip 50, after having been placed around the reservoir housing 14, is fastened to the motherboard of the computer system by means of bolts (not shown) or the like fastening means extending through the holes 53 in the footings 52 and further though corresponding holes in the motherboard. The corresponding holes in the motherboard are preferably holes already available in the motherboard in the vicinity of the CPU and the socket of the CPU, respectively. Accordingly, the legs 51 and the footings 52 of the clip 50 are specially designed in accordance with the already provided holes in the motherboard.

[0136] Alternatively, the heat exchanging interface 4 and thus the reservoir housing 14 may be fastened to the CPU or other processing unit by any other suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be

provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging interface. One such means may be the fastening means shown in FIG. 4 and FIG. 5 or similar fastening means already provided as part of the computer system.

[0137] When stiffening and/or cooling fins 36 are provided at the exterior of the reservoir housing 14, the shape of and the number of fins may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting. Also, the purpose of the fins i.e. just for stiffening the reservoir, or also or instead for cooling purposes, may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

[0138] The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0139] The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

[0140] The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the

electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

[0141] The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V AC power or 220V AC power. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by either an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be nevertheless be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump.

[0142] In every aspect of the invention, where an AC motor is used for driving an impeller from a DC motor, although this way of configuring a pump is contradictory, the following preferred mode of operation is established for alleviating the disadvantages:

[0143] In order to be able to control direction of rotation of the impeller attached to the rotor and to optimize the conditions of maximum average torque value during starting, i.e. from zero speed up to the synchronous speed, an electronic control circuit is used. The electronic control circuit comprises a processing unit, which drives a static power switch, constituted for example by a triac arranged in

series between the alternating-voltage power, which is obtained from the DC power supply of the computer system, and the AC motor. The same series network also includes a detector for the current I which flows through the triac and then through the AC motor. The output of the current detector is an input signal for the electronic processing unit.

[0144] The electronic control circuit may also comprise a number or sensors suitable for detecting the position and polarity of the permanent magnets comprised in the rotor of the AC motor, both when the rotor is moving and when it is in particular operating conditions, or when it is motionless or stalled at zero speed. The number of position sensors may be Hall sensors, encoders or optical or electromechanical sensors capable of establishing and/or measuring the position of the rotor. The output signal from the number of position sensors is an input signal for the electronic processing unit.

[0145] Alternatively, the output signal from the position sensor may be phase shifted by means of an electronic phase shifting circuit before the output signal is sent to the input of the electronic processing unit.

[0146] A third signal may be input to the processing unit, said third signal enabling the processing unit to detect the polarity of the AC voltage applied to the AC motor. However, the third signal is not compulsory.

[0147] The signals input to the electronic processing unit are converted into digital form and after being processed by the processing unit, an output signal is provided by the processing unit. The

output signal is used for closing or opening the static switch constituted by a triac arranged in series with the AC motor.

[0148] In the electronic processing unit, the current signal provided by the current sensor enters a zero-crossing detector which provides in output a logical "1" signal indicating that said current approaches zero with a positive or negative deviation from the zero value of said current. This deviation depends on the type of motor used and on its application, as well as on the type of static power switch being used. The signal arriving from the position sensor enters a phase-shift and processing circuit the output whereof is 1 or 0 according to the position and polarity of the rotor.

[0149] In the electronic processing unit, the phase shifted position signal as well as the signal processed from the AC voltage, enter an electronic logic XOR gate which outputs a "1" signal if the digital value of the AC voltage is equal to "0" and the digital value of the phase shifted position signal is equal to "1" or the digital value of the AC voltage is equal to "1" and the digital value of the phase shifted position signal is equal to "0".

[0150] The output of the zero-crossing detector and the output of the XOR gate, thus in digital form, enter an electronic logic AND gate which provides in output the control signal for closing or opening the static power switch.

[0151] The AND gate with two inputs and the signal processing system allow determining two conditions: 1) the AC voltage signal is positive, the current is proximate to zero, and the rotor rotation angle is between 0 degrees and 180 degrees; 2) the AC voltage signal is negative, the current

is proximate to zero, and the rotor rotation angle is between 180 degrees and 360 degrees. These two conditions provide the same rotation direction of the rotor of the AC motor.

[0152] FIG. 18 shows an embodiment of an AC motor in which one stator pole 54 is longer than the other stator pole 55 by an amount indicated by I. With this configuration the permanent-magnet rotor 39 with an ideal line 56 separating the north N and the south S of the rotor, is positioned so that the ideal line 56 do not coincide with the median axis 57 of the stator 37, but so that the ideal line 56 is tilted by a certain angle .alpha. in respect to the median 57 of the stator 37.

[0153] Two energizing windings 58, 59 are provided on the two poles 54,55 of the stator 37, respectively, and the energizing windings are connected in series and are powered, through terminals (not shown), by an AC power source. With this configuration of the AC motor, the motor is able to start more easily in an intended rotational direction of the rotor.

[0154] In a preferred embodiment of the invention, the control electronics supplies the AC motor with only a half-wave voltage signal during start up, thereby providing torque pulses to the rotor. Since only a half-wave voltage signal is supplied to the motor, the torque pulses are always unidirectional and will therefore force the rotor to start rotating in a required direction. The required direction of rotation is determined by the design of the impeller attached to the rotor and by polarity of the half-wave voltage signal.

[0155] After some amount of time, in which a number of half-wave voltage signals has been supplied to the motor, the rotor will stop rotating at a certain position e.g. as shown in the figure. Thus, the rotor is brought into a determined steady state position that is independent of its start

position. Subsequent to this process, the AC motor is supplied with a full-wave voltage signal that will accelerate the rotor until the motor enters synchronous operation, that is, when the rotor rotates with the same cyclic frequency as the frequency of the AC voltage source.

[0156] The initial polarity of the AC voltage signal is determinative for the resulting direction of rotation of the rotor, thus if the initial voltage is positive with an increasing amplitude, the rotor will start rotating in one direction, whereas if the voltage is negative with a decreasing amplitude, the rotor will start rotating in an opposite direction.

[0157] The number of half-waves required for bringing the rotor into a determined steady state position, where the rotor stops rotating, depends on the characteristics of the motor such as moment of inertia and the external load applied to the rotor. Thus, the number of half-waves required is based on empirical analysis of a particular motor in particular load conditions.

[0158] The half-wave voltage signal and the corresponding half-wave current signal supplied to the motor will have an appearance as shown in FIG. 19.

[0159] In an alternative embodiment the control electrics used to drive the AC motor shown if FIG. 18 is configured so that that the control electronics dictates the AC motor to stop at a predetermined position by supplying the motor with a number of half-wave voltage signals subsequent to the synchronous operation in which the motor was supplied with a full-wave voltage signal. Thus, at the time the motor needs to be started again, the rotor is already in a position so that only the polarity of the full-wave AC voltage signal supplied to the motor must be chosen so that the resulting direction of rotation of the rotor is in conformity with the terminal position of the rotor at the last operation.

[0160] According to this method, the initial step of bringing the rotor into a determined steady state position by supplying the motor with a number of half-wave voltage signals is not required. Even in the alternative, it will be possible to both terminate the full-wave power supply with a number of half-wave voltage signals as well as commencing the full-wave power supply by initially supplying the motor with a number of half-wave signals. However, this is more cumbersome, but nevertheless more safe.

[0161] FIG. 19 shows a voltage signal V and a current signal I applied to the AC motor as well as the position signal of the rotor. Initially the rotor stands still, which is represented by the straight line L. The electronic control circuit controls the static power switch so that the voltage signal V and the current signal I are present as half-waves. Thus, the rotor receives torque pulses due to the current-voltage combination; these pulses are always one-way directional and tend to start the rotor moving in the required direction. Subsequent to the start-up phase, the rotor enters into its synchronous operation.

[0162] Thus, an AC signal is generated, preferably a 12 V AC signal, possibly by means of digital electric pulses from the 12 V DC power supply of the computer's power supply. Based on a possible sensor output relating to the impeller position, a decision is made of how to initiate the AC power signal, i.e. with a negative or positive half-wave, and by doing making sure the impeller starts in the same rotational direction each time and thus the performance benefits of the AC pump is similar to those of a DC pump.

[0163] Alternatively, the magnetic field sensor is omitted, and instead of reading the impeller position, the impeller is forced to be in the same position every time the impeller starts. To be sure the impeller is in a defined position before start, a signal is supplied to the stator of the AC motor for a defined period of time. The signal is supplied perhaps three times in a row according to the curvature of the electrical power source. The pulses must be within the same half-wave part of a signal period. The frequency of the pulsed signal is arbitrary, but may be 50/60 Hz, although, despite the fact that under normal circumstances an AC pump being driven by the AC signal from the power outlet of the public electrical power network and transformed from 230/115 V to 12V would not function, as there is no chance of changing the sine signal from the public network.

[0164] By this way the impeller will be forced to the right polarity before start, and the pump will start turning the impeller in a defined way of rotation when the power signal full-wave is supplied. The full-wave power signal, which is supplied, must start in the opposite signal half-wave amplitude than that of the initial half-wave pulses, that was supplied before start of the full-wave power signal.

[0165] The invention has been described with reference to specific embodiments and with reference to specific utilization, it is to be noted that the different embodiments of the invention may be manufactured, marketed, sold and used separately or jointly in any combination of the plurality of embodiments. In the above detailed description of the invention, the description of one embodiment, perhaps with reference to one or more figures, may be incorporated into the description of another embodiment, perhaps with reference to another or more other figures, and vice versa. Accordingly, any separate embodiment described in the text and/or in the drawings, or any combination of two or more embodiments is envisaged by the present application.

CLAIMS

What is claimed is:

1. A liquid cooling system for cooling a heat-generating component of a computer, comprising:

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor with a stator and an impeller, the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:

a pump chamber including the impeller; and

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled together by one or more passages;

a heat-exchanging interface removably coupled to the reservoir, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component;

a heat radiator adapted to pass the cooling liquid therethrough, the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;

a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump; and

a control system configured to independently control a speed of the pump and a speed of the fan.

2. The cooling system of claim 2, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3. The cooling system of claim 1, wherein the heat exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat -exchanging interface to the cooling liquid in the thermal exchange chamber.

5. The cooling system of claim 4, wherein the features include at least one of pins or fins.

6. The cooling system of claim 1, wherein the impeller is positioned in the pump chamber.

7. The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

8. A cooling system for a computer system, comprising:

a centrifugal pump adapted to circulate a cooling liquid, the pump including:

a curved impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:

a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;

a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber;

a heat radiator fluidly coupled to the reservoir and positioned at a location spaced apart from the heat-generating component;

a fan attached to the heat radiator, wherein a speed of the fan is configured to be varied independent of a speed of the pump; and

a control system configured to independently adjust a speed of the pump and a speed of the fan to provide a desired cooling capacity.

9. The cooling system of claim 8, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.

10. The cooling system of claim 8, wherein the control system is configured to independently control the speed of the pump and the speed of the fan to minimize noise while providing the desired cooling capacity.

11. The cooling system of claim 10, wherein, if the fan generates more noise than the pump, the control system reduces the speed of the fan before the speed of the pump to reduce noise, and if the pump generates more noise than the fan, the control system reduces the speed of the pump before the speed of the fan to reduce noise.

12. The cooling system of claim 8, wherein the control system is configured to determine the desired cooling capacity based on a performance parameter of the heat generating component.

13. (New) The cooling system of claim 12, wherein the performance parameter is one of an operating load or an operating temperature of the heat-generating component.

14. The cooling system of claim 8, wherein the control system configured to determine the desired cooling capacity based on at least one of an operating load or an operating temperature of the heat-generating component.

15. The cooling system of claim 8, wherein the control system is configured to determine the desired cooling capacity based on a type of computer processing taking place in the heat-generating component.

16. The cooling system of claim 8, wherein the control system is configured to reduce the speed of the fan before the speed of the pump to reduce noise if the fan generates more noise than the pump, and reduce the speed of the pump before the speed of the fan to reduce noise if the pump generates more noise than the fan.

17. The cooling system of claim 8, wherein the control system is configured to select a rotational direction of the impeller.

18. The cooling system of claim 8, wherein the control system is configured to determine an angular position of the rotor.

ABSTRACT

The invention relates to a cooling system for a computer system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid. The cooling system has a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, Different embodiments of the heat exchanging system as well as means for establishing and controlling a flow of cooling liquid and a cooling strategy constitutes the invention of the cooling system.

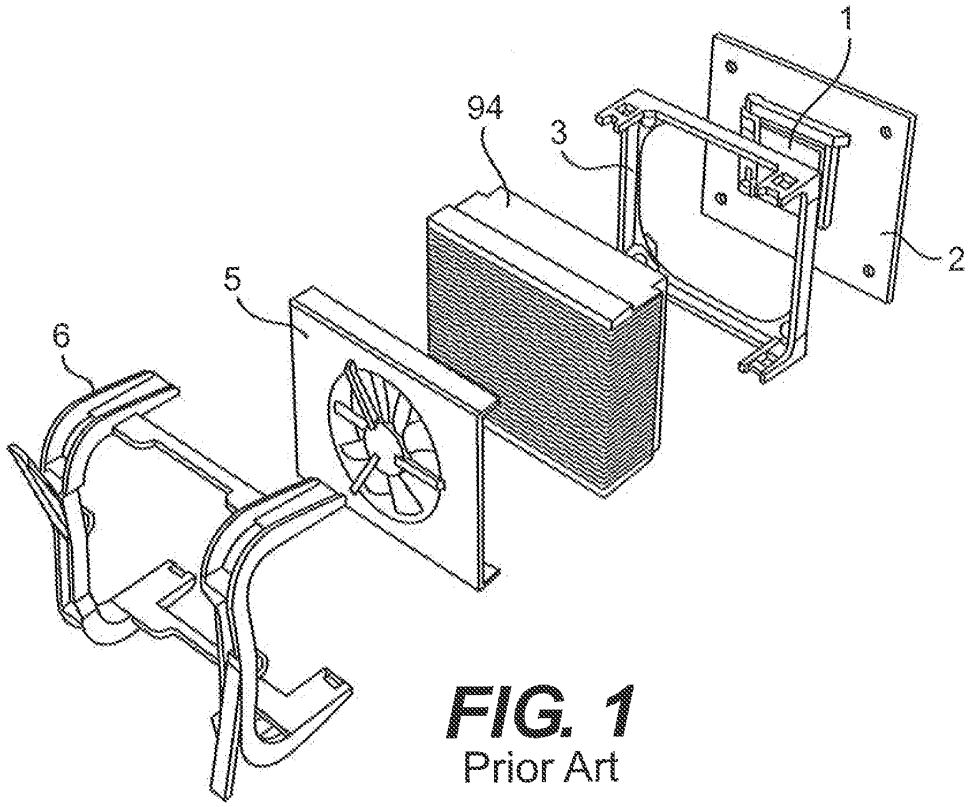


FIG. 1
Prior Art

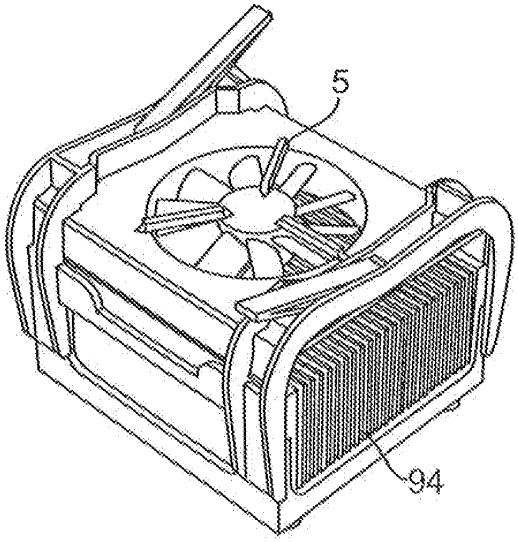


FIG. 2
Prior Art

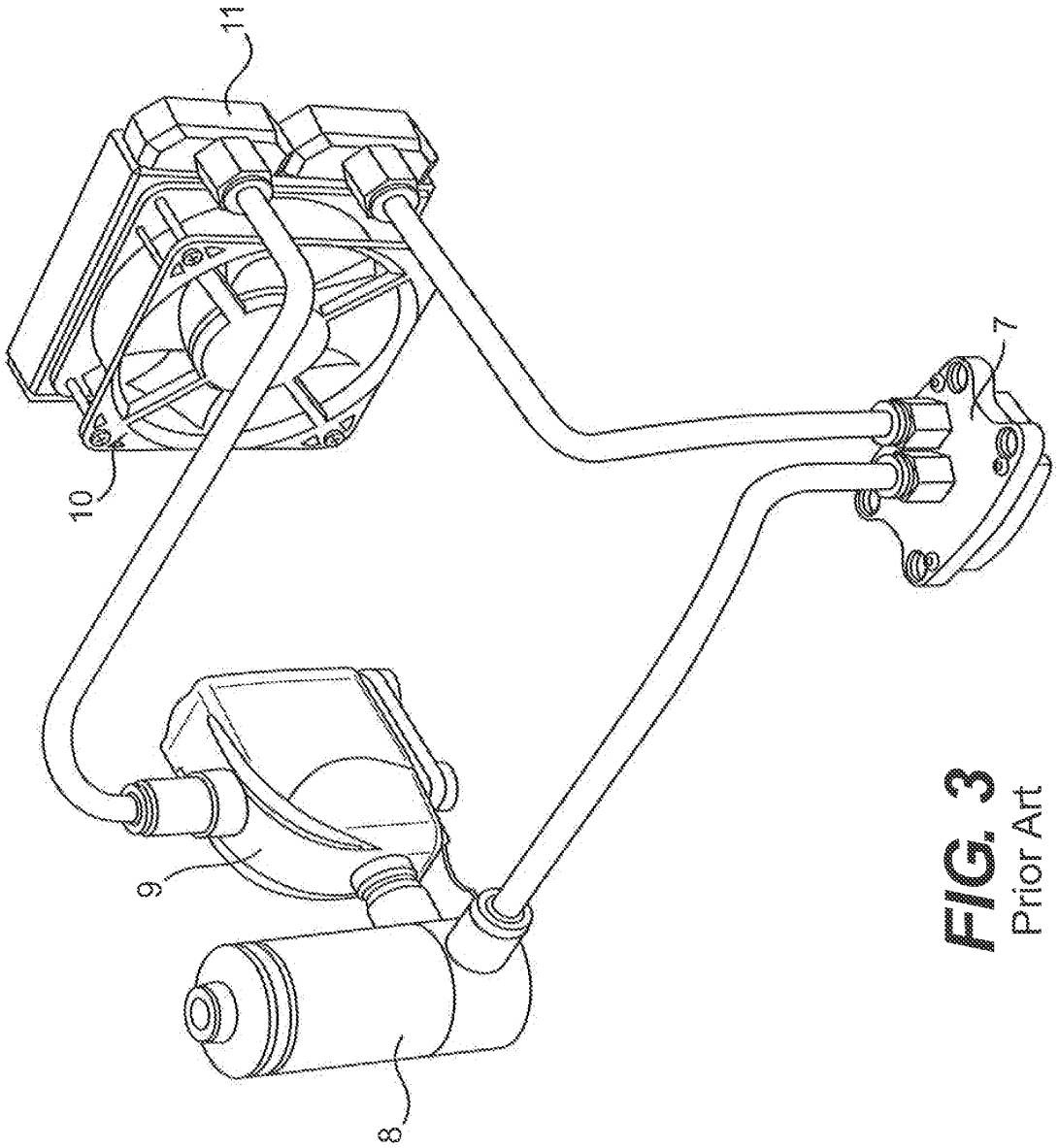


FIG. 3
Prior Art

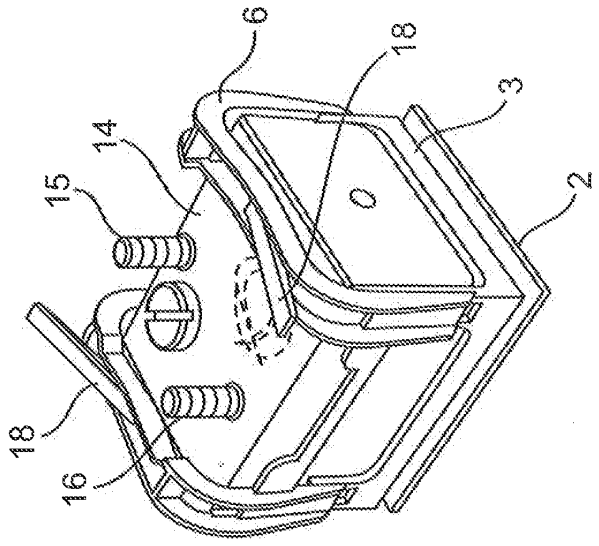


FIG. 5

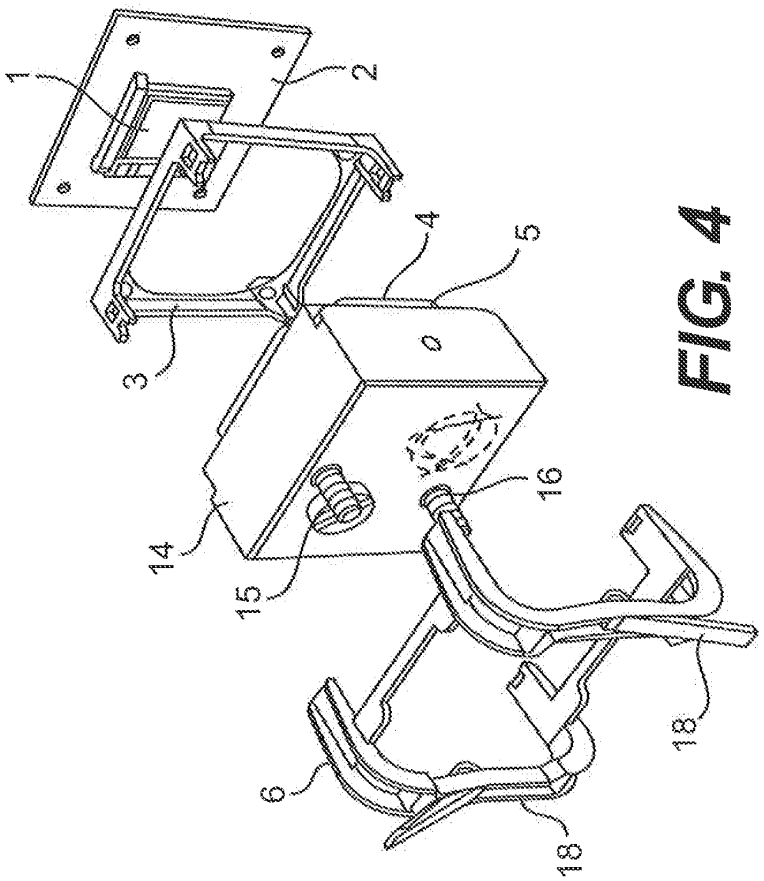


FIG. 4

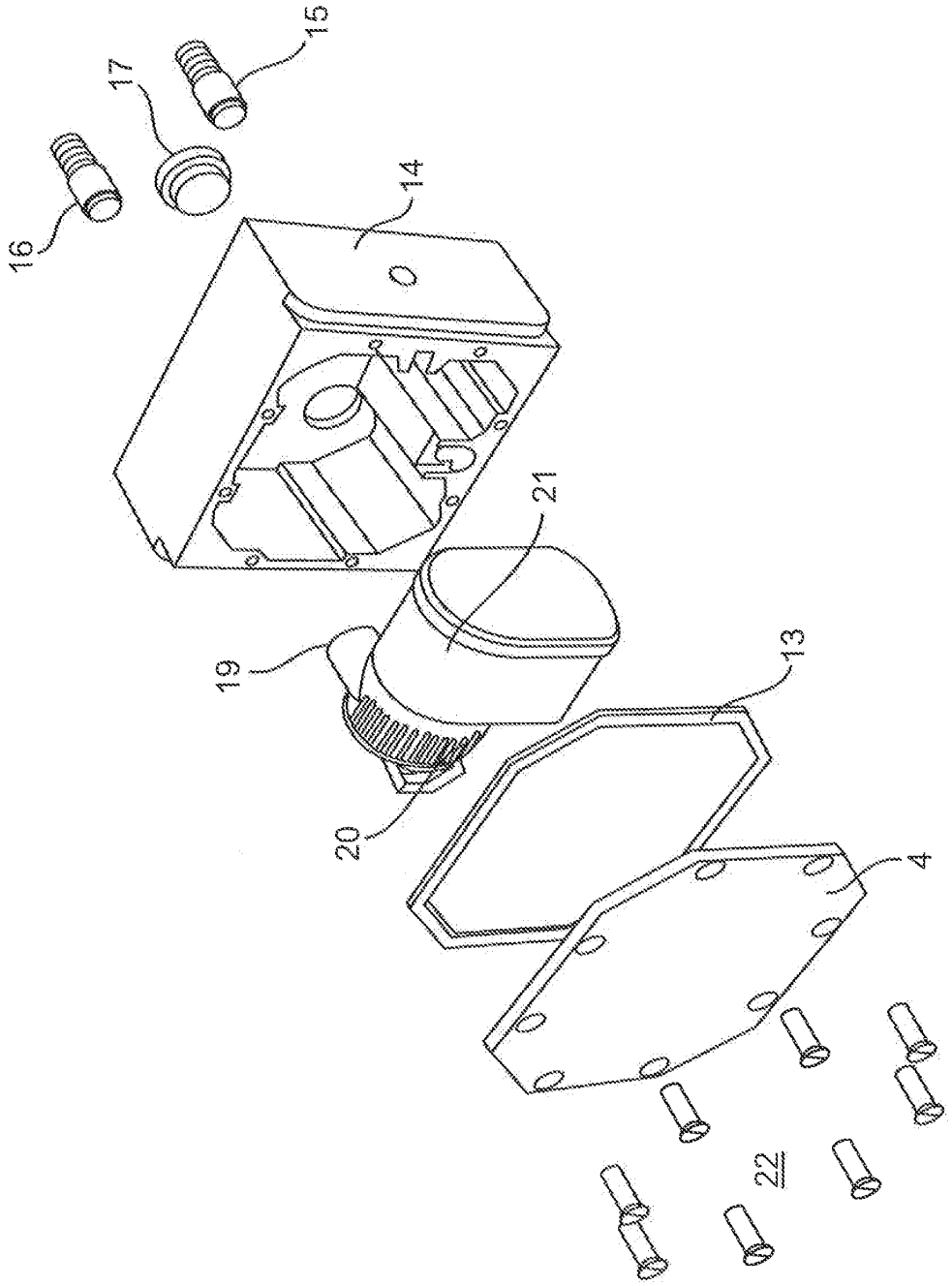


FIG. 6

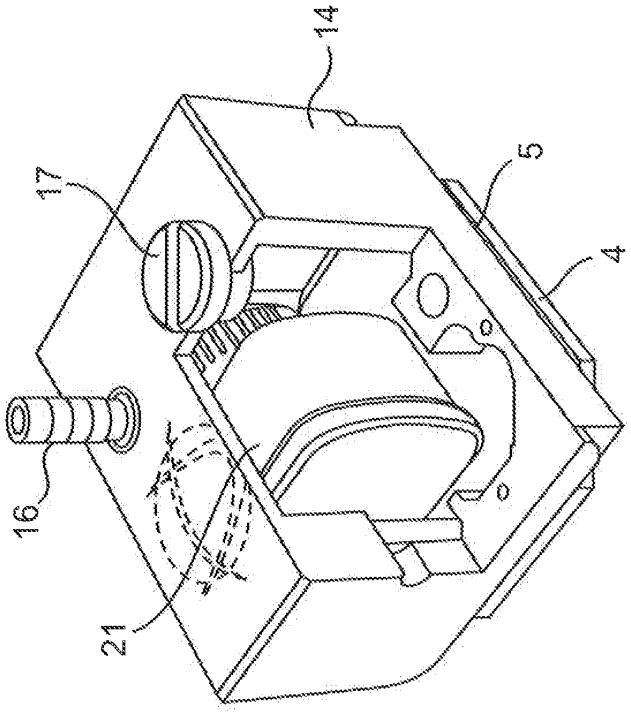


FIG. 8

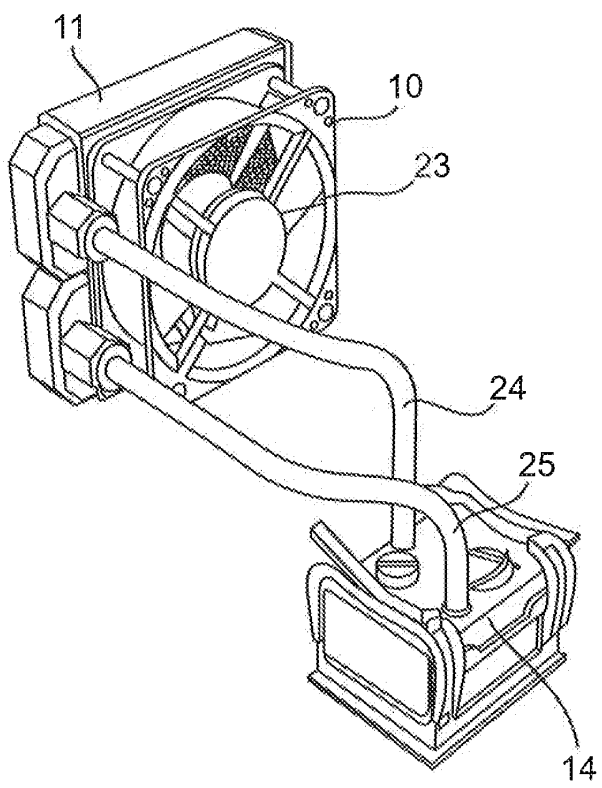


FIG. 7

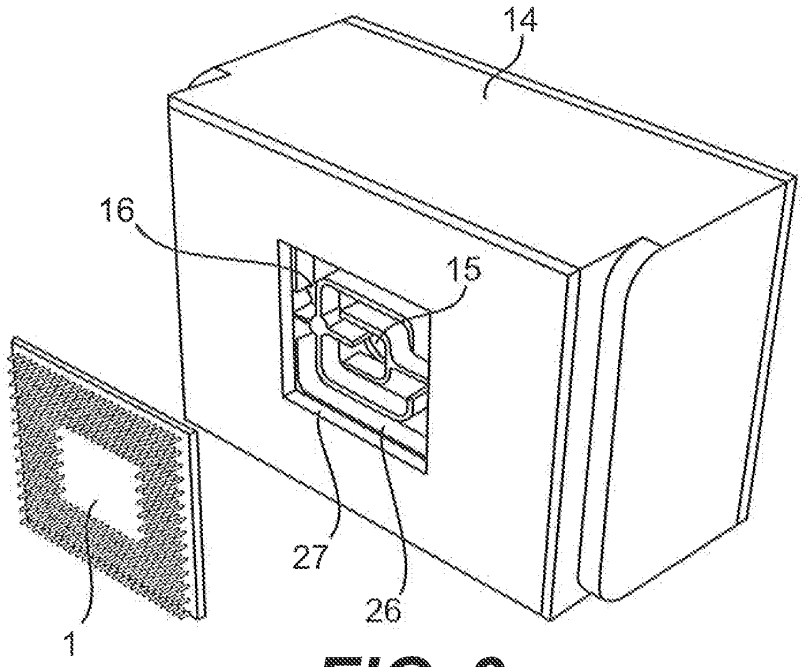


FIG. 9

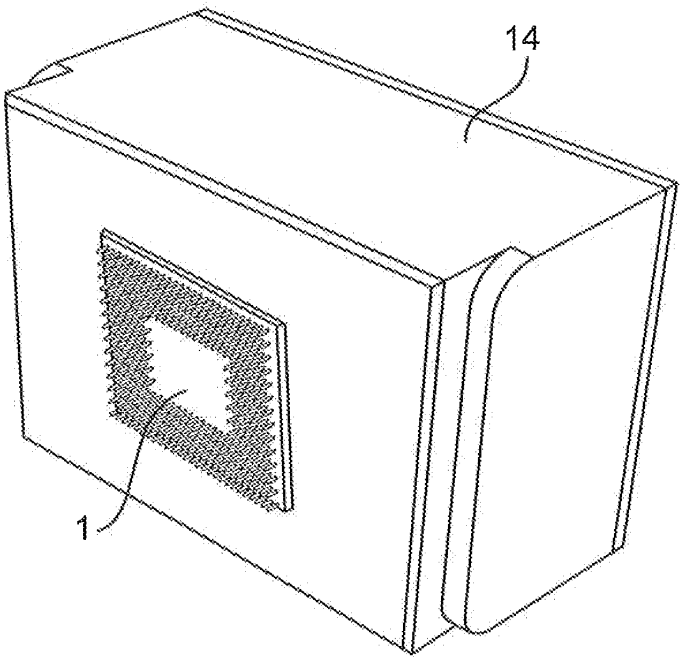


FIG. 10

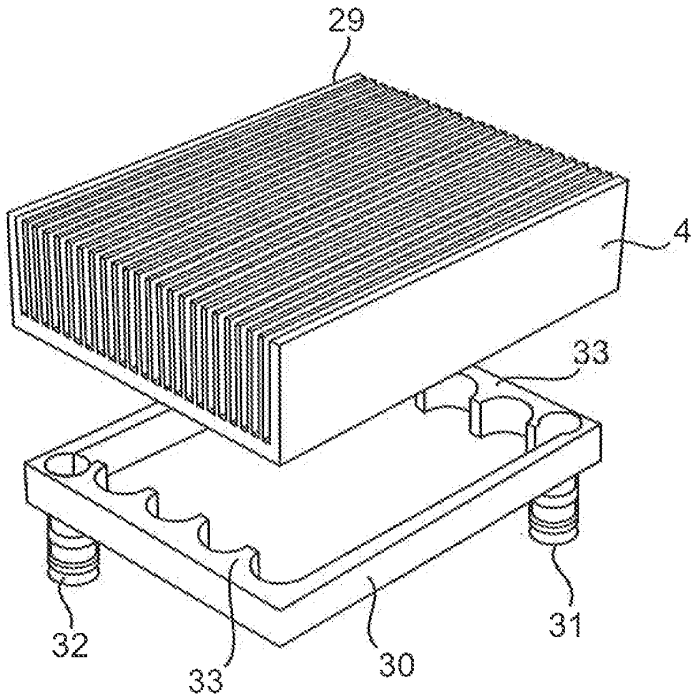


FIG. 11

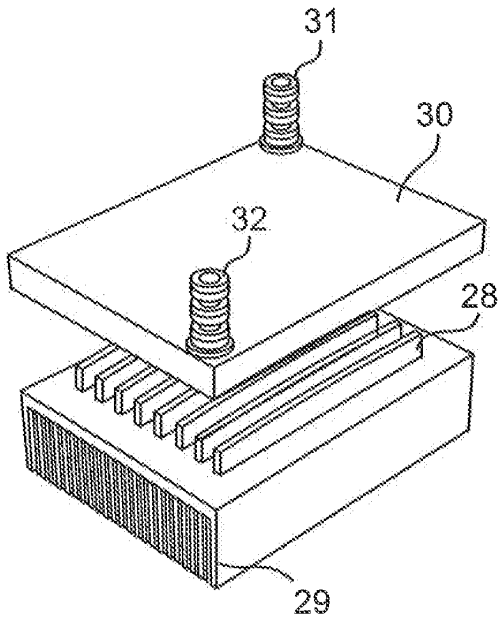


FIG. 12

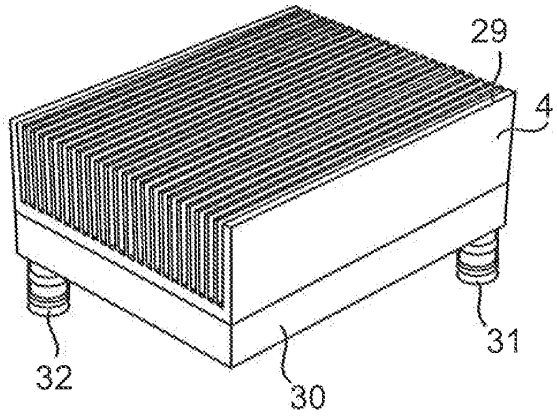


FIG. 13

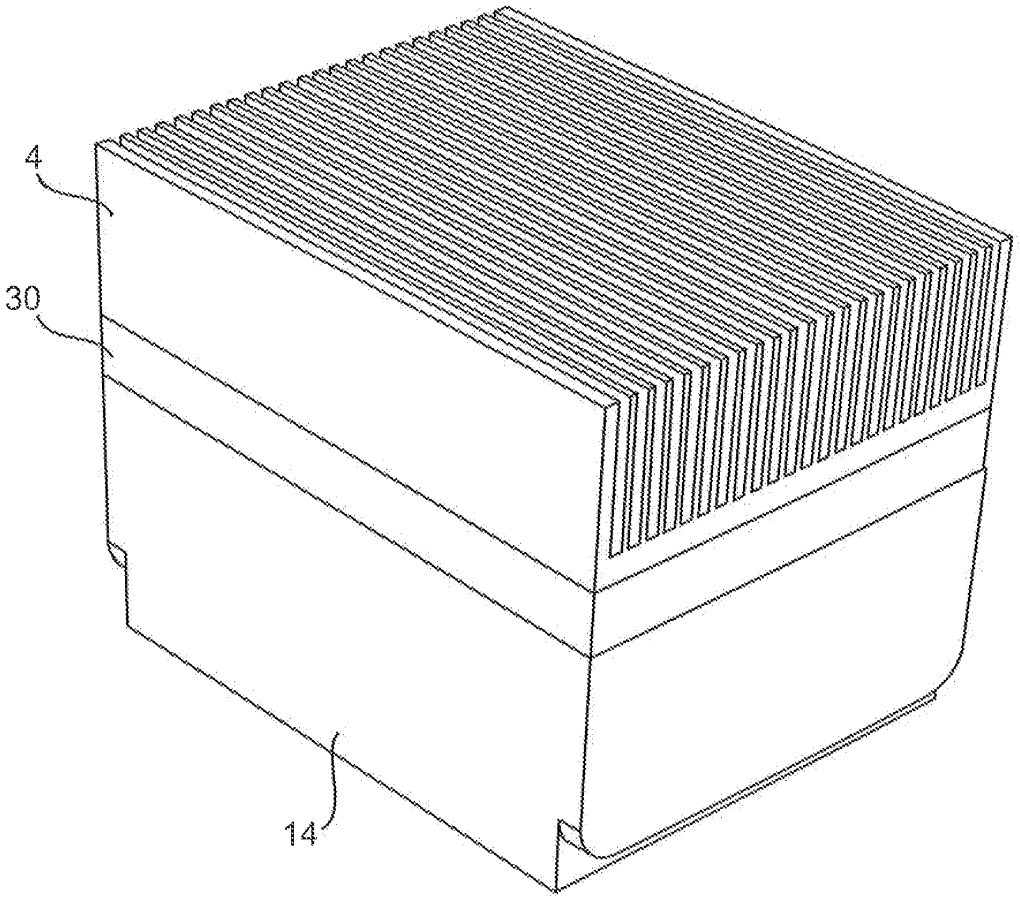


FIG. 14

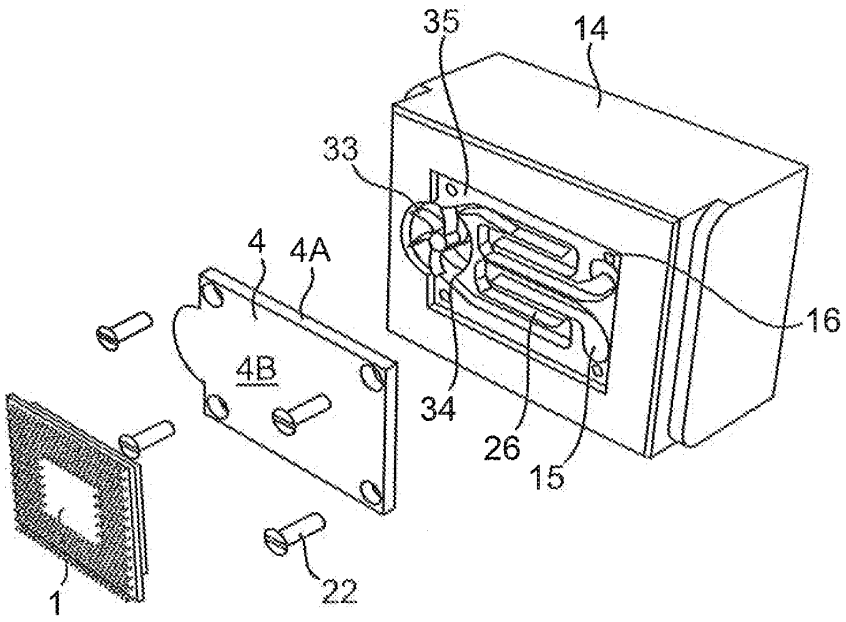


FIG. 15

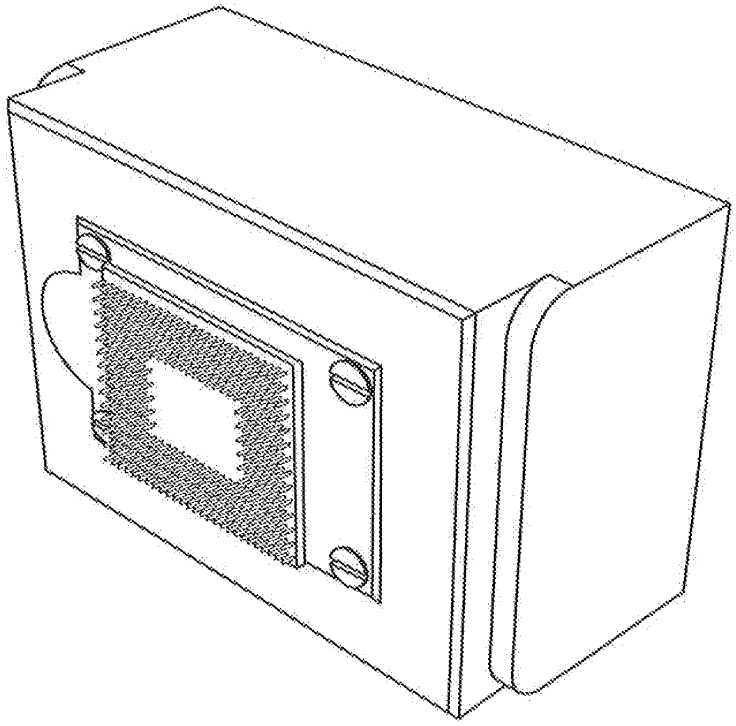


FIG. 16

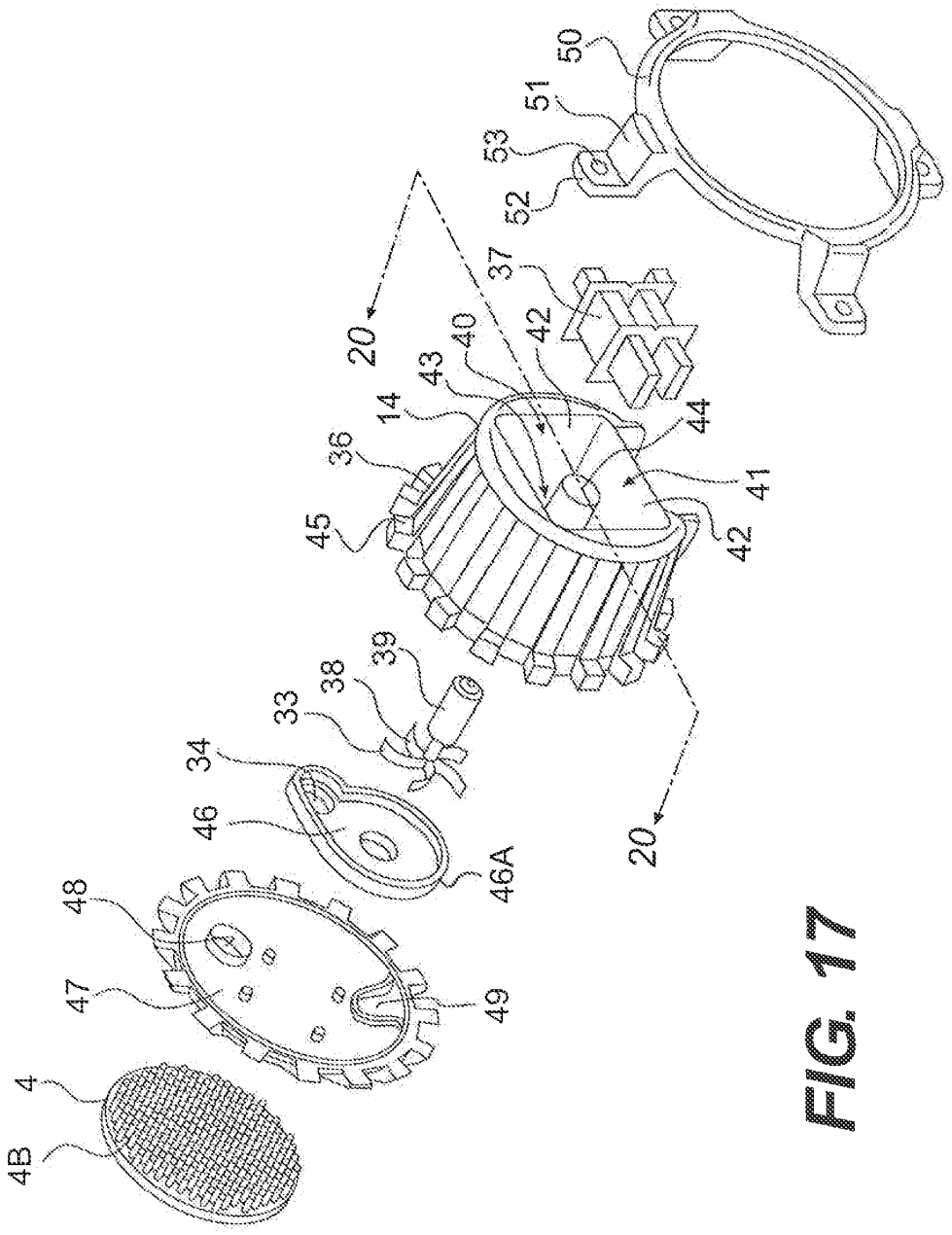

50
51
53
52
37
20
42
40
43
14
44
36
41
45
42
39
38
33
34
46
46A
48
47
49
4
4B
20

FIG. 17

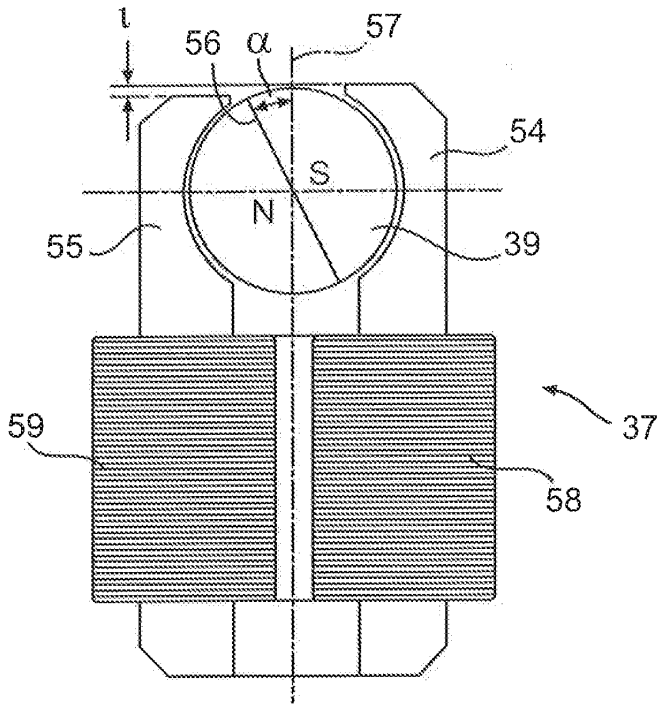


FIG. 18

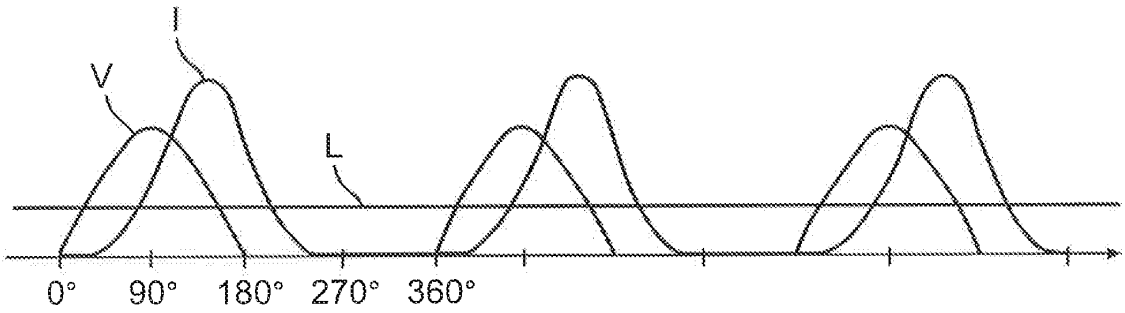


FIG. 19

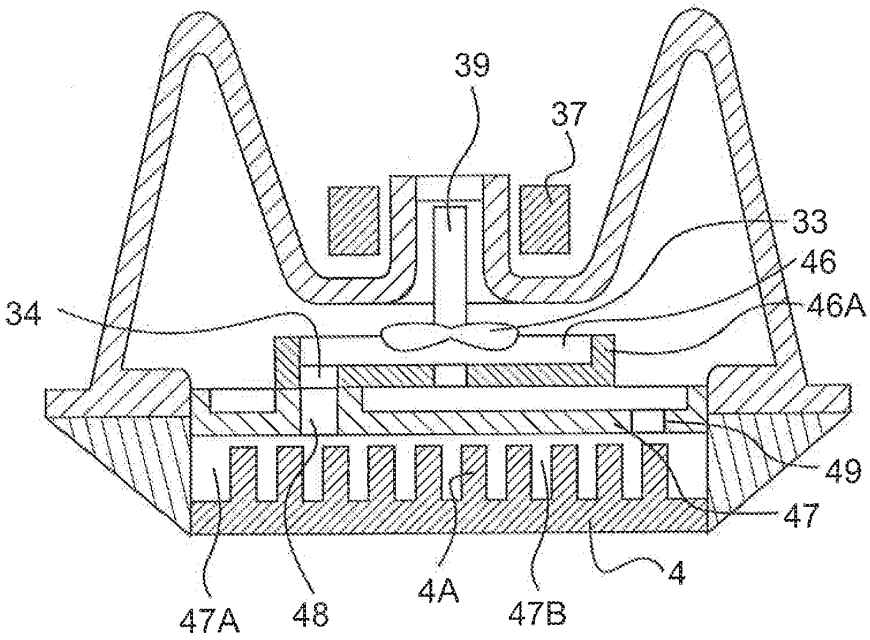


FIG. 20

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10494.0003-03000
	Application Number	
Title of Invention	COOLING SYSTEM FOR A COMPUTER SYSTEM	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	André	Sloth	ERIKSEN	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Morgan Hill	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	925 Via Vivaldi		
Address 2			
City	Morgan Hill	State/Province	CA
Postal Code	95037	Country	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	22852		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	COOLING SYSTEM FOR A COMPUTER SYSTEM		
Attorney Docket Number	10494.0003-03000	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	17	Suggested Figure for Publication (if any)	17

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10494.0003-03000
	Application Number	
Title of Invention	COOLING SYSTEM FOR A COMPUTER SYSTEM	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	22852		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	11919974	2009-01-06
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
11919974	a 371 of international	PCT/DK2005/000310	2005-05-06

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[1] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10494.0003-03000
	Application Number	
Title of Invention	COOLING SYSTEM FOR A COMPUTER SYSTEM	

Application Number	Country[1]	Filing Date (YYYY-MM-DD)	Access Code[1] (if applicable)

Remove

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10494.0003-03000
	Application Number	
Title of Invention	COOLING SYSTEM FOR A COMPUTER SYSTEM	

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(●) Assignee	( ) Legal Representative under 35 U.S.C. 117	( ) Joint Inventor
( ) Person to whom the inventor is obligated to assign.	( ) Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☒

Organization Name	ASETEK A/S		
Mailing Address Information For Applicant:			
Address 1	SALTUMVEJ 27		
Address 2			
City	BRONDERSLEV	**State/Province**	
Country	DK	Postal Code	DK-970
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest), as the patent application publication will include the name of the applicant(s).

If the Assignee is an Organization check here. ☐

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	10494.0003-03000
	Application Number	
Title of Invention	COOLING SYSTEM FOR A COMPUTER SYSTEM	

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Signature				Date (YYYY-MM-DD)	2013-04-12
First Name	Biju	Last Name	Chandran	Registration Number	63684

Additional Signature may be generated within this form by selecting the Add button.

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	Andre Sloth Eriksen
Filer:	Biju I. Chandran
Attorney Docket Number:	10494.0003-03000

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	280	280
Utility Search Fee	1111	1	600	600
Utility Examination Fee	1311	1	720	720
Pages:				
Claims:				
Miscellaneous-Filing:				
Late Filing Fee for Oath or Declaration	1051	1	140	140
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1740**

Electronic Acknowledgement Receipt	
EFS ID:	15502518
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	Andre Sloth Eriksen
Customer Number:	22852
Filer:	Biju I. Chandran
Filer Authorized By:	
Attorney Docket Number:	10494.0003-03000
Receipt Date:	12-APR-2013
Filing Date:	
Time Stamp:	13:18:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1740
RAM confirmation Number	10287
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		Application.pdf	4292435 e50de981af267b08c4248ff75641c7470514b28b	yes	87

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Transmittal of New Application	1	3
Specification	4	59
Claims	60	64
Abstract	65	65
Drawings-only black and white line drawings	66	82
Application Data Sheet	83	87

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	36704 6a999a8540694a53443726dda77d44c0afa5c3c2	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	4329139		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: PA..

Document Description: Power of Attorney

PTO/AIA/82B(07-12)

Approved for use through 11/30/2014. OMB 0651-0035

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent): 22,852

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

Name	Registration Number	Name	Registration Number

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

☒ The address associated with the above-mentioned Customer Number.

OR

☐ The address associated with Customer Number:

OR

☐ Firm or individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant:

☐ Inventor or Joint Inventor

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (*e.g.*, a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature		Date	
Name	André Sloth ERIKSEN	Telephone	486 998 9002
Title and Company			

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below *.

☒ *Total of one forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	COOLING SYSTEM FOR A COMPUTER SYSTEM

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 13/861,593 filed on April 12, 2013

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: André Sloth ERIKSEN Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PATENT
Customer No. 22,852
Attorney Docket No. 10494.0003-03000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
André Sloth ERIKSEN	)	Group Art Unit: Not available
	)	
Application No.: 13/861,593	)	
	)	Examiner: Not available
Filed: April 12, 2013	)	
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	Confirmation No.: 3473
	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.97(b)

Pursuant to 37 C.F.R. §§ 1.56 and 1.97(b), Applicant brings to the attention of the Examiner the listed documents on the attached form. This Information Disclosure Statement is being filed within three months of the filing date of the above-referenced application.

The listed foreign and non-patent literature documents with cite numbers 81-98, 100, and 101 are of record in prior application number 11/919,974, filing date November 6, 2007, upon which Applicant relies for the benefits provided in 35 U.S.C. § 120, and accordingly copies are not enclosed. A copy of the listed non-patent literature document with cite number 99 is attached. Copies of U.S. Patent publications are not enclosed.

Applicant respectfully requests that the Examiner consider the listed documents and indicate that they were considered by making appropriate notations on the attached form.

This submission does not represent that a search has been made or that no better art exists and does not constitute an admission that each or all of the listed documents are material or constitute "prior art." If the Examiner applies any of the documents as prior art against any claim in the application and Applicant determines that the cited documents do not constitute "prior art" under United States law, Applicant reserves the right to present to the U.S. Patent and Trademark Office the relevant facts and law regarding the appropriate status of such documents.

Applicant further reserves the right to take appropriate action to establish the patentability of the disclosed invention over the listed documents, should one or more of the documents be applied against the claims of the present application.

If there is any fee due in connection with the filing of this Statement, please charge the fee to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: May 3, 2013

By: _____
Biju I. Chandran
Reg. No. 63,684

Cooler Master Co., Ltd. Exhibit 1006, Page 95 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
(Use as many sheets as necessary)				*Art Unit*	Not available
				Examiner Name	Not available
Sheet	1	of	4	*Attorney Docket Number*	10494.0003-03000

U.S. PATENTS					
Examiner Initials[3]	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	US-3,810,509	05/14/1974	Kun	
	2	US-4,109,707	08-29-1978	Wilson et al.	
	3	US-4,520,298	05-28-1985	Abbondanti	
	4	US-4,563,620	01/07/1986	Komatsu	
	5	US-4,777,578	10-11-1988	Jahns	
	6	US-4,898,579 A	02-06-1990	Groshong et al.	
	7	US-5,001,548	03-19-1991	Iversen	
	8	US-5,006,924	04-09-1991	Frankeny et al.	
	9	US-5,070,936	12-10-1991	Carroll et al.	
	10	US-5,142,214	08-25-1992	Purson et al.	
	11	US-5,316,077	05-31-1994	Reichard	
	12	US-5,441,102	08-15-1995	Burward-Hoy	
	13	US-5,566,745	10-22-1996	Hill et al.	
	14	US-5,708,564	01/13/1998	Lin	
	15	US-5,731,954	03/24/1998	Cheon	
	16	US-5,763,951	06-09-1998	Hamilton et al.	
	17	US-5,784,257	07/21/1998	Tata	
	18	US-5,825,622	10/20/1998	Rife et al.	
	19	US-5,890,880	04/06/1999	Lustwerk	
	20	US-5,901,037	05/04/1999	Hamilton et al.	
	21	US-6,019,165	02/01/2000	Batchelder	
	22	US-6,021,844	02-08-2000	Batchelder	
	23	US-6,114,827	09-05-2000	Alvaro	
	24	US-6,166,907	12/26/2000	Chien	
	25	US-6,170,563	01-09-2001	Hsieh	
	26	US-6,263,957 B1	07/24/2001	Chen et al.	
	27	US-6,305,463 B1	10/23/2001	Salmonson	
	28	US-6,343,478 B1	02/05/2002	Chang	
	29	US-6,408,937	06-25-2002	Roy	
	30	US-6,415,860 B1	07/09/2002	Kelly et al.	
	31	US-6,447,270 B1	09/10/2002	Schmidt et al.	
	32	US-6,529,376	03-04-2003	Hamman	
	33	US-6,551,734 B1	04/22/2003	Simpkins et al.	
	34	US-6,580,610	06-17-2003	Morris et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
				Art Unit	Not available
(Use as many sheets as necessary)				Examiner Name	Not available
Sheet	2	of	4	Attorney Docket Number	10494.0003-03000

U.S. PATENTS					
	35	US-6,668,911 A	12-30-2003	Bingler	
	36	US-6,702,002	03-09-2004	Wang	
	37	US-6,725,682 B2	04-27-2004	Scott	
	38	US-6,728,107	04-27-2004	Tseng et al.	
	39	US-6,749,012 B2	06-15-2004	Gwin et al.	
	40	US-6,796,370	09-28-2004	Doll	
	41	US-6,892,802 B2	05/17/2005	Kelly et al.	
	42	US-6,945,315	09-20-2005	Gektin et al.	
	43	US-6,952,345	10-04-2005	Weber et al.	
	44	US-6,967,841 B1	11/22/2005	Chu et al.	
	45	US-6,972,954 B2	12/06/2005	Minamitani et al.	
	46	US-6,992,887	01-31-2006	Jairazbhoy et al.	
	47	US-7,055,581	06-06-2006	Roy	
	48	US-7,100,389	09-05-2006	Wayburn	
	49	US-7,215,546 B2	05/08/2007	Hata et al.	
	50	US-7,298,617 B2	11/20/2007	Campbell et al.	
	51	US-7,325,588 B2	02/05/2008	Malone et al.	
	52	US-7,325,591	02-05-2008	Duan et al.	
	53	US-7,359,197 B2	04/15/2008	Stefanoski et al.	
	54	US-7,455,103	11-25-2008	Sato et al.	
	55	US-7,544,049	06-09-2009	Koga	
	56	US-7,591,302	09-22-2009	Lenehan et al.	
	57	US-7,971,632	07-05-2011	Eriksen	

U.S. PUBLISHED PATENT APPLICATIONS					
Examiner Initials*	Cite No.[3]	Document Number Number-Kind Code[4] (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	58	US-2002/0117291	08-29-2002	Cheon	
	59	US-2003/0010050 A1	01/16/2003	Scott	
	60	US-2003/0039097	02-27-2003	Igarashi	
	61	US-2003/0056939	03-27-2003	Chu et al.	
	62	US-2003/151895 A1	08-14-2003	Zuo	
	63	US-2004/0042176	03-04-2004	Niwatsukino et al.	
	64	US-2004/0052048	03-18-2004	Wu et al.	
	65	US-2004/0052049 A1	03/18/2004	Wu et al.	
	66	US-2004/0052663	03-18-2004	Laing et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
(Use as many sheets as necessary)				Art Unit	Not available
				Examiner Name	Not available
Sheet	3	of	4	Attorney Docket Number	10494.0003-03000

U.S. PUBLISHED PATENT APPLICATIONS					
	67	US-2004/0105232 A1	06-03-2004	Ito et al.	
	68	US-2004/0141275	07-22-2004	Athari	
	69	US-2005/0052847	03-10-2005	Hamman	
	70	US-2005/0061482 A1	03/24/2005	Lee et al.	
	71	US-2005/0069432	03-31-2005	Tomioka	
	72	US-2005/0083656 A1	04/21/2005	Hamman	
	73	US-2005/0183848	08-25-2005	Cheng et al.	
	74	US-2005/0126750	06-16-2005	Yokozawa et al.	
	75	US-2005/0243518 A1	11-03-2005	Hata et al.	
	76	US-2006/0113066 A1	06/01/2006	Mongia et al.	
	77	US-2006/0157230	07-20-2006	Kawahara et al.	
	78	US-2006/0161311	07-20-2006	Vinson et al.	
	79	US-2006/0169440	08-03-2006	Chou et al.	
	80	US-2007/0000268	01-04-2007	Crocker et al.	

Note: Submission of copies of U.S. Patents and published U.S. Patent Applications is not required.

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[5] Number[6] Kind Code[7] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[8]
	81	DE 19534423 A1	03-20-1997	Kunz		
	82	EP 0400455 A1	05-22-1990	Gfroeer		
	83	EP 0574823 A2	12/22/1993	Marioni et al.		
	84	EP 0610826 A2	08/17/1994	Marioni et al.		
	85	WO 01/25581 A	04-12-2001	Asetek A/S		
	86	WO 2005/017468 A2	02-24-2005	Culbert et al.		
	87	WO 2005/045654 A2	05/19/2005	Eriksen André Sloth.		
	88	WO 2006/119761	11-16-2006	Asetek A/S		

NONPATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[8]
	89	Office Action mailed on 08/22/2007 in U.S. Patent Application No. 10/578,578 (9 pages)	
	90	Office Action mailed on 04/25/2008 in U.S. Patent Application No. 10/578,578 (11 pages)	
	91	Office Action mailed on 08/18/2008 in U.S. Patent Application No. 10/578,578 (12 pages)	
	92	Office Action mailed on 03/20/2009 in U.S. Patent Application No. 10/578,578 (14 pages)	
	93	Office Action mailed on 07/15/2009 in U.S. Patent Application No. 10/578,578 (14 pages)	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
(Use as many sheets as necessary)				Art Unit	Not available
				Examiner Name	Not available
Sheet	4	of	4	Attorney Docket Number	10494.0003-03000

NONPATENT LITERATURE DOCUMENTS			
	94	Office Action mailed on 04/13/2010 in U.S. Patent Application No. 10/578,578 (14 pages)	
	95	Office Action mailed on 11/24/2010 in U.S. Patent Application No. 10/578,578 (11 pages)	
	96	Office Action mailed on 11/23/2011 in U.S. Patent Application No. 12/826,802 (11 pages)	
	97	Office Action mailed on 12/05/2011 in U.S. Patent Application No. 12/826,768 (14 pages)	
	98	Office Action mailed on 09/12/2012 in U.S. Patent Application No. 13/547,240 (15 pages)	
	99	Office Action mailed on 01/16/2013 in U.S. Patent Application No. 13/547,240 (9 pages)	
	100	Notice of Allowability with Examiner's Reason for Allowance mailed on 04/08/11 in U.S. Patent Application No. 10/578,578 (5 pages)	
	101	Notice of Allowability with Examiner's Reason for Allowance mailed on 05/17/12 in U.S. Patent Application No. 12/826,768 (4 pages)	

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Electronic Acknowledgement Receipt

EFS ID:	15684040
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	Andre Sloth Eriksen
Customer Number:	22852
Filer:	Justin Loffredo/Faith Wills
Filer Authorized By:	Justin Loffredo
Attorney Docket Number:	10494.0003-03000
Receipt Date:	03-MAY-2013
Filing Date:	
Time Stamp:	12:48:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		POA-IDS.pdf	754149 21abbadb1b7b4a77ac7a21ad22806fab51ec756f	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Power of Attorney	2	2
	Oath or Declaration filed	3	3
	Transmittal Letter	4	5
	Information Disclosure Statement (IDS) Form (SB08)	6	9
Warnings:			
Information:			

2	Non Patent Literature	OfficeAction1-16-2013.pdf	679105 d812483b7484997928ad6b056d547b7f62ad0b78	no	9
Warnings:					
Information:					
		Total Files Size (in bytes):	1433254		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: PA..

Document Description: Power of Attorney

PTO/AIA/82A (07-12)

Approved for use through 11/30/2014. OMB 0651-0035

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B or equivalent) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	13/861,593
Filing Date	April 12, 2013
First Named Inventor	André Sloth ERIKSEN
Title	COOLING SYSTEM FOR A COMPUTER SYSTEM
Art Unit	Not available
Examiner Name	Not available
Attorney Docket Number	10494.0003-03000

SIGNATURE of Applicant or Patent Practitioner

Signature		Date	May 3, 2013
Name	Biju I. Chandran	Telephone	202.408.4000
Registration Number	63,684		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.

■ *Total of one forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/861,593	04/12/2013	3744	1740	10494.0003-03000	18	2

CONFIRMATION NO. 3473

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

FILING RECEIPT

OC000000061320558

Date Mailed: 05/23/2013

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)
André Sloth Eriksen, Morgan Hill, CA;

Applicant(s)
ASETEK A/S, Bronderslev, DENMARK

Assignment For Published Patent Application
ASETEK A/S, Bronderslev, DENMARK

Power of Attorney: None

Domestic Priority data as claimed by applicant
This application is a CON of 11/919,974 01/06/2009 ABN
which is a 371 of PCT/DK2005/000310 05/06/2005

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 05/17/2013

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/861,593**

Projected Publication Date: 08/29/2013

Non-Publication Request: No

Early Publication Request: No

Title

COOLING SYSTEM FOR A COMPUTER SYSTEM

Preliminary Class

062

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

Cooler Master Co., Ltd. Exhibit 1006, Page 104 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/861,593

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	18 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1600

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000

CONFIRMATION NO. 3473

IMPROPER CPOA LETTER

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

OC000000061323919

Date Mailed: 05/23/2013

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 05/03/2013. The power of attorney in this application is not accepted for the reason(s) listed below:

- The power of attorney from the inventors has not been accepted because the power of attorney must be signed by the applicant for patent. See 37 CFR 1.32(b)(4).

/sfu/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Cooler Master Co., Ltd. Exhibit 1006, Page 107 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Doc Code: PA..

Document Description: Power of Attorney

PTO/AIA/82B(07-12)
Approved for use through 11/30/2014. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

22,852

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

Name	Registration Number	Name	Registration Number

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

☒ The address associated with the above-mentioned Customer Number.

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant:

☐ Inventor or Joint Inventor

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (*e.g.*, a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature		Date	April 13, 2013
Name	André Sloth ERIKSEN	Telephone	408 998 9002
Title and Company	CEO - Asetek A/S		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below *.

☒ *Total of one forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	16155457
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	Adriana Leigh Burgy/Lisa Tkach
Filer Authorized By:	Adriana Leigh Burgy
Attorney Docket Number:	10494.0003-03000
Receipt Date:	26-JUN-2013
Filing Date:	12-APR-2013
Time Stamp:	10:58:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	Power_of_Attorney.pdf	1003347 384a095982640316ee1f3cfd6a4e17d10c65b9b7	no	1

Warnings:	
Information:	

Total Files Size (in bytes):	1003347

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/861,593	04/12/2013	3744	1740	10494.0003-03000	18	2

CONFIRMATION NO. 3473

REPLACEMENT FILING RECEIPT

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

OC00000062329710

Date Mailed: 07/05/2013

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

André Sloth Eriksen, Morgan Hill, CA;

Applicant(s)

ASETEK A/S, Bronderslev, DENMARK

Power of Attorney: The patent practitioners associated with Customer Number 22852

Domestic Priority data as claimed by applicant

This application is a CON of 11/919,974 01/06/2009 ABN
which is a 371 of PCT/DK2005/000310 05/06/2005

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 05/17/2013

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/861,593**

Projected Publication Date: 08/29/2013

Non-Publication Request: No

Early Publication Request: No

Cooler Master Co., Ltd. Exhibit 1006, Page 111 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Title

COOLING SYSTEM FOR A COMPUTER SYSTEM

Preliminary Class

165

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

Cooler Master Co., Ltd. Exhibit 1006, Page 112 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000

CONFIRMATION NO. 3473

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

POA ACCEPTANCE LETTER

OC000000062329683

Date Mailed: 07/05/2013

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/26/2013.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/snguyen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/861,593	04/12/2013	Andre Sloth Eriksen	10494.0003-03000

CONFIRMATION NO. 3473

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

PUBLICATION NOTICE

OC000000063498941

Title:COOLING SYSTEM FOR A COMPUTER SYSTEM

Publication No.US-2013-0220582-A1
Publication Date:08/29/2013

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Cooler Master Co., Ltd. Exhibit 1006, Page 115 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	13/861,593
Filing Date	April 12, 2013
First Named Inventor	André Sloth Eriksen
Art Unit	3744
Examiner Name	Judy J. Swann
Attorney Docket Number	10494.0003-03000

U.S. PATENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-6,408,937	06-25-2002	Roy	
		US-6,470,289	10-22-2002	Peters	

U.S. PUBLISHED PATENT APPLICATIONS

Examiner Initials*	Cite No.[3]	Document Number Number-Kind Code[4] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

Note: Submission of copies of U.S. Patents and published U.S. Patent Applications is not required.

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[5] Number[6] Kind Code[7] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[8]
		EP 0105667	04-18-1984	Bingler		
		JP 3452059	09-29-2003	Matsushita Electric Ind. Co. Ltd.		Yes

NONPATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[8]
		Notice of Allowability with Examiner's Reason for Allowance mailed on May 23, 2012 in U.S. Patent Application No. 13/269,334 (8 pages).	
		Office Action mailed on December 20, 2011 in U.S. Patent Application No. 13/269,234 (9 pages).	
		Office Action mailed on March 13, 2012 in U.S. Patent Application No. 13/269,234 (11 pages).	
		Office Action mailed on March 27, 2012 in U.S. Patent Application No. 11/919,974 (16 pages).	
		Order re: Claim Construction for U.S. Patent Nos. 8,240,362 and 8,245,764 in U.S. District Court, Northern District of California, Case Nos. C-12-4498 EMC and C-13-0457 JST, filed December 3, 2013 (18 pages).	
		Third Party Observation for European Application No. EP20080100686 submitted on August 15, 2014 (8 pages).	
		Third Party Observation for European Application No. EP20080100686 submitted on August 18, 2014 (7 pages).	

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 105 687
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 83305720.1

(22) Date of filing: 26.09.83

(51) Int. Cl.³: F 04 D 13/06
H 02 K 5/128

(30) Priority: 27.09.82 US 424843
26.09.83

(43) Date of publication of application:
18.04.84 Bulletin 84/16

(84) Designated Contracting States:
DE FR GB IT

(71) Applicant: MILTON ROY CO.
One Plaza Place, N.E.
St. Petersburg Florida 33701(US)

(72) Inventor: Bingler, Douglas J.
Pa. Rt. 253 P.O. Box 235
Furlong Pennsylvania 18925(US)

(74) Representative: Evans, David Charles et al,
F.J. CLEVELAND & COMPANY 40-43, Chancery Lane
London, WC2A 1JQ(GB)

(54) **Electronically commutated electric pump.**

(57) A shaftless pump apparatus (10) has a rotary impeller (18) incorporating a permanent magnet (24) and is driven by a plurality of stator elements (26a-d) selectively activated by control circuit means (32) to create a rotating magnetic field torquing the impeller (18), the only rotating component of the apparatus. The stator elements (26a-d) are activated as a function of angular position of the impeller (18) providing performance equivalent to a DC motor drive. Preferably, Hall effect switches (30a, b) are used to sense impeller angle position for controlling the motor drive.

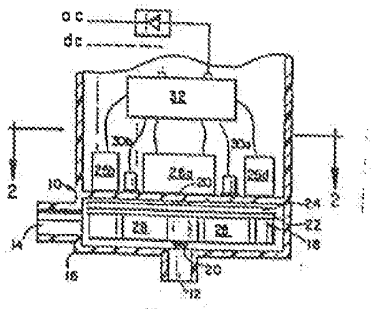


FIG. 1

EP 0 105 687 A1

"ELECTRONICALLY COMMUTATED ELECTRIC PUMP"

DESCRIPTION

This invention relates to pumps and in particular to electrically powered pumps not requiring a drive shaft or drive shaft seals between impeller means of the pump and motor means driving the impeller means.

Shaftless, electrically powered pumps are generally known. Magnetically coupled pumps such as are described, for example, in U.S. Patent Specifications Nos. 3,938,914, 3,932,069 and 3,802,804, typically incorporate a rotary impeller having a cylindrical magnet or comparable magnetic means positioned about the central hub of the impeller. A conventional DC or AC motor drives a shaft on which is mounted one or more permanent magnets. The motor and shaft with magnets are separated from the impeller by a wall of the pump housing. A magnetic coupling created through the housing wall between the impeller magnet(s) and the shaft driven magnets causes the impeller to follow

the rotation of the shaft. This arrangement allows the use of a DC or, if desired, AC motor and eliminates the necessity of a shaft seal in the all of the pump chamber. The latter feature reduces the maintenance requirements of such a pump and eliminates a major source of pump failure.

Another type of shaftless pump is that of the type described in U.S. Patent Specification No. 3,171,072. Here the shaft and permanent magnets are eliminated and the size of the pump is reduced by using the pump impeller as the armature of the motor. Stator elements positioned about the impeller are sequentially energized by direct current or a direct current passing through the stator elements is reversed at an appropriate time by a control circuit, typically employing transistors, so as to create a rotating magnetic field among the stator elements driving the rotor/armature. While DC powered, these motor/pump devices operate like AC induction motors. The rotor/armature is typically a squirrel cage, wound wire or other inductive armature construction while the energization or switch of energization in the stator elements is controlled independently of rotor speed. These motor/pump devices exhibit the same

limitations typically found in AC motor powered pumps: low starting torque, low operating efficiencies and limited range of operating speeds. While control circuits are known which, to some extent, overcome these problems (see, for example, U.S. Patent Specification Nos. 3,365,636, 3,324,368 and 3,281,631) such circuits are not sufficient to provide the superior initial starting torque and efficiencies of DC motor powered pumps.

According to this invention, a pump housing is provided having a fluid inlet, fluid outlet and a pump chamber in fluid communication with the inlet and the outlet. Rotary impeller means are provided in the pump chamber for moving fluid from the inlet through the outlet. The impeller means incorporate permanent magent means providing at least a pair of opposite magnetic poles in a plane parallel to the plane of rotation of the impeller means. Also provided in the housing and spaced from the impeller means are a plurality of stator elements positioned in a plane also parallel to said plane of rotation of the impeller means for torquing the impeller means. Each stator element typically comprises a stator pole and one or more windings about the pole. Means for

sensing angular positions of the impeller means, such as Hall effect switches are provided for motor control. Control means responsive to the sensor means selectively provides electrical currents to the stator elements to create a rotating magnetic field among the stator elements driving said impeller means. A variety of two phase and polyphase pump/motor combinations as well as a variety of pump/motor configurations are possible. The impeller, which also acts as the motor armature, is the only moving component of the apparatus. Becuse the impeller is driven magnetically, the need for a drive shaft extending through the pump chamber wall and a seal for the shaft are eliminated.

Following is a description by way of example only and with reference to the accompanying drawings of methods of carrying the invention into effect.

In the drawings:-

Figure 1 is a diagrammatic side view of a first envisioned centrifugal pump according to the present invention;

Figure 2 is an overhead view of the pump of Figure 1 sectioned along the line 2-2 showing the position of the impeller permanent magnet, the stator elements and the angular position sensors;

Figure 3 comprises two graphs, a and b, graph a depicting the torque output of two of the stator elements with respect to impeller angle position and graph b depicting the optimized torque output when the stator elements are switched;

Figure 4 is a block diagram for control logic sequentially energizing the stator elements of Figures 1 and 2;

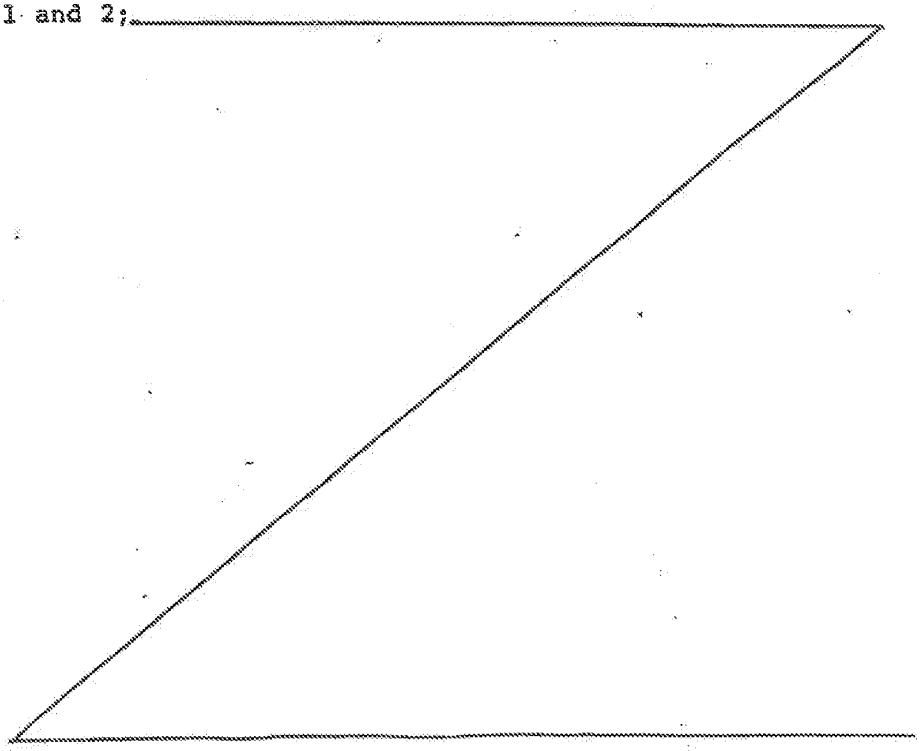


FIG. 5 depicts signals outputted by the position sensors and control signals outputted by circuitry controlling the energization of the stator elements;

FIG's. 6a and 6b depict in diagrammatic side and end views, a second envisioned centrifugal pump/motor configuration of the present invention;

FIG's. 7a and 7b depict in diagrammatic side and end views a third envisioned centrifugal pump/motor configuration of the present invention: and

FIG. 8 depicts in sectioned form a fourth envisioned centrifugal pump/motor configuration of the present invention.

FIG. 1 depicts diagrammatically an embodiment of the present invention, having a two phased, DC centrifugal pump/motor apparatus of parallel or "pancake" configuration. A pump housing or casing 10 having a fluid inlet 12 and fluid outlet 14 is provided with a hollow interior forming a pump chamber 16 in fluid communication with the inlet 12 and outlet 14. Within chamber 16 is a rotary impeller assembly 18 supported for free rotation within the pump chamber 16 by suitable means such as an axle 20. The rotary impeller structure 18 comprises a base 22 incorporating a circular permanent magnet 24 and a plurality of vanes 28. The circular permanent magnet 24 and its two magnetic poles lie in a plane parallel to the plane of rotation of the impeller assembly 18. Arrayed in a second plane parallel to the plane of rotation of the impeller assembly 18 are a plurality of stator elements 26a through 26d. Element 26c is hidden behind 26a in this view. Each element comprises a magnetizable core and one or more windings about the core which, when energized by an electric current, create a magnetic field imparting a torque on the rotor assembly 18. The stator elements 26a-26d may be fixed by suitable means to the housing or incorporated into the housing 10 by suitable manufacturing techniques, such as forming the

housing 10 from plastic material in which the stator elements 26 are embedded. Also provided are two Hall effect switches 30a and 30b for determining angular positions of the impeller assembly 18. Although other sensors such as optical transducing systems may be employed, possible opacity of fluid in the pump chamber 16 may limit their usefulness. The Hall effect switches 30a and 30b output a high level signal when one of the two magnetic polarities (N or S) of the circular magnet 24 is opposite the switch 30a or 30b. If desired, commutation magnets (not depicted) may be incorporated into the impeller assembly 18 so as to pass opposite the switches 30a and 30b and more precisely trigger their operation. The use of commutating magnets in brushless, electronically switched DC motors is taught, for example, in U.S. Patent 4,311,933 incorporated in its entirety by reference herein. Output of the sensing means 30a and 30b are fed to control circuit 32, further described with respect to FIG.4. Direct current is supplied to the stator elements 28 by means of the control circuit 32. As is depicted in FIG. 1, direct current may be supplied to the control circuit 32 directly or by means of rectifying an alternate current, as is well known.

FIG. 2 depicts diagrammatically in a sectioned overhead view of the apparatus of FIG. 1, the orientation of the circular two pole permanent magnet 24 of the impeller assembly 18, four stator elements 26a through 26d and two Hall effect switches 30a and 30b, together with the axis of rotation 36 of the impeller assembly 18 with magnet 24, the inlet 12 and the axle 20. Each of the stator elements 26a through 26d is energized sequentially by the control circuit 32 so as to create a magnetic field rotating clockwise in the plane of rotation of the impeller structure 18 as viewed in Fig. 2. Of course, the field could be made to rotate in the opposite direction. By properly timing and controlling the magnetic field created by each of the stator elements 26a-26d the permanent magnet 24 and impeller 18 can be made to rotate following a magnetic field rotating among the stator elements

26a-26d. If desired, opposite pairs of stator elements (i.e. 26a with 26c and 26b with 26d) may be energized by the control circuit 32 with opposite polarities to increase torque. This may be accomplished by conventional means such as providing a pair of opposing windings on each stator element and supplying a single current through all windings or by supplying reversed currents through identical windings. For simplicity, the invention will be described solely with respect to rotating a magnetic field of a single polarity about the stator elements 26.

The solid curve 26a' in FIG. 3a represents generally the torque applied to the impeller assembly 18 by continuously energizing with a constant current, a single stator element, such as the element 26a, as a function of the angular position of the impeller assembly 18 in electrical degrees. The torque output from the next successive stator element 26b is also indicated by a broken line 26b', again with respect through the same electrical reference position. As can be seen the torque output of each successive stator element 26a through 26d lags that of the preceding element by approximately 90 degrees. Peak torque output is provided by activating each stator element 26a through 26d successively at 90 degree increments of the impeller assembly rotation and at points offset 45 degrees (electrical) from the peak torque output positions. The net torque applied to the impeller 18 by successively commutating each of the stator elements 26a-26d in this fashion is illustrated in FIG. 3b with the contribution of each stator element identified, by corresponding line segments 26a'-26d'.

In the embodiment depicted, which is strictly illustrative, a pair of Hall effect switches 30a and 30b are located 90 degrees apart with respect to the axis of rotation 36. The first switch 30a is located so as to output a high level signal when the impeller assembly 18 is between the 45° and 225° (electrical) positions while the second switch 30b is positioned to output a high level signal when the impeller assembly 18 is between the 135° and 315° (electrical)

positions. The signals generated and outputted by the switches 30a and 30b as a function of the angular position (electrical) of the impeller assembly 18, are depicted in FIG's 5a and 5b, respectively.

Referring now to FIG's. 5a and 5b, A represents the high level output of the sensor 30a and $\bar{A}$ represents its low level output while B and $\bar{B}$ represent the corresponding high and low output levels of the second sensor 30b. The following concurrent switch outputs correspond to the indicated electrical angular positions of the impeller assembly 18 and are used to control energization of the stator elements 26a and 26d successively: $A+\bar{B}$ (45° to 135°), A+B (135° to 225°), $\bar{A}+B$ (225° to 315°) and $\bar{A}+\bar{B}$ (315° to 45°). An exemplary logic control circuit 132, which is envisioned to be a component of the control logic circuit 32, for controlling successive activation of the stator elements 26a to 26d is depicted in FIG. 4. Outputs from the two sensors 30a and 30b are carried via lines 130a and 130b, respectively, to a series of AND gates 50-56. The output of sensor 30a fed into AND gates 54 and 56 is inverted by inverters 58 and 60. Similarly, the output from sensor 30b fed into AND gates 50 and 56 is inverted by inverters 62 and 64, respectively. The high and low level outputs of each AND gate 50 through 56 are depicted in FIG's. 4c through 4f, respectively, as a function of the angular position of the impeller assembly 18. The outputs of each AND gate 50 through 56 is fed to a corresponding power control switch 80 through 86. The high level output of each AND gate 50 to 56 is used to activate the corresponding switch 80 to 86, energizing a connected stator element 26a to 26d.

FIG's. 6a and 6b depict in diagrammatic side and end views, respectively, an envisioned second centrifugal pump/motor impeller embodiment operating in a manner similar to the embodiment described with respect to the previous figures. In the second embodiment, an impeller assembly 118 is supported by an axle 120 or other suitable means in a pump chamber 116. The housing 110 forming the pump chamber 116 includes a recess 117

into which a portion of the impeller assembly 118 extends. Fixedly attached to (or incorporated into) the impeller assembly 118 extending into the recess 117, is a cylindrical two-pole permanent magnet 124. Arrayed about the circular magnet 124 outside the recess 117 are a plurality of stator elements 126a through 126d lying in the same plane as the circular magnet 124. Again, a pair of Hall switches 130a and 130b are positioned to sense angular position of the impeller assembly 118 and control the energization of the stator elements 126a-126d as previously described.

FIG's. 7a and 7b depict in diagrammatic side and end sectioned views, respectively, a third envisioned centrifugal pump/motor configuration. In this embodiment, an impeller assembly 218 is again provided, supported by a shaft 220 or other means suitable for free rotation in a pump chamber 216. Again the impeller assembly 218 includes a cylindrical permanent magnet 224. The cylindrical magnet encircles a portion of the pump housing 210 containing a plurality of stator elements 226 and a plurality of impeller angular position sensors 230. This configuration is also particularly suited for driving a turbine type impeller.

FIG. 8 depicts diagramatically yet another envisioned embodiment 100 of the invention. The apparatus 100 includes a pump chamber housing or case 102 which includes a fluid outlet 101 and a fluid outlet 103. The interior of the pump case 102 forms a pumping chamber in which is located a combined pump impeller/motor armature assembly 120'. The impeller assembly 120 includes a permanent magnet disk 106 supported by a flux return and bearing support plate 105. The disk 106 provides a pair of opposite magnetic poles at the disk face juxtaposed to a partition or "diaphragm" 110' and parallel to the plane of rotation of the assembly 120'. The assembly 120' is supported on a rotor support spindle 107 by means of a radial support bearing 108 and combined radial and thrust support bearing 109. The assembly 120' further includes a number of impeller blades 104 (only two of which are depicted diagramatically for

illustration) provided on a surface of the support plate 105 opposite the permanent magnet 106 for urging fluid from the inlet 101 through the outlet 103. The spindle 107 is attached to a diaphragm 110' for support. The diaphragm 110' separates the pump chamber formed by the interior of the pump case 102 from a motor compartment formed by the interior of a housing piece 114. The diaphragm 110' is held in position by means of a ring 113 mated by suitable means such as screws or nuts and bolts (not depicted) with a flange 102a of the pump housing 102. The face of the flange 102a is configured for mating with the juxtaposed face of the ring 113. The housing piece 114 also has a flange 114a with a face configured for mating the juxtaposed face of the ring 113 and is separately attached for access to the motor compartment without disturbance of the diaphragm 110'. O-rings 111 are provided for water-tight sealing. Contained within the motor compartment formed by the diaphragm 110', ring 113 and housing piece 114 are a motor stator assembly 119 and pair of Hall sensors 118' (only one of which is depicted). The Hall sensors are located in a plane approximately parallel to the plane of the diaphragm 110' and are used to sense the angular position of the impeller assembly 120'. The motor compartment also contains an electronic package 112 (indicated in phantom) of the type previously described, providing power and electronic commutation to the stator 119. The stator assembly 119 includes a tape-wound laminate ring-shaped core 117' (bisected in FIG. 8). A pair of stator windings 116a and 116b, depicted in sectioned view, are provided to form two stator elements for two-phase operation. In this configuration, the Hall sensors 118' are spaced 90° apart with respect to the center of spindle 107, magnet 106 and winding 119, all of which are coaxial. Additional windings may be provided in a known manner for providing higher orders of poly-phase operation.

Because the impellers in each of the depicted, envisioned embodiments are driven by magnetically induced torque, the impellers and pump chamber may be separated from

the stators and other electronic elements in a motor chamber thereby eliminating a drive shaft extending through the pump chamber wall and a seal in the wall about the shaft. The indicated designs provide the improved reliability of a sealess pump design, a reduced number of rotating components as compared with the existing pump/motor combinations using motor driven rotating magnets to rotate an impeller and the preferred performance of a direct current motor directly driving an armature/impeller assembly.

Other combinations of logic and transistor elements can be used to accomplish the results of the depicted control circuit 32. The outputs of the logic gates 50-56 can be used to control bipolar power supplies or energize one of a pair of reversed windings on each of these stator elements 26 so as to simultaneously energize opposite pairs of stator elements (i.e. 26a with 26c and 26b with 26d) with opposite polarities to improve the power output of the apparatus. The torque output of the depicted devices may be smoothed by providing a greater number of stator elements as well as a plurality of permanent magnets on the rotor assembly.

CLAIMS

1. A pump apparatus comprising:

pump housing means having a fluid inlet, a fluid outlet and a pump chamber in fluid communication with the inlet and the outlet;

rotating impeller means located within the pump chamber for urging fluid between the inlet and the outlet and having at least one permanent magnet providing a pair of opposite magnetic poles in a plane of rotation of the impeller means;

a plurality of stator elements positioned in a plane parallel to a plane of rotation of the impeller means;

sensing means for identifying angular positions of the impeller means; and

control means responsive to output of said sensing means for selectively energizing said stator elements to create a rotating magnetic field starting and driving said impeller means.

2. The apparatus of claim 1 wherein said sensing means comprises Hall effect switches.

3. Apparatus as claimed in claim 1 or claim 2 wherein the rotary impeller means is supported for free rotation within said pump chamber and comprises a base incorporating a circular magnet, the poles of which lie in a plane substantially parallel to the plane of said impeller means.

4. Apparatus as claimed in any preceding claims wherein each stator element comprises a magnetizable core and one or more windings about said core, which when energised, create a magnetic field which imparts a torque on said rotor means.

5. Apparatus as claimed in any one of claims 2 to 4 wherein the Hall effect switches output a high level signal when a magnetic pole of the impeller means is juxtaposed therewith and a lower level signal when the said magnetic poles are remote therefrom.

6. Apparatus as claimed in claim 1 or claim 2 wherein the impeller means comprises a permanent disc magnet and a flux return and bearing support plate;

said disc being supported on a rotor support spindle and having a number of impeller blades carried therewith for the purpose of urging fluid from said inlet to said outlet.

7. Apparatus as claimed in claim 1 and substantially as herein described with reference to the accompanying drawings.

0105687

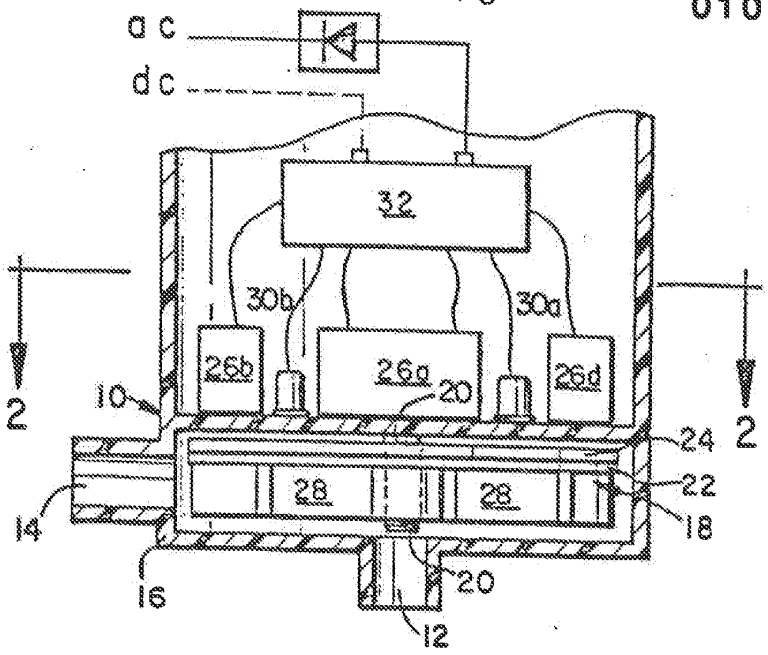


FIG. 1

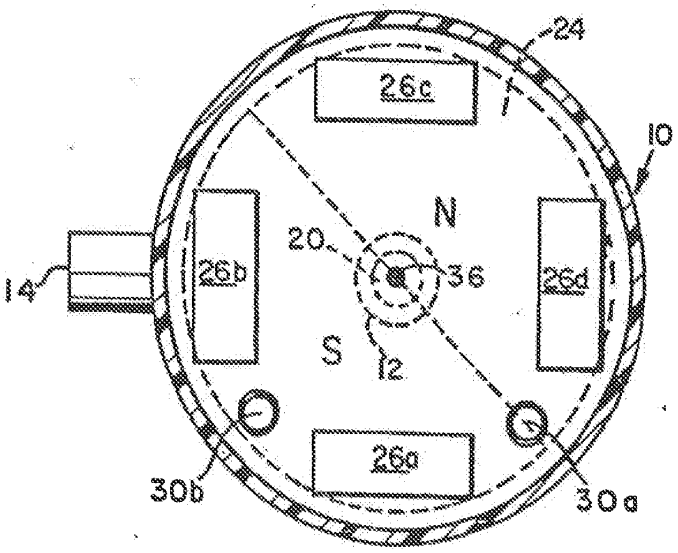


FIG.2

Cooler Master Co., Ltd. Exhibit 1006, Page 133 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

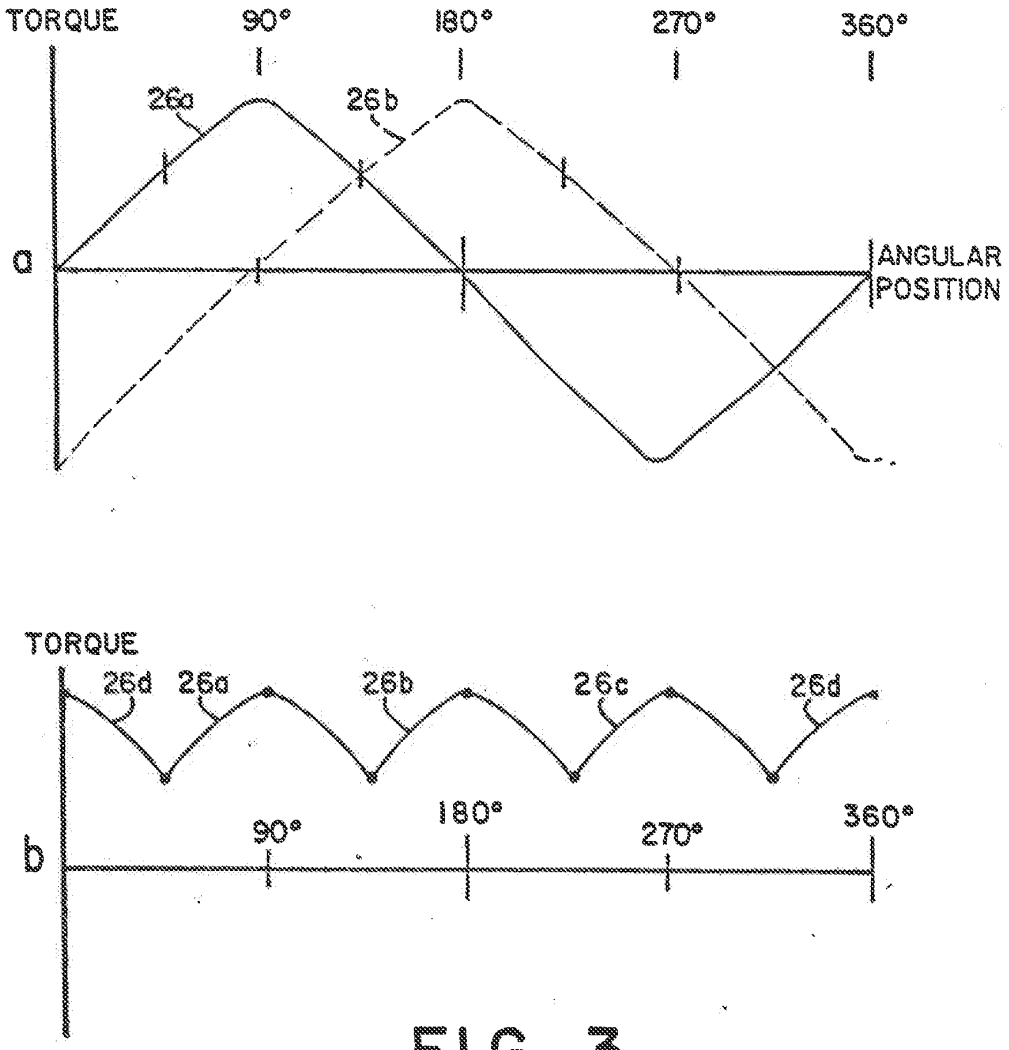

TORQUE
90°
180°
270°
360°
26a
26b
a
ANGULAR POSITION
TORQUE
26d
26a
26b
26c
26d
90°
180°
270°
360°
b

FIG. 3

3/6

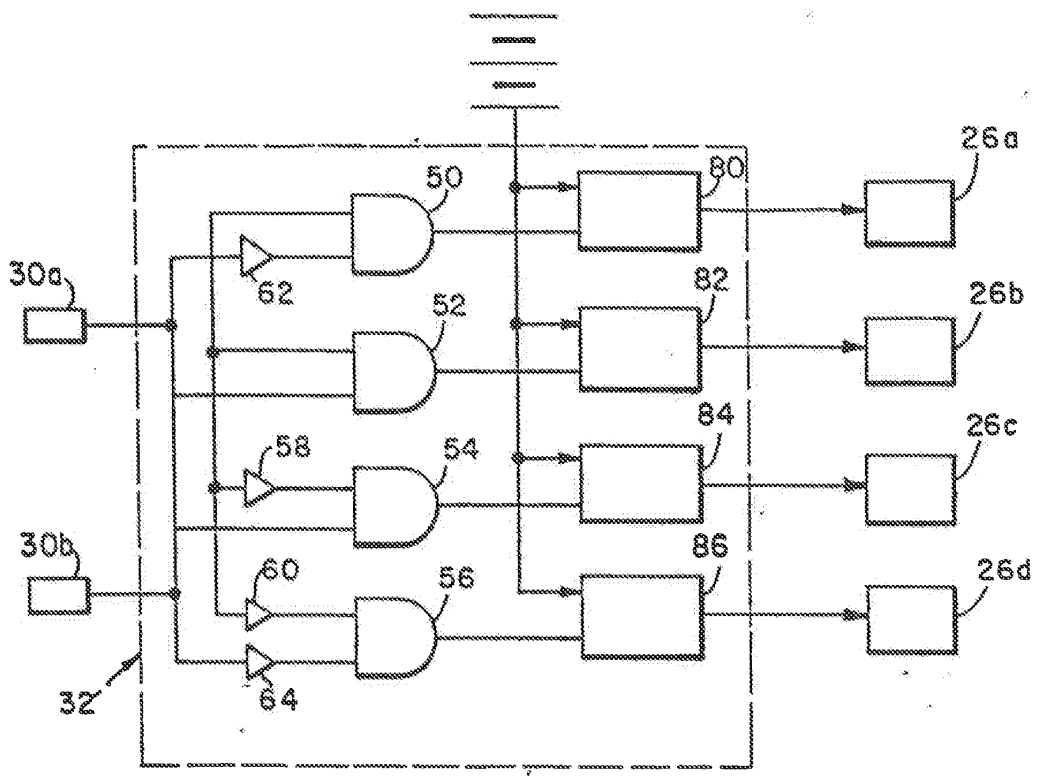

26a
50
80
30a
62
82
26b
52
84
26c
58
54
30b
86
26d
60
56
32
64

FIG. 4

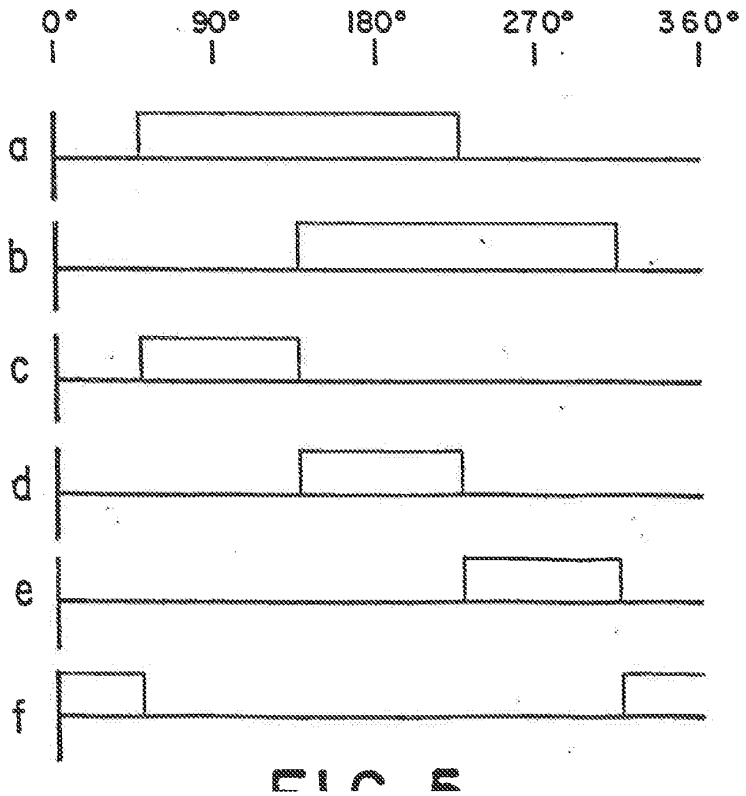

0°
90°
180°
270°
360°
a
b
c
d
e
f

FIG. 5

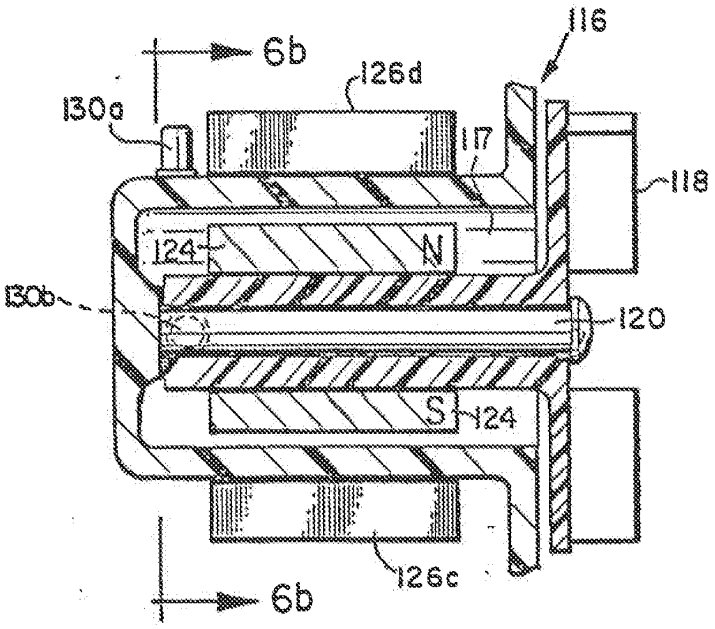

116
6b
126d
130a
117
118
124
N
130b
120
S
124
126c
6b

FIG. 6a

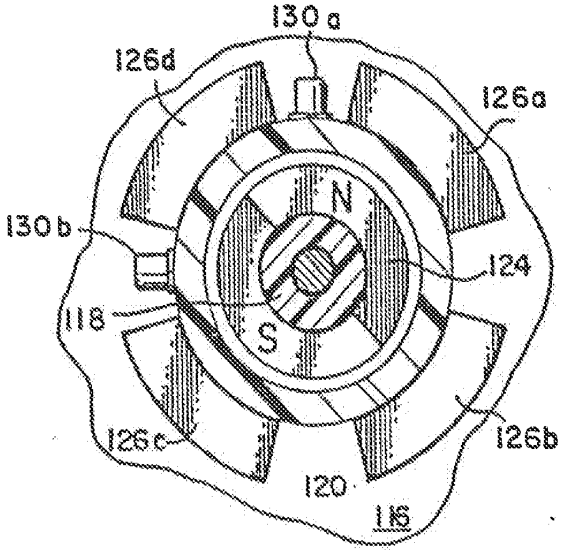

130a
126d
126a
N
130b
124
118
S
126c
126b
120
116

FIG. 6b

516

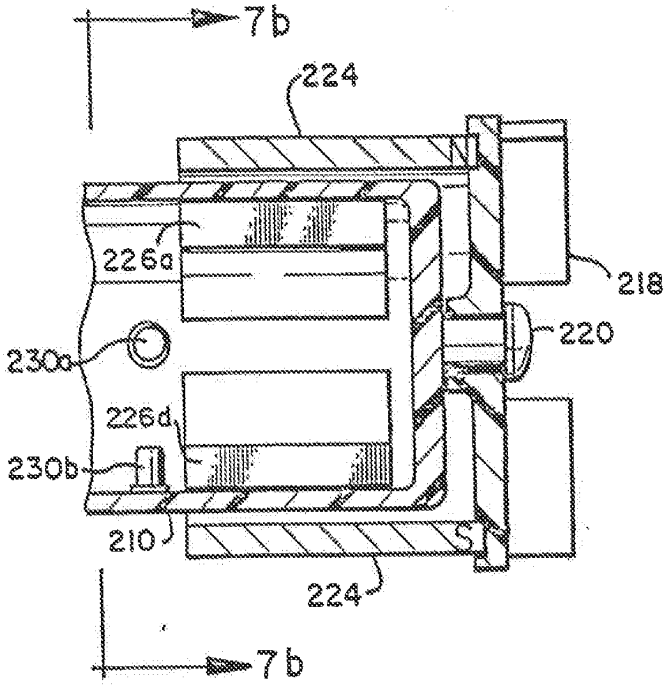


FIG. 7a

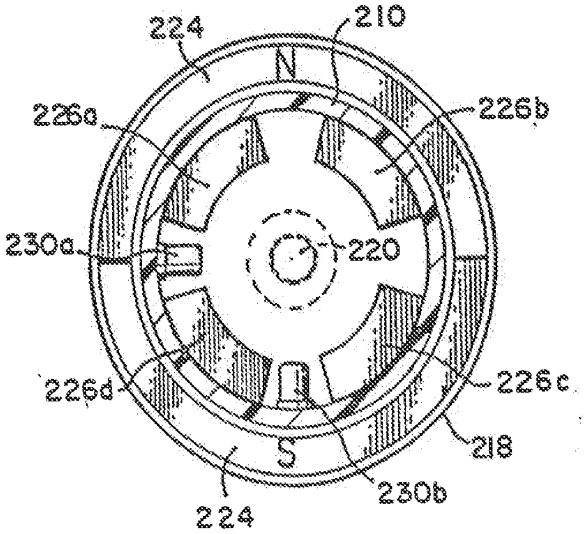


FIG. 7b

6/6

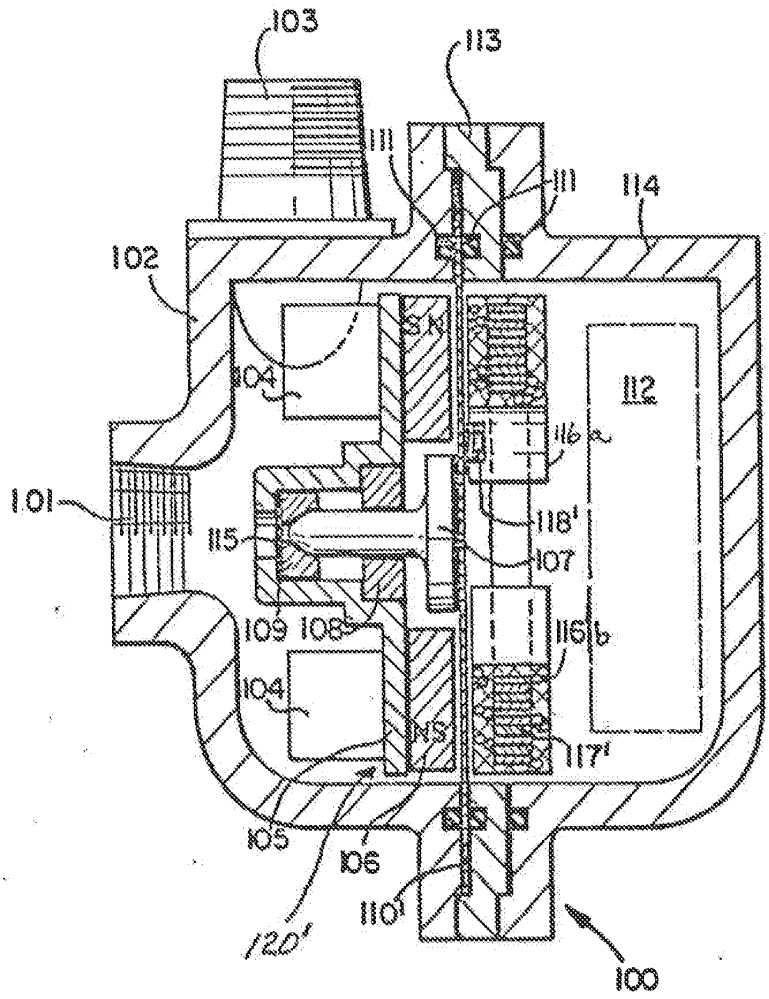

103
113
111
111
114
102
104
112
116
101
118'
115
107
109
108
116b
104
117'
105
106
110
120'
100

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 83305720.1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	GB - A - 1 195 747 (LICENTIA) * Page 1, line 63 - page 2, line 2; fig. *	1-7	F 04 D 13/06 H 02 K 5/128
Y	GB - A - 1 473 436 (FORD) * Page 2, line 42 - page 3, line 72; fig. 1-3 *	1-7	
A,D	US - A - 3 938 914 (ZIMMERMANN)		
A,D	US - A - 3 802 804 (ZIMMERMANN)		
A	GB - A - 1 187 866 (SEALD MOTOR CONSTRUCTION)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

F 04 B
F 04 D
H 02 K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	15-12-1983	WITTMANN

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503 03.82

(19)日本国特許庁（ＪＰ）　(12)特　許　公　報（Ｂ１）　(11)特許番号

特許第3452059号
(P3452059)

(45)発行日　平成15年９月29日(2003.9.29)　(24)登録日　平成15年７月18日(2003.7.18)

(51)Int.Cl.⁷	識別記号	ＦＩ	
Ｈ０５Ｋ　7/20		Ｈ０５Ｋ　7/20	Ｎ
			Ｒ
Ｃ０６Ｆ　1/20		Ｈ０２Ｋ　7/14	Ａ
Ｈ０１Ｌ　23/473		9/19	Ｚ
Ｈ０２Ｋ　7/14		21/22	Ｚ

請求項の数13(全 13 頁)　最終頁に続く

(21)出願番号　特願2002－293848(P2002－293848)

(22)出願日　平成14年10月７日(2002.10.7)

審査請求日　平成14年11月１日(2002.11.1)

(31)優先権主張番号　特願2002－139598(P2002－139598)

(32)優先日　平成14年５月15日(2002.5.15)

(33)優先権主張国　日本（ＪＰ）

早期審査対象出願

(73)特許権者　000005821
松下電器産業株式会社
大阪府門真市大字門真1006番地

(72)発明者　庭月野　基
大阪府門真市大字門真1006番地　松下電器産業株式会社内

(72)発明者　廣瀬　政志
大阪府門真市大字門真1006番地　松下電器産業株式会社内

(72)発明者　橋本野　滋
大阪府門真市大字門真1006番地　松下電器産業株式会社内

(74)代理人　100097445
弁理士　岩橋　文雄　(外２名)

審査官　新海　岳

最終頁に続く

(54)【発明の名称】　冷却装置とそれを備えた電子機器

(57)【特許請求の範囲】

【請求項１】冷媒を循環する閉循環路を構成する配管と放熱器と接触熱交換型ポンプが接続して設けられ、前記接触熱交換型ポンプが発熱電子部品に接触されて内部の冷媒の熱交換作用で該発熱電子部品から熱を奪い、かつ冷媒を循環させ、前記放熱器から放熱を行う冷却装置であって、

前記接触熱交換型ポンプのポンプケーシングが高熱伝導率の材料で形成されるとともに、

前記ポンプケーシングには、内部のポンプ室に沿った側面に受熱面が形成され、該受熱面が接触位置において前記発熱電子部品の上部表面の３次元的な形状と相補的な形状に形成されていることを特徴とする冷却装置。

【請求項２】前記受熱面に補助熱伝導部材が設けられたことを特徴とする請求項１記載の冷却装置。

【請求項３】前記補助熱伝導部材が、接触位置において前記発熱部材の上部表面形状と下面が合致し、前記受熱面の形状と上面が合致した板状体であることを特徴とする請求項２記載の冷却装置。

【請求項４】前記補助熱伝導部材が、前記ポンプケーシングの前記ポンプ室に沿った側面に設けられたヒートパイプであることを特徴とする請求項２記載の冷却装置。

【請求項５】前記接触熱交換型ポンプが渦流ポンプであることを特徴とする請求項１～４のいずれかに記載の冷却装置。

【請求項６】前記接触熱交換型ポンプが、外周に多数の溝状の羽根が形成され、内周にローターマグネットが設けられたリング状羽根車と、前記ローターマグネットの内周側に設けられたモーターステーターと、該モーターステーターと前記ローターマグネットの間に配設する円

Cooler Master Co., Ltd. Exhibit 1006, Page 140 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

筒部が形成されるとともに、前記羽根車を内部に収容し吸込口と吐出口を有するポンプケーシングとを備え、前記円筒部が前記リング状羽根車を回転自在に軸支した渦流ポンプであることを特徴とする請求項５記載の冷却装置。

【請求項７】前記受熱面が平面であることを特徴とする請求項１～６のいずれかに記載の冷却装置。

【請求項８】前記円筒部の内側に設けられたモーターステーターを熱伝導率の高いモールド材でモールドしたことを特徴とする請求項６～７のいずれかに記載の冷却装置。

【請求項９】前記ポンプ室内の表面粗さを鏡面にしたことを特徴とする請求項６～８のいずれかに記載の冷却装置。

【請求項１０】前記円筒部には、前記リング状羽根車に作用する半径方向スラストの方向と軸心に対して反対側表面にラジアル動圧発生手段が設けられたことを特徴とする請求項６～９のいずれかに記載の冷却装置。

【請求項１１】前記接触熱交換型ポンプは、厚さが３～１５ｍｍ、半径方向代表寸法が１０～７０ｍｍであることを特徴とする請求項１～１０のいずれかに記載の冷却装置。

【請求項１２】中央処理装置を含む電子回路と記憶装置を収納して上面にキーボードが設けられた第一筐体と、前記中央処理装置による処理結果を表示することができる表示装置を備えた第二筐体とを備え、前記第二筐体が前記第一筐体に回転可能に取り付けられた電子装置であって、前記中央処理装置を含む発熱電子部品を冷却するために請求項１～１１のいずれかに記載の冷却装置が設けられたことを特徴とする電子機器。

【請求項１３】前記接触熱交換型ポンプが前記中央処理装置上面に受熱面を接触させて装置され、前記放熱器が前記第二筐体内の表示装置裏面に配設されたことを特徴とする請求項１２に記載の電子機器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、筐体内部に配設された中央処理装置（以下、ＣＰＵ）等の発熱電子部品を、冷媒を循環させて冷却する電子機器の冷却装置と、それを備えた電子機器に関するものである。

【０００２】

【従来の技術】最近のコンピューターにおける高速化の動きはきわめて急速であり、ＣＰＵのクロック周波数は以前と比較して格段に大きなものになってきている。この結果、ＣＰＵの発熱量が増し、従来のようにヒートシンクで空冷するだけでは能力不足で、高効率で高出力の冷却装置が不可欠になっている。そこでこのような冷却装置として、発熱電子部品を搭載した基板を、冷媒を循環させて冷却する冷却装置が提案された（特許文献１、特許文献２参照）。

【０００３】以下、このような冷媒を循環させて冷却する従来の電子機器の冷却装置について説明する。なお、本明細書において電子機器というのは、ＣＰＵ等にプログラムをロードして処理を行う装置、中でもノート型パソコンのような携行可能な小型の装置を中核とするが、このほかに通電により発熱する発熱電子部品を搭載した装置を含むものである。この従来の第1の冷却装置は、例えば図１０に示すようなものが知られている。図１０は従来の電子機器の第1冷却装置の構成図である。図１０において、１００は筐体であり、１０１は発熱電子部品、１０２は発熱電子部品１０１を実装した基板、１０３は発熱電子部品１０１と冷媒との間で熱交換を行ない発熱電子部品１０１を冷却する冷却器、１０４は冷媒から熱を取り除く放熱器、１０５は冷媒を循環させるポンプ、１０６はこれらを接続する配管、１０７は放熱器１０４を空冷するファンである。

【０００４】この従来の第１冷却装置の動作を説明すると、ポンプ１０５から吐出された冷媒は、配管１０６を通って冷却器１０３に送られる。ここで発熱電子部品１０１の熱を奪うことでその温度が上昇し、放熱器１０４に送られる。この放熱器１０４でファン１０７によって強制空冷されてその温度が降下し、再びポンプ１０５へ戻ってこれを繰り返す。このように、冷媒を循環させて発熱電子部品１０１を冷却するものであった。

【０００５】次に、電子機器の従来の第２冷却装置として、図１１に示すものが提案されている（特許文献３参照）。

【０００６】この第２冷却装置は、発熱部材を狭い筐体内に搭載したとき、発熱部材の発生熱を放熱部である金属筐体壁まで効率良く輸送し発熱部材を冷却するものである。図１１は従来の電子機器の第２冷却装置の構成図である。図１１において、１０８は電子機器の配線基板、１０９はキーボード、１１０は半導体発熱素子、１１１はディスク装置、１１２は表示装置、１１３は半導体発熱素子１１０との間で熱交換する受熱ヘッダ、１１４は放熱のための放熱ヘッダ、１１５はフレキシブルチューブ、１１６は電子機器の金属筐体である。

【０００７】この第２冷却装置は、発熱部材である半導体発熱素子１１０と金属筐体１１６とをフレキシブル構造の熱輸送デバイスにより熱的に接続するものである。この熱輸送デバイスは、半導体発熱素子１１０に取り付けた液流路を有する扁平状の受熱ヘッダ１１３、液流路を有し金属筐体１１６の壁に接触させた放熱ヘッダ１１４、さらに両者を接続するフレキシブルチューブ１１５で構成され、内部に封入した液を放熱ヘッダ１１４に内蔵した液駆動機構により受熱ヘッダ１１３と放熱ヘッダ１１４との間で駆動あるいは循環させるものである。これにより、半導体発熱素子１１０と金属筐体１１６とが部品配列に左右されることなく容易に接続できるとともに、液の駆動により高効率で熱が輸送される。放熱ヘッ

Cooler Master Co., Ltd. Exhibit 1006, Page 141 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

ダ１１４においては、放熱ヘッダ１１４と金属筐体１１６とが熱的に接続されているので、金属筐体１１６の高い熱伝導率のために熱が広く金属筐体１１６に拡散されるものである。

【０００８】また、内部的に熱交換を行える熱交換機能付ポンプも従来提案されている（例えば特許文献４参照）。

【０００９】図１２は従来の熱交換機能付ポンプの一部破砕斜視図である。図１２において、１２０はモーター、１２１は熱交換器、１２２は冷却水路、１２２ａは吐出口、１２２ｂは吸込口、１２３は遠心ポンプ、１２４はケーシング、１２５はインペラである。

【００１０】遠心ポンプ１２３は、ボリュート形のケーシング１２４の中央に吸込口１２４ｂ、外側接線方向に吐出口１２４ａが設けられている。ケーシング１２４内部にはインペラ１２５が設けられ、このインペラ１２５の軸がモーター１２０に連結されている。インペラ１２５の外側全周に、熱交換器１２１の冷却水路１２２がジグザグ状にして収容されている。

【００１１】このような従来の熱交換機能付ポンプの動作を説明すると、インペラ１２５がモーター１２０により回転すると、機器側で熱せられた冷媒Ａが吸込口１２４ｂからケーシング１２４内部に入り、ケーシング１２４の内部を旋回して外側の吐出口１２４ａから吐出される。このとき、ケーシング１２４の内部外方は高圧で乱流状態となっているから、冷媒Ａが冷却水路１２２に激しく触れて冷却水路１２２内を流れる冷却水Ｂにより冷却される。こうして、冷媒Ａを遠心ポンプ１２３の部分で冷却しながらがら機器側に圧送させるものであった。

【００１２】

【特許文献１】特開平５－２６４１３９号公報

【特許文献２】特開平８－３２２６３号公報

【特許文献３】特開平７－１４２８８６号公報

【特許文献４】実開平２－１４７９００号公報

【００１３】

【発明が解決しようとする課題】しかしながら、従来の第１冷却装置では、発熱電子部品１０１と冷媒とで熱交換を行ない発熱電子部品１０１を冷却する冷却器１０３、冷媒から熱を取り除くための放熱器１０４、冷媒を循環させるポンプ１０５、図示はしないが冷媒を補充しなければならず補充用タンクが必要であり、これらを組み合わせるため装置が大型且つ複雑で小型化が難しく、コストも高くなるという問題があった。すなわち従来の第１冷却装置は、本来大型の電子機器の冷却に適したものであって、小型、軽量且つ薄型で、様々の姿勢で運ばれ、使われる最近の高性能携行型のノート型パソコン等には対応しきれないものであった。

【００１４】また、従来の第２冷却装置はノート型パソコン等に使用することが可能であるが、半導体発熱素子１１０に取り付けた扁平状の受熱ヘッダ１１３も、金属筐体１１６の壁に接触させた放熱ヘッダ１１４もいずれもがボックス状で厚くならざるをえず、ノート型パソコン等の薄型化を妨げるものであった。すなわち従来の第２冷却装置では、放熱ヘッダ１１４の中に液体駆動装置として他のポンプより横幅が比較的小さくなる往復動ポンプが設けられており、残念なことに、この往復動ポンプが放熱ヘッダ１１４の厚さを規定して全体を厚くしている。これではノート型パソコンの薄型化はできない。

【００１５】しかし、薄型のノート型パソコンで第２冷却装置の往復動ポンプを受熱ヘッダ１１３の中に収容することは困難である。すなわちポンプの厚さのほかに半導体発熱素子１１０等の厚みも加わって、ノート型パソコンの高さを増加させ、薄型化に逆行することになるからである。その上、往復動ポンプの振動と騒音は、これを載置する半導体発熱素子１１０に影響を与えるし、耳障りになる場合もあり、これらの面からも実現は困難である。

【００１６】さらに、第２冷却装置において、金属筐体１１６の壁に接触させた放熱ヘッダ１１４は、放熱面積が小さくて伝熱効率が悪く、冷却力に限界が存在するものであった。冷却力を上げるために放熱面積を増すことも考えられるが、これ以上面積を増すのでは流路が長くなって循環量が増し、内蔵した往復動ポンプの出力増加を招き、これによって放熱ヘッダ１１４の厚みを増すという矛盾があった。そこで、往復動ポンプを独立して金属筐体１１６内に収納するという手段を講じると、限界まで無駄なスペースを減少させたノート型パソコン本体に新たなスペースを割かなければならないし、組み立て作業も面倒になってしまう。このように、第２冷却装置はノート型パソコン等の小型化、薄型化に対しては限界を有するものであった。そして、最近のようにＣＰＵの能力が向上して益々大きな冷却能力が要求されるときに、このような問題を抱えた従来の第２冷却装置では将来性で疑問が残るものであった。

【００１７】また、従来の熱交換機能付ポンプは、冷媒を別の冷却水で冷やしているため、ポンプ内に冷却水路が必要で大型化しポンプ構造が複雑になり、また、冷却水を循環させる第２のポンプや冷却水から熱を奪う第２の熱交換器が必要であるため、システムが複雑で小型化が難しく、部品点数も作業性も悪く、従って熱効率も良好なものは見込めず、コストも高いという課題があった。

【００１８】そこで、本発明は、冷却効率を改善しながら小型化、薄型化することができ、構造が簡単で低コストの冷却装置を提供することを目的とする。

【００１９】また本発明は、小型化、薄型化することができ、構造が簡単で低コストの電子機器を提供することを目的とする。

【００２０】

【課題を解決するための手段】この課題を解決するため

Cooler Master Co., Ltd. Exhibit 1006, Page 142 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

に本発明の冷却装置は、接触熱交換型ポンプが発熱電子部品に接触されて内部の冷媒の熱交換作用で該発熱電子部品から熱を奪い、放熱器から放熱を行う冷却装置であって、接触熱交換型ポンプのポンプケーシングが高熱伝導率の材料で形成されるとともに、ポンプケーシングには、内部のポンプ室に沿った側面に受熱面が形成され、該受熱面が接触位置において発熱電子部品の上部表面の３次元的な形状と相補的な形状に形成されていることを特徴とする。

【００２１】これにより、冷却効率を改善しながら小型化、薄型化することができ、構造が簡単で低コストの冷却装置を実現できる。

【００２２】また本発明の電子機器は、中央処理装置を含む電子回路と記憶装置を収納して上面にキーボードが設けられた第一筐体と、表示装置を備えた第二筐体とを備え、第二筐体が第一筐体に回転可能に取り付けられ、中央処理装置を含む発熱電子部品を冷却するために上述の冷却装置が設けられていることを特徴とする。

【００２３】これにより、小型化、薄型化することができ、構造が簡単で低コストの電子機器を提供することができる。

【００２４】

【発明の実施の形態】本発明の請求項１に記載の発明は、冷媒を循環する閉循環路を構成する配管と放熱器と接触熱交換型ポンプが接続して設けられ、前記接触熱交換型ポンプが発熱電子部品に接触されて内部の冷媒の熱交換作用で該発熱電子部品から熱を奪い、かつ冷媒を循環させ、前記放熱器から放熱を行う冷却装置であって、前記接触熱交換型ポンプのポンプケーシングが高熱伝導率の材料で形成されるとともに、前記ポンプケーシングには、内部のポンプ室に沿った側面に受熱面が形成され、該受熱面が接触位置において前記発熱電子部品の上部表面の３次元的な形状と相補的な形状に形成されていることを特徴とする冷却装置であるから、接触熱交換型ポンプが冷却器を兼ねることができ、冷却装置の小型化、低コスト化が可能になる。

【００２５】本発明の請求項２に記載の発明は、受熱面に補助熱伝導部材が設けられたことを特徴とする請求項1記載の冷却装置であるから、ポンプケーシングより高い熱伝導率の材料の補助熱伝導部材を介することによって熱伝達を促進できる。

【００２６】本発明の請求項３に記載の発明は、補助熱伝導部材が、接触位置において発熱部材の上部表面形状と下面が合致し、受熱面の形状と上面が合致した板状体であることを特徴とする請求項２記載の冷却装置であるから、ポンプケーシングより高い熱伝導率の板状体の補助熱伝導部材を介することによって熱伝達を促進できる。

【００２７】本発明の請求項４に記載の発明は、補助熱伝導部材が、ポンプケーシングのポンプ室に沿った側面に設けられたヒートパイプであることを特徴とする請求項２記載の冷却装置であるから、ヒートパイプによって熱伝達を促進できる。

【００２８】本発明の請求項５に記載の発明は、接触熱交換型ポンプが渦流ポンプであることを特徴とする請求項１～４に記載の冷却装置であるから、羽根車の厚さが薄く、ポンプ流れに沿った側面に受熱面を形成して、発熱電子部品を中心に外方に伝熱される熱を羽根車外周の流れで乱流熱交換して効果的に冷却でき、冷却効率を改善しながら冷却装置の小型化、低コスト化が可能になる。

【００２９】本発明の請求項６に記載の発明は、接触熱交換型ポンプが、外周に多数の溝状の羽根が形成され、内周にローターマグネットが設けられたリング状羽根車と、ローターマグネットの内周側に設けられたモーターステーターと、該モーターステーターとローターマグネットの間に配設する円筒部が形成されるとともに、羽根車を内部に収容し吸込口と吐出口を有するポンプケーシングとを備え、円筒部がリング状羽根車を回転自在に軸支した渦流ポンプであることを特徴とする請求項５記載の冷却装置であるから、接触熱交換型ポンプのモーター部分が受熱面に対して突出部分をつくることがなく、超薄型ポンプとすることができ、伝熱される熱が羽根車外周で冷媒と激しく乱流熱交換されるので、冷却効率を改善しながら冷却装置のさらなる薄型化、低コスト化が可能になる。

【００３０】本発明の請求項７に記載の発明は、受熱面が平面であることを特徴とする請求項１～６のいずれかに記載の冷却装置であるから、受熱面を上面がフラットな基板に装着することができる。

【００３１】本発明の請求項８に記載の発明は、円筒部の内側に設けられたモーターステーターを熱伝導率の高いモールド材でモールドしたことを特徴とする請求項６～７のいずれかに記載の冷却装置であるから、モールド材でモールドすることにより、熱伝達を促進するとともに、モーターステーターを完全に防水することができる。

【００３２】本発明の請求項９に記載の発明は、ポンプ室内の表面粗さを粗面にしたことを特徴とする請求項６～８のいずれかに記載の冷却装置であるから、乱流熱交換することにより、熱伝達を促進することができる。

【００３３】本発明の請求項１０に記載の発明は、円筒部には、リング状羽根車に作用する半径方向スラストの方向と軸心に対して反対側表面にラジアル動圧発生手段が設けられたことを特徴とする請求項６～９のいずれかに記載の冷却装置であるから、リング状羽根車が円滑に回転することができる。

【００３４】本発明の請求項１１に記載の発明は、接触熱交換型ポンプは、厚さが３～１５ｍｍ、半径方向代表寸法が１０～７０ｍｍであることを特徴とする請求項１～１０のいずれかに記載の冷却装置であるから、冷却効

Cooler Master Co., Ltd. Exhibit 1006, Page 143 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

率を改善しながら小型化、薄型化することができる。

【００３５】本発明の請求項１２に記載の発明は、中央処理装置を含む電子回路と記憶装置を収納して上面にキーボードが設けられた第一筐体と、中央処理装置による処理結果を表示することができる表示装置を備えた第二筐体とを備え、第二筐体が第一筐体に回転可能に取り付けられた電子装置であって、中央処理装置を含む発熱電子部品を冷却するために請求項1～１１に記載の冷却装置が設けられたことを特徴とする電子機器であるから、キーボードを搭載した第一筐体と表示装置を有する第二筐体とを有する電子装置を冷却させることで、電子機器本体の小型化がさらに可能になる。

【００３６】本発明の請求項１３に記載の発明は、接触熱交換型ポンプが中央処理装置上面に受熱面を接触させて設置され、放熱器が第二筐体内の表示装置裏面に配設されたことを特徴とする請求項１２に記載の電子機器であるから、第一筐体内に接触熱交換型ポンプを配設し、第二筐体内に放熱器を配設することで、電子機器本体の小型化がさらに可能になる。

【００３７】以下、本発明の実施の形態について、図１から図９を用いて説明する。なお、これらの図面において同一の部材には同一の符号を付しており、また、重複した説明は省略されている。

【００３８】（実施の形態１）実施の形態１における冷却装置とそれを備えた電子機器は、接触熱交換型ポンプと放熱器を第二筐体と第一筐体の回転を許容するフレキシブルな配管で接続したものである。電子機器はノート型パソコン等の折り畳み可能な機器である。図１は本発明の実施の形態１における冷却装置を組み込んだ電子機器の全体構成図、図２は本発明の実施の形態１における接触熱交換型ポンプの断面図、図３は本発明の実施の形態１における接触熱交換型ポンプの分解斜視図、図４は本発明の実施の形態１における接触熱交換型ポンプ内の冷媒の流れを示す要部断面図である。

【００３９】図１において、１はノート型パソコン等の第一筐体、２は第一筐体１の上面に設けられたキーボード、３は第一筐体１内に収められたＣＰＵ等の発熱電子部品、４は発熱電子部品３を実装した基板、５は第一筐体１の蓋となる第二筐体、６は第二筐体５の内面側に設けられたＣＰＵによる演算処理結果を表示する表示装置、７は発熱電子部品３に密着し発熱電子部品３と冷媒Ｘとで熱交換を行ない発熱電子部品３を冷却するとともに冷媒Ｘを循環させる接触熱交換型ポンプ、８は表示装置６の裏面に配設され冷媒Ｘから熱を取り除く放熱器、８ａは繰り返し流行した冷媒通路、８ｂは冷媒Ｘを補充するためのリザーブタンク、９はこれらを接続する配管である。なお、冷媒Ｘとしては、食品添加物などに用いられる無害なプロピレングリコール水溶液が適当であり、さらに後述するようにケーシング材料としてアルミや銅等を使用する場合には、これらに対する防食性能を向上させるための防食添加剤を添加するのが望ましい。

【００４０】放熱器８は、表示装置６の裏面の幅の狭く広い空間で冷媒Ｘから熱を取り除く必要があるため、熱伝導率が高く放熱性のよい材料、例えば銅、アルミニウムなどの薄板材で構成され、図１に示すように、内部に冷媒通路８ａとリザーブタンク８ｂが形成されている。また、放熱器８に強制的に空気を当てて冷やし冷却効果を増やすためファンを設けてもよい。配管９は、配管レイアウトの自由度を確保するため、フレキシブルでガス透過性の少ないゴム、例えばブチルゴムなどのゴムチューブで構成されている。これはチューブ内に気泡が混入するのを防止するためである。

【００４１】続いて接触熱交換型ポンプ７の構成の説明を行う。本実施の形態1の接触熱交換型ポンプ７は渦流ポンプ（ウエスコ型ポンプ、再生ポンプ、摩擦ポンプとも呼称される）を用いている。図２、３において、１１は渦流ポンプのリング状羽根車、１２は外周に多数形成されたリング状羽根車１１の溝状の羽根、１３はリング状羽根車１１の内周に設けられたローターマグネットである。１４はローターマグネット１３の内周側に設けられたモーターステーター、１５はリング状羽根車１１を収容すると同時にリング状羽根車１１が流体に与えた運動エネルギーを圧力回復して吐出口へと導くポンプケーシング、１５ａは発熱電子部品３に接触して熱を奪う受熱面、１５ｂは羽根１２で与えられた運動エネルギーを圧力回復して吐出口へと導くためのポンプ室、１６はポンプケーシング１５の一部をなしリング状羽根車１１を収納した後ポンプ室１５ｂを密閉するためのケーシングカバー、１７はポンプケーシング１５に設けられ、リング状羽根車１１を回転自在に軸支するための円筒部である。なお、本実施の形態１の接触熱交換型ポンプ７は回転軸方向の厚さが５～１０ｍｍ、半径方向の代表寸法が４０～５０ｍｍ、回転数は１２００ｒｐｍ、流量が０．０８～０．１２Ｌ／分、ヘッドが０．３５～０．４５ｍ程度のポンプである。そして、本発明のポンプの諸元は、本実施の形態１の値を含んで、厚さ３～１５ｍｍ、半径方向代表寸法１０～７０ｍｍ、流量が０．０１～０．５Ｌ／分、ヘッド０．１～２ｍ程度のものとなる。これは比速度でいうと、２４～２８（単位：ｍ、m^3／分、ｒｐｍ）程度のポンプであって、従来のポンプとはまったく隔絶した大きさの小型薄型のポンプである。

【００４２】そして、従来、側面を接触させて熱交換するポンプは、伝熱効率が悪いものとして、その熱交換機能が検討の対象にされることはなかった。また、ポンプで側面をフラットに構成することの困難さから、薄型でフラットな受熱面をもつポンプの実用化は無理と考えられていた。しかし本発明者らは渦流ポンプに着目し、以下詳述する改良を加えることで、発熱電子部品３から伝熱される熱を渦流ポンプ外周で乱流熱交換すれば熱交換機能は十分なものとなり、フラットな受熱面という点も

Cooler Master Co., Ltd. Exhibit 1006, Page 144 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

駆動部の一部を羽根車と一体化して全体を平板状に配置することにより実現可能になる、という知見に到達したものである。さらにこのとき、流量に対する受熱面の面積、流量に対する伝熱量を考えたとき、通常の大きさのポンプと異なってこの小型薄型のポンプは冷却に十分な値を持ち得るからである。

【００４３】すなわち、接触熱交換型ポンプ７のポンプケーシング１５内の流れは、羽根１２の機構による遠流型特有のスパイラル状の流れであり、巨視的にはリング状のポンプ室１５ｂに沿って流れる。この流れによって熱源から外方へ伝熱される熱をリング状羽根車１１の外周部分で（微視的には図４のように伝熱方向と部分的に向流しながら）奪うため、冷却器を別に設けなくとも熱交換器として機能させることが可能になる。但し、冷却力を増強するため補助の冷却器を併設することは可能である。またローターマグネット１３がリング状羽根車１１と一体化されてリング状となり、円筒部１７で軸支されるため、リング状羽根車１１の慣性質量を小さくすることができ、これにより駆動部の発熱量を抑え、接触熱交換型ポンプ７を小型且つ薄型で軽量化することができる。そして、熱伝達を促すためにポンプケーシング１５とケーシングカバー１６は、熱伝導率が高い銅、アルミニウム等の材料を選択する必要がある。そして基本的には銅やアルミニウム等の熱伝導率の良い金属材料を用いるのが適当であるが、熱伝導に対する影響が少ないところでは熱伝導率の高い樹脂等を使用するのでも差し支えない。重量軽減のため等にポンプケーシング１５の材料としてアルミニウムを選択した場合には、アルミニウムよりも更に熱伝導率の高い銅板をポンプケーシング１５の下面に取り付けるのがよい。また、さらにヒートパイプをポンプケーシング１５の下面（受熱面側１５ａ）に取り付けるか、もしくはその一部に埋め込めば、受熱した熱をより効率的にポンプケーシング１５のリング状羽根車１１の外周部分にまで伝達することができる。この銅板，ヒートパイプが本発明の補助熱伝導部材である。板材を取り付けるだけでなく、棒状の銅材を摩擦圧接により溶かし不要部分を切削することで補助熱伝導部材をつくるのもよい。また、ポンプケーシング１５，ケーシングカバー１６には、外側表面にフィン状の凹凸をつけて外気との熱交換を積極的に行わせるのも好適である。

【００４４】さらに、この接触熱交換型ポンプ７は、ポンプケーシング１５の受熱面１５ａを完全にフラットにすることが可能となる。すなわち、ポンプケーシング１５の側面をポンプ室１５ｂ側面及びモーターステーター１４側面との間で一致させ、モーターステーター１４は円筒部１７内の窪みに収容することにより、接触熱交換型ポンプ７の受熱面１５ａを平面化し、発熱電子部品３（通常上部はフラットに構成されている）にぴったり接触させることができる。発熱電子部品３の上部形状に凹凸があるときなどには、肉厚を変化させるなどすれば形状を合致させ隙間なく接触させることができる。受熱面１５ａと発熱電子部品３の上部形状との間に上述の銅板と同様に高熱伝導率の接着用樹脂やゴムを介在させ、できる限り伝熱効率を下げずに固定するのがよい。なお、ここで発熱電子部品３の上部形状に合致させるというのは、発熱電子部品３の上部表面の３次元的な形状と相補的な形状を受熱面１５ａに与えることであり、発熱電子部品３に載置可能な状態で曲面が合致していることである。そしてＣＰＵ等の発熱電子部品３の大きさ及び形状と受熱面１５ａの大きさ及び形状には差があることが多いが（本発明の接触熱交換型ポンプ７は非常に小さく、通常発熱電子部品３の方が大きさが大きいし、形状も本発明の接触熱交換型ポンプ７が様々な形状を採用できるのに対し、通常は四角形である。）、少なくともその取付け位置（接触位置）においては曲面が合致していることを意味する。また熱伝達を効果的に行うためには受熱面１５ａと発熱電子部品３との間に空気の層を形成しないようにする必要があり、以下は決して好ましいことではないが、例えば、一方に小さな凹みを形成するような場合を包含するものである。

【００４５】そして本発明の実施の形態１の場合、モーターステーター１４はポンプケーシング１５の円筒部１７によって形成された中央の窪み部分に収容されて伝熱し、他方の側は大気に開放されて外気に放熱される。従って駆動部から発生する熱はもともと小さい上に、外気にも放熱されるため、接触熱交換型ポンプ７はもっぱら発熱電子部品３を冷却することが可能になる。しかし、発熱電子部品３の冷却のためには、発熱するモーターステーター１４付近にＣＰＵ等の発熱電子部品３を位置するのは避けた方がよい。すなわち、発熱電子部品３の大きさと受熱面１５ａの大きさにもよるが、発熱電子部品３の配置をどこにするかで伝熱速度に差が出てくる。モーターの発熱があるため、受熱面１５ａの中でもポンプ室１５ｂの壁を挟んだ側面またはその近傍、あるいは受熱面１５ａの中でも吸込口１９、吐出口２０に近い部分の方が、受熱効率が高くなる。とくに、受熱面１５ａの中でも吸込口１９、吐出口２０、ポンプ室１５ｂで囲まれる領域に発熱電子部品３の中心を配置するのがもっとも放熱に効果的である。

【００４６】さらに、モーターステーター１４が収容された窪み部分を熱伝導率の高いシリコン樹脂やウレタン樹脂等でモールドすれば、モーターステーター１４で発熱があっても、このモールド部を通してポンプ室１５ｂへ熱伝達が起こりる。また、受熱面１５ａから受熱した発熱電子部品３の熱をこのモールド部からポンプ室１５ｂ内の冷媒Ｘへ伝達することができる。これにより、さらに伝熱速度を上げることができる。なお、このように巻き線を含むモーターステーター１４をモールド材でモールドすると、発熱電子部品３からの放熱の促進だけでなく、電気が通る巻き線部分が完全に防水されるため、

Cooler Master Co., Ltd. Exhibit 1006, Page 145 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

モーターステーター１４の漏水対策を万全なものにすることができる。

【００４７】さらに、本実施の形態１の接触熱交換型ポンプ7は、円滑な運転を長時間継続するために流体力学的に発生する軸方向、半径方向のスラストを抑え、非接触で回転させることができる。図2、図3において、１８はスラスト板、１９は吸込口、２０は吐出口である。２２はリング状羽根車１１の両側面に形成されたスパイラル状溝パターンを有するスラスト動圧発生溝、２３は同様にリング状羽根車１１の内周面に形成されたヘリングボーン状溝パターンを有するラジアル動圧発生溝である。

【００４８】渦流ポンプにおいては吐出口２０付近の圧力の方が吸込口１９付近の圧力より大きいため半径方向のスラストのバランスが崩れてしまう。そこで、スラスト動圧発生溝２２のスパイラル状溝パターンは、リング状羽根車１１の回転に伴い当該溝の内周側に流体を押し出すポンプ作用をなす形状とし、リング状羽根車１１の両側面に液膜を形成し、軸方向のスラストを動圧で支えている。また、ラジアル動圧発生溝２３のヘリングボーン状溝パターンはリング状羽根車１１の回転に伴い当該溝の軸方向中央側に流体を押し出すポンプ作用をなす形状としており、これにより液膜を形成し、リング状羽根車１１にかかる半径方向のスラストを動圧で支えている。スラスト動圧発生溝２２はリング状羽根車１１側でなく、ポンプケーシング１５やケーシングカバー１６のスラスト板１８側に形成してもよいし、ラジアル動圧発生溝２３はポンプケーシング１５の円筒部１７側に形成してもよい。

【００４９】図5（ａ）は本発明の実施の形態1におけるリング状羽根車にかかる半径方向のスラストの生成テーブル図、図5（ｂ）は本発明の実施の形態1におけるリング状羽根車にかかる半径方向のスラストの説明図である。図5（ｂ）に示すように、渦流ポンプにおいては吐出口２０付近の圧力の方が吸込口１９付近の圧力より大きいため、半径方向のスラストは吐出口２０の反対側となるθ方向に作用する。従って、ラジアル動圧発生溝２３を吐出口２０近くの円筒部１７のＡ部分（ポンプケーシング１５の円筒部１７の太線部分）だけに形成したり、全周に形成した場合でもＡ部分の溝深さを動圧が高くなる深さにして流体の押し出す作用を強化させれば、半径方向のスラストがリング状羽根車１１を円筒部１７に接触させるのを防止することができ、ポンプの運転を安定して行なうことができる。なお、図5（ａ）のデータが示すように、Ａ部分は吐出口２０と吸込口１９の圧力差の大きさによってリング状羽根車１１に作用する力の方向が変化するために、使用する領域によってＡ部の範囲を決定することができる。

【００５０】このように接触熱交換型ポンプ7によれば、第１に、渦流ポンプの駆動部をローターマグネット１３とモーターステーター１４に分離し、ローターマグネット１３をリング状羽根車１１と一体化してモーターステーター１４とともに全体構成を平板状に配置できる。これによってフラットで大きな受熱面１５ａがポンプ側面に形成可能になる。第２に、発熱電子部品３から伝熱される熱は受熱面１５ａを伝わって、スパイラル流れで伝熱方向と部分的に向流しながらポンプ外周で乱流熱交換されるため、接触熱交換型ポンプ7は冷却器として十分に機能する。第３に、円筒部１７を設けることでリング状羽根車１１を完全に水封でき、ポンプケーシング１５内で非接触で浮上させることで負荷を最小限にすることができ、駆動部からの発熱を抑えて冷却機能を向上させることができる。第４に、この接触熱交換型ポンプ7は、冷却器を兼ねるため従来の冷却器が不要になるばかりでなく、冷却器を組み立てる作業も不要となる。加えて、この接触熱交換型ポンプ７自体を発熱電子部品３に装着するときに、別途煩わしい組み立てや特殊の構造が必要でなく、ただ受熱面１５ａを接触させて固定するだけで十分であり、冷却装置の組み立てやコストの面でもきわめて有効である。

【００５１】次に本発明の実施の形態１における冷却装置と、それを備えた電子機器の動作について説明する。外部電源から電力を供給されると、接触熱交換型ポンプ７に設けられた半導体スイッチング回路により制御された電流がモーターステーター１４のコイルに流れ、回転磁界が発生する。この回転磁界がローターマグネット１３に作用するとローターマグネット１３に物理力が発生する。このときローターマグネット１３はリング状羽根車１１と一体化されており、リング状羽根車１１はポンプケーシング１５の円筒部１７に回転自在に軸支されているため、リング状羽根車１１に回転トルクが作用し、この回転トルクによりリング状羽根車１１が回転を始める。リング状羽根車１１の外周に設けられた羽根１２はリング状羽根車１１の回転によって吸込口１９から流入した流体に運動エネルギーを与え、その運動エネルギーによりポンプケーシング１５内の流体の圧力が徐々に高められ吐出口２０から吐き出される。

【００５２】ここで、リング状羽根車１１の回転に伴うスラスト動圧発生溝２２のポンプ作用により、スラスト動圧発生溝２２の内周側に流体を押し出してリング状羽根車１１の両側面とスラスト板１８との間にスラスト動圧が発生する。このためリング状羽根車１１は液膜によりスラスト板１８と接触することなく円滑に回転する。また、リング状羽根車１１の回転に伴うラジアル動圧発生溝２３のポンプ作用により、ラジアル動圧発生溝２３の軸方向中央側に流体を押し出してリング状羽根車１１の内周面と円筒部１７との間にラジアル動圧が発生する、このためリング状羽根車１１は円筒部１７と接触することなく浮上して円滑に回転する。リング状羽根車１１は慣性モーメントが小さく、応答性がきわめて良好と

Cooler Master Co., Ltd. Exhibit 1006, Page 146 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

なる。また、これによりポンプ自体の重量もきわめて軽量となる。

【００５３】この状態で接触熱交換型ポンプ７は円滑に冷媒Ｘを吸い込む。吸い込まれた冷媒Ｘは、図４に示すようにポンプケーシング１５とケーシングカバー１６に囲まれた空間でリング状羽根車１１によって撹拌され、渦流ポンプ特有のポンプ室１５ｂ内の流れを形成して、昇圧されながら吐出される。このとき冷媒Ｘは、発熱電子部品３からの伝熱で高温になったポンプケーシング１５やケーシングカバー１６と激しく乱流熱交換を行う。この乱流熱交換は、ポンプ室１５ｂ内壁面の表面粗さをショットブラスト、ショットピーニング加工等により粗くすることによって促進させることができる。これは、表面粗さが粗くなることによって伝熱面積が大きくなるとともに、乱流が激しくなって熱伝達が大きくなったからと考えられる。同様に、図６に示すように、ポンプ室１５ｂ内壁面からリング状羽根車１１に向けて突出するフィン１５Ｃを設けると、ポンプ室１５ｂ内の流れを円滑にするとともに、ポンプケーシング１５から冷媒Ｘへの伝達面積が増加するため、熱交換量を増加させることができる。図６は本発明の実施の形態１におけるフィンを設けた接触熱交換型ポンプ内の冷媒の流れを示す要部断面図である。

【００５４】このように乱流熱交換により発熱電子部品３の熱を奪って昇温した冷媒Ｘは、配管９を通って放熱器８に送られ、放熱器８で冷却されて、温度降下した後に再度配管９を通って接触熱交換型ポンプ７へ戻り、これを繰り返す。

【００５５】放熱器８から放出された熱は第二筐体５の外部へ排出され、第一筐体１内部の温度は一定に保たれるため、使用者が触れる機会の多い第一筐体１の表面温度が上昇して使用者に不快感を与えることはない。このように、接触熱交換型ポンプ７は冷媒Ｘを循環させて発熱電子部品３から熱を奪い、発熱電子部品３をその許容温度に保つことができる。

【００５６】本発明の実施の形態１の冷却装置とこれを備えた電子機器は、接触熱交換型ポンプ７によりポンプと冷却器を兼ねることで、ポンプと冷却器を別々に設置する必要がなく、またポンプと冷却器を接続する配管も不要となり、冷却装置の小型化、低コスト化が実現できる。冷却器の組み立て作業も不要となる。加えて、この接触熱交換型ポンプ７自体を発熱電子部品３に装着するときに、別途煩わしい組み立てや特殊の構造が必要とならず、ただ単純に載置して接触させるだけで十分であり、冷却装置の組み立てやコストの面でもきわめて有用である。

【００５７】また、接触熱交換型ポンプ７のポンプを、羽根１２とローターマグネット１３および回転軸とを一体化してリング状羽根車１１を形成し、その中にモーターステーター１４を挿入する超薄型の渦流ポンプとすることで、ポンプの内部で冷媒が激しく乱流熱交換されるので、冷却器での冷却効率を改善しながら冷却装置のさらなる薄型化、低コスト化が可能になる。

【００５８】さらに、配管９をガス透過性の少ないゴムチューブにすることで、配管レイアウトの自由度を確保しながら、長期にわたって冷却装置内の冷媒Ｘが外部に蒸発して多量のガスが冷却装置内混入するのを防止できる。また、第一筐体１内に接触熱交換型ポンプ７を配設し、第二筐体５内に放熱器８を配設することで、ノート型パソコン等本体の小型化がさらに可能になる。

【００５９】（実施の形態２）本発明の実施の形態２における冷却装置とそれを備えた電子機器は、接触熱交換型ポンプと放熱器を配管と第二筐体と第一筐体の回転を許容する回動部材で接続したものである。電子機器はノート型パソコン等の折り畳み可能な機器である。そして実施の形態１と比較して接触熱交換型ポンプの構成には違いはない。図７は本発明の実施の形態２における冷却装置を組み込んだ電子機器の全体構成図、図８は本発明の実施の形態２における回動部材の断面図、図９は本発明の実施の形態２における回動部材をワンタッチ着脱可能なコネクターと一体化した場合の断面図である。

【００６０】図７において、１は第一筐体、２はキーボード、３は発熱電子部品、４は基板、５は第二筐体、６は表示装置、７は接触熱交換型ポンプ、８は放熱器、８ａは冷媒通路、８ｂはリザーブタンク、９ａは接触熱交換型ポンプ７側の配管、９ｂは放熱器８側の配管である。３０は第一筐体１と第二筐体５の接続部内に設けられ、第二筐体５の回転に伴って回動可能な構造を有する回動部材であり、接触熱交換型ポンプ７側の配管９ａと放熱器８側の配管９ｂに接続されている。

【００６１】次に、この回動部材３０の説明を行う。図８において、３１は一端が配管と接続され他端が後述の内筒３２と接続される中空の外筒、３１ａは抜け落ち防止用の切り欠き、３２は外筒３１に挿入されて接続される中空の内筒、３２ｂは抜け落ち防止用の切り欠き３１ａに挿入される突起である。中空部分が冷媒Ｘの通路となる。３２ａは内筒３２の外周に設けられた溝、３３は外筒３１と内筒３２の間に設けられ溝３２ａに嵌め込まれるＯリング状弾性部材である。Ｏリング状弾性部材３３は外筒３１と内筒３２とを回動可能に支持し、外筒３１と内筒３２の各通路と外部との間をシールして、通路内の冷媒Ｘが外部に漏れるのを防ぐ。さらにＯリング状弾性部材３３を二列に配置することで、長期にわたって冷却装置内の冷媒Ｘが外部に蒸発して多量のガスが冷却装置内に混入するのを防止している。なお、外筒３１と内筒３２が抜けるのを防ぐ目的で、内筒３２側に突起３２ｂ、外筒３１側に切り欠き３１ａが設けられている。

【００６２】また、図９において、３１ｂは回動部材３０の外筒３１内に設けられた弁、３１ｃは弁３１ｂを付勢するスプリング、３２ｃは内筒３２内に設けられた

Cooler Master Co., Ltd. Exhibit 1006, Page 147 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

弁、３２ｄは弁３２ｃを付勢するスプリングである。弁３１ｂと弁３２ｃは、外筒３１と内筒３２を分離して取り外した状態でそれぞれの内部の通路を外部と封止するもので、外筒３１と内筒３２を接続した場合には各通路がつながるようになっている。

【００６３】接触熱交換型ポンプ７の構成および動作は本発明の実施の形態１と同じであるので、ここでは説明を省略する。

【００６４】次に本発明の実施の形態２における冷却装置と、それを備えた電子機器の動作について説明する。接触熱交換型ポンプ７に吸い込まれた冷媒Ｘは、接触熱交換型ポンプ７内でリング状羽根車１１によって撹拌され、発熱電子部品３からの伝熱で高温になったポンプケーシング１５やケーシングカバー１６と激しく乱流熱交換を行い、その結果、温度上昇して配管９と回動部材３０内の流路を通って放熱器８に送られ、放熱器８で冷却され、温度降下して配管９と回動部材３０内の流路を通って接触熱交換型ポンプ７へ戻ってこれを繰り返す。このように、冷媒Ｘを循環させて発熱電子部品３を冷却して、発熱電子部品３をその許容温度に保つ。

【００６５】使用者がノート型パソコン等の電子機器において第二筐体５を開け閉めした場合、第二筐体５が第一筐体１のヒンジ回りに回転するが、その回転に伴って回動部材３０の外筒３１と内筒３２がそれぞれに対して回動するため、第二筐体５の回転がスムーズに行え、且つ、第一筐体１内の接触熱交換型ポンプ７側の配管９ａと第二筐体５内の放熱器８側の配管９ｂは回動部材３０で接続されているので変形することがなく、内部の冷媒の流れを妨げることを防止できる。

【００６６】また、図９に示すように回動部材をコネクターと一体化した場合、接触熱交換型ポンプ側と放熱器側とを別々に組み立てることが可能となり、それぞれを第一筐体１内および第二筐体５内に組み込んで第一筐体１および第二筐体５をサブアッセンブリした後で第一筐体１と第二筐体５を接続できるので、製造コストを低減できる。

【００６７】以上説明したように本発明の実施の形態２によれば、第一筐体１と第二筐体の間の配管に回動部材３０を設けることで、第二筐体５の回転がスムーズに行え、且つ、配管が変形して内部の冷媒の流れを妨げることを防止できる。また、接触熱交換型ポンプ７と放熱器８とを接続する配管にワンタッチ接続可能なコネクターを設けることで、接触熱交換型ポンプ７側と放熱器８側とを別々に組み立てることが可能となり製造コストを低減できる。さらに、回動部材３０とコネクターを一体化することで、さらなるノート型パソコン等の本体の小型化、低コスト化が可能になる。

【００６８】

【発明の効果】以上のように本発明の冷却装置によれば、接触熱交換型ポンプが冷却器を兼ねることで、ポンプと冷却器を別々に設置する必要がなく、またポンプと冷却器を接続する配管も不要となり、冷却装置の小型化、低コスト化が可能となる。組み立ても容易となる。

【００６９】また、接触熱交換型ポンプが渦流ポンプであるから、羽根車の厚さが薄く、ポンプ流れに沿った側面に受熱面を形成して、発熱電子部品を中心に外方に伝熱される熱を羽根車外周の流れで乱流熱交換して効果的に冷却でき、冷却効率を改善しながら冷却装置の小型化、低コスト化が可能になる。

【００７０】接触熱交換型ポンプが、内周にローターマグネットが設けられたリング状羽根車と、モーターステーターとローターマグネットの間に配設された円筒部を有するポンプケーシングとを備え、円筒部がリング状羽根車を回転自在に軸支した渦流ポンプであるから、接触熱交換型ポンプのモーター部分が受熱面に対して突出部分をつくることがなく、超薄型ポンプとすることができ、伝熱される熱が羽根車外周で冷媒と激しく乱流熱交換されるので、冷却効率を改善しながら冷却装置のさらなる薄型化、低コスト化が可能になる。

【００７１】受熱面がポンプケーシングの側面全体から構成されているから、受熱面がポンプケーシングを最大に活かして大きく採ることができる。受熱面が平面であるため、受熱面を上面かフラットな基板に装着することができる。モールド材でモールドすることにより、熱伝達を促進するとともに、モーターステーターを完全に防水することができる。

【００７２】本発明の電子装置によれば、第二筐体が第一筐体に回転可能に取り付けられ、中央処理装置を含む発熱電子部品を冷却するために冷却装置が設けられたから、キーボードを搭載した第一筐体と表示装置を有する第二筐体とを有する電子装置を冷却させることで、電子機器本体の小型化がさらに可能になる。

【００７３】接触熱交換型ポンプが中央処理装置上面に受熱面を接触させて設置され、放熱器が第二筐体内の表示装置裏面に配設されたから、第一筐体内に接触熱交換型ポンプを配設し、第二筐体内に放熱器を配設することで、電子機器本体の小型化がさらに可能になる。

【図面の簡単な説明】

【図１】本発明の実施の形態１における冷却装置を組み込んだ電子機器の全体構成図

【図２】本発明の実施の形態１における接触熱交換型ポンプの断面図

【図３】本発明の実施の形態１における接触熱交換型ポンプの分解斜視図

【図４】本発明の実施の形態１における接触熱交換型ポンプ内の冷媒の流れを示す要部断面図

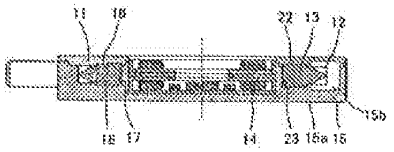
【図５】（ａ）本発明の実施の形態１におけるリング状羽根車にかかる半径方向のスラストの生成テーブル図

（ｂ）本発明の実施の形態１におけるリング状羽根車にかかる半径方向のスラストの説明図

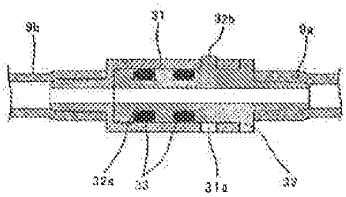
Cooler Master Co., Ltd. Exhibit 1006, Page 148 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

【図６】本発明の実施の形態１におけるフィンを設けた接触熱交換型ポンプ内の冷媒の流れを示す要部断面図
【図７】本発明の実施の形態２における冷却装置を組み込んだ電子機器の全体構成図
【図８】本発明の実施の形態２における回動部材の断面図
【図９】本発明の実施の形態２における回動部材をワンタッチ着脱可能なコネクターと一体化した場合の断面図
【図１０】従来の電子機器の第1冷却装置の構成図
【図１１】従来の電子機器の第２冷却装置の構成図
【図１２】従来の熱交換機能付ポンプの一部破砕斜視図
【符号の説明】
１　第一筐体
２，１０９　キーボード
３，１０１　発熱電子部品
４，１０２　基板
５　第二筐体
６　表示装置
７　接触熱交換型ポンプ
８，１０４　放熱器
８ａ　冷媒通路
８ｂ　リザーブタンク
９，９ａ，９ｂ，１０６　配管
１１　リング状羽根車
１２　羽根
１３　ローターマグネット
１４　モーターステーター
１５　ポンプケーシング
１５ａ　受熱面
１５ｂ　ポンプ室
１６　ケーシングカバー
１７　円筒部
１８　スラスト板
１９　吸込口
２０　吐出口
２２　スラスト動圧発生溝
２３　ラジアル動圧発生溝
３０　回動部材
３１　外筒
３１ａ　切り欠き
３２　内筒
３２ａ　溝
３２ｂ　突起
３３　Ｏリング状弾性部材
１００　筐体
１０３　冷却器
１０５　ポンプ
１０７　ファン
１０８　配線基板
１１０　半導体発熱素子
１１１　ディスク装置
１１２　表示装置
１１３　受熱ヘッダ
１１４　放熱ヘッダ
１１５　フレキシブルチューブ
１１６　金属筐体
１２０　モーター
１２１　熱交換器
１２２　冷却水路
１２２ａ　吐出口
１２２ｂ　吸込口
１２３　遠心ポンプ
１２４　ケーシング
１２５　インペラ
【要約】
【課題】　本発明は、冷却効率を改善しながら小型化、薄型化することができ、構造が簡単で低コストの冷却装置とそれを備えた電子機器を提供することを目的とする。
【解決手段】　本発明の冷却装置とそれを備えた電子機器は、接触熱交換型ポンプ７が発熱電子部品３に接触されて内部の冷媒の熱交換作用で発熱電子部品３から熱を奪い、放熱器８から放熱を行う冷却装置であって、接触熱交換型ポンプ７のポンプケーシング１５が高熱伝導率の材料で形成されるとともに、ポンプケーシング１５には、内部のポンプ室１５ｂに沿った側面に受熱面１５ａが形成され、該受熱面１５ａが接触位置において発熱電子部品３の上部表面の３次元的な形状と相補的な形状に形成されていることを特徴とする。

【図２】

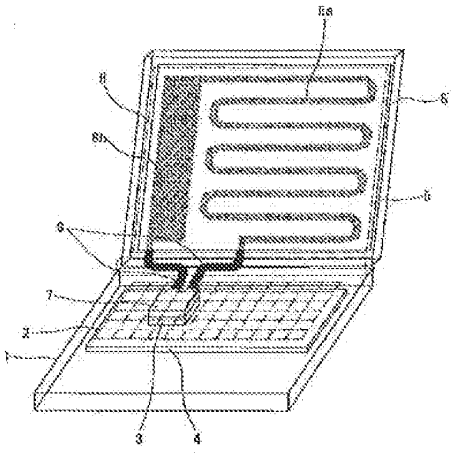


【図８】

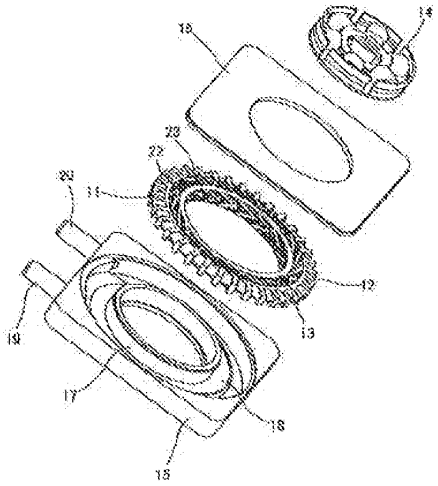


Cooler Master Co., Ltd. Exhibit 1006, Page 149 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

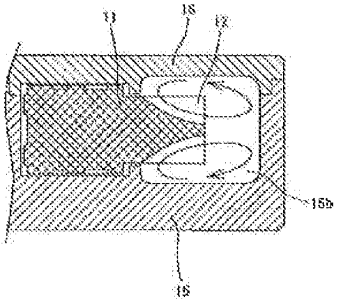
【図１】



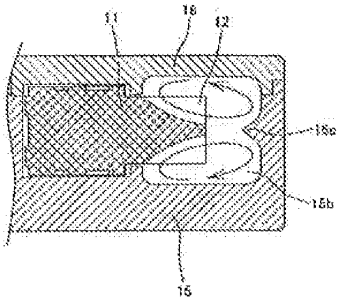
【図３】



【図４】



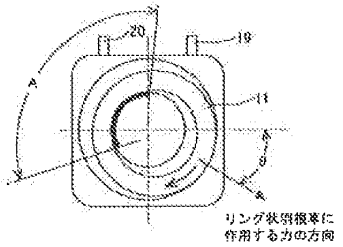
【図６】



【図５】

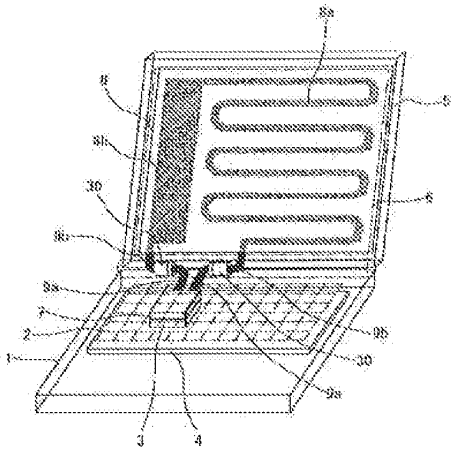
吐出圧力 (kPa)	吸込圧力 (kPa)	伝回速度 (m/min)	θ (deg)
2.0	−0.64	213	18
4.0	−0.36	158	15
6.0	−0.15	104	12
8.0	−0.02	38	10

（a）

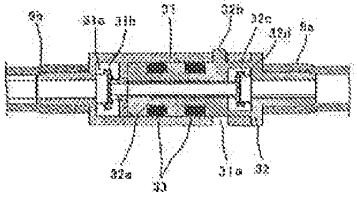


（b）

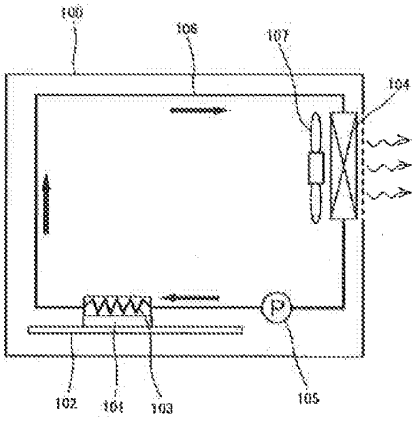
【図７】



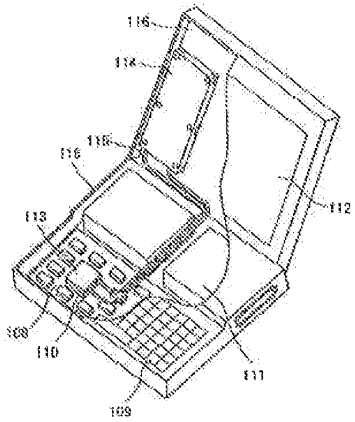
【図９】



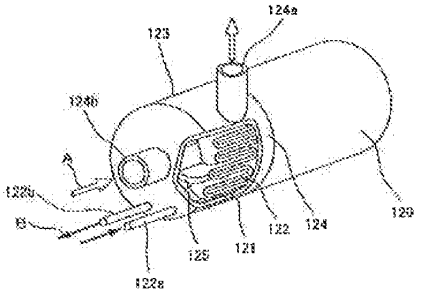
【図１０】



【図１１】



【図１２】



フロントページの続き

(51)Int.Cl.[7]	識別記号	FI	
H02K 9/19		H01L 23/46	Z
21/22		G06F 1/00	360C
			360A

(72)発明者　相園　誠光
大阪府門真市大字門真1006番地　松下電器産業株式会社内
(72)発明者　笠原　一志
大阪府門真市大字門真1006番地　松下電器産業株式会社内

(56)参考文献　特開2002－94276（ＪＰ，Ａ）
特開2002－100713（ＪＰ，Ａ）
特開2001－320187（ＪＰ，Ａ）
特開2000－151638（ＪＰ，Ａ）
特開2000－236581（ＪＰ，Ａ）
特開　平10－22426（ＪＰ，Ａ）
特開2001－24372（ＪＰ，Ａ）
登録実用新案3038538（ＪＰ，Ｕ）

(58)調査した分野(Int.Cl.', ＤＢ名)
H05K　7/20
H01L　23/473
G06F　1/20

[Detailed Description of the Invention]

[0001]

[Field of the Invention]The present invention relates to the cooling system of the electronic device which circulates a refrigerant and cools heat releasing electronic parts, such as a central processing unit (the following, CPU) arranged inside the housing, and the electronic device provided with it.

[0002]

[Description of the Prior Art]The movement toward the improvement in the speed in the latest computer is very rapid, and the clock frequency of CPU is markedly boiled as compared with before, and is becoming big. As a result, the efficient high-output cooling system is indispensable by deficiency in performance only by the calorific value of CPU carrying out air cooling with a heat sink like increase and before. Then, the cooling system which circulates a refrigerant and cools the substrate which mounted the heat releasing electronic part as such a cooling system was proposed (a Patent document 1, see Patent Document 2).

[0003]It describes about the cooling system of the conventional electronic device which is made to circulate through such a refrigerant and is cooled hereafter. Although an electronic device makes a core the equipment which processes by loading a program to CPU etc., and the small equipment in which carrying especially like a notebook sized personal computer is possible in this Description, the equipment which mounted the heat releasing electronic part which generates heat by energization is included. The thing as shows this conventional first cooling system to Fig.10, for example is known. Fig.10 is a configuration diagram of the 1st cooling system of the conventional electronic device. The substrate in which 100 was a housing, 101 mounted the heat releasing electronic part, and 102 mounted the heat releasing electronic part 101 in Fig.10, The condensator which 103 performs heat exchange between the heat releasing electronic part 101 and a refrigerant, and cools the heat releasing electronic part 101, the radiator with which 104 removes heat from a refrigerant, the pump which 105 makes circulate through a refrigerant, piping whose 106 connects these, and 107 are fans which carry out air cooling of the radiator 104.

[0004]A description of operation of this 1st conventional cooling system will send the refrigerant discharged from the pump 105 to the condensator 103 through the piping 106. The temperature rises by taking the heat of the heat releasing electronic part 101 here, and it is sent to the radiator 104. An air cooling with blower is carried out by the fan 107 with this radiator 104, that temperature descends, it returns to the pump 105 again, and this is repeated. Thus, a refrigerant is circulated and the heat releasing electronic part 101 is cooled.

[0005]Next, what is shown in Fig.11 is proposed as the 2nd conventional cooling system of an electronic device (see Patent Document 3).

[0006]Even the metal box body wall which is a radiator transports the generating heat of a heating member efficiently, and this 2nd cooling system cools a heating member, when a heating member is mounted in a narrow housing. Fig.11 is a configuration diagram of the 2nd cooling system of the conventional electronic device. In Fig.11, the wiring board of an electronic device and 109 108 A keyboard, As for the heat-receiving header which 112 carries out a semiconductor heater element and 111 by a disk unit, and carries out it with a display device and in which 113 carries out heat exchange between the semiconductor heater elements 110 110, and 114, a flexible tube and 116 are the metal housings of an electronic device the heat dissipation header for heat dissipation, and 115.

[0007]This 2nd cooling system connects thermally the semiconductor heater element 110 and the metal housing 116 which are heating members with the heat transport device of flexible structure. This heat transport device comprises the heat-receiving header 113 of the flat shape which has the liquid flow channel attached to the semiconductor heater element 110, the heat dissipation header 114 which has a liquid flow channel and was contacted in the wall of the metal housing 116, and the flexible tube 115 which connects both further, The liquid enclosed with the inside is driven or circulated between the heat-receiving header 113 and the heat dissipation header 114 with the liquid drive mechanism built in the heat dissipation header 114. While being able to connect easily by this, without the semiconductor heater element 110 and the metal housing 116 being influenced by part arrangement, by the drive of liquid, it is efficient and heat is transported. In the heat dissipation header 114, since the heat dissipation header 114 and the metal housing 116 are connected thermally, for the high thermal conductivity of the metal housing 116, heat is wide and the metal housing 116 diffuses.
[0008]The conventional proposal also of the pump with a heat exchange function which can perform heat exchange internally is made (for example, see Patent Document 4).
[0009]Fig.12 is a partial crushing perspective view of the conventional pump with a heat exchange function. in Fig.12 -- 120 -- a motor and 121 -- as for a discharge port and 122b, a cooling channel and 122a of a suction opening and 123 are [a casing and 125] impellers a centrifugal pump and 124 a heat exchanger and 122.
[0010]As for the centrifugal pump 123, the suction opening 124b is provided in the center of the casing 124 of a volute form, and the discharge port 124a is provided by the outside tangential direction. The impeller 125 is provided by casing 124 inside and the axis of this impeller 125 is connected with the motor 120. The cooling channel 122 of the heat exchanger 121 uses zigzag shape, and is accommodated in the outside whole circumference of the impeller 125.
[0011]If operation of such a conventional pump with a heat exchange function is described and the impeller 125 will rotate by the motor 120, the refrigerant A heated by the apparatus side will go into casing 124 inside from the suction opening 124b, will rotate the inside of the casing 124, and will be discharged from the outside discharge port 124a. Since the method of the outside of an inside of the casing 124 is a turbulent flow condition with high voltage at this time, the refrigerant A is cooled with the cooling water B which touches the cooling channel 122 violently and flows into it through the inside of the cooling channel 122. In this way, it is made to feed to the ****** side, cooling the refrigerant A in the portion of the centrifugal pump 123.
[0012]
[Patent document 1] JP,HS-264139,A[Patent document 2] JP,H8-32263,A[Patent document 3] JP,H7-142886,A[Patent document 4] JP,H2-147900,U[0013]
[Problem to be solved by the invention]However, in the 1st conventional cooling system, Although the pump 105 and graphic display which circulate the radiator 104 for removing heat from the condensator 103 which performs heat exchange with the heat releasing electronic part 101 and a refrigerant, and cools the heat releasing electronic part 101, and a refrigerant, and a refrigerant are not carried out, must fill up a refrigerant and the tank for a supplement is required, There was a problem that equipment is large-sized and complicated, a miniaturization is difficult in order to combine these, and cost also became high. Namely, originally the 1st conventional cooling system fits cooling of a large-sized electronic device, and it cannot be equivalent to the latest highly efficient carrying type notebook sized

personal computer used with various attitudes being carried with small size, a light weight, and a thin shape.

[0014]Although the 2nd conventional cooling system can be used for a notebook sized personal computer etc., the heat-receiving header 113 of the flat shape attached to the semiconductor heater element 110, the heat dissipation header 114 contacted in the wall of the metal housing 116, and any -- although -- the shape of a box -- thick -- not becoming -- it does not obtain but thinning of a notebook sized personal computer etc. is barred. That is, in the 2nd conventional cooling system, the reciprocating pump which becomes comparatively smaller as a liquid drive than other pumps in lateral width is provided in the heat dissipation header 114, and regrettably, this reciprocating pump specifies the thickness of the heat dissipation header 114, and thickens the whole. Now, thinning of a notebook sized personal computer cannot be performed.

[0015]However, it is difficult to accommodate the reciprocating pump of the 2nd cooling system into the heat-receiving header 113 with a thin notebook sized personal computer. That is, it is because thickness, such as the semiconductor heater element 110, will also be added besides the thickness of a pump, the height of a notebook sized personal computer will be made to increase and it will move against thinning. Moreover, vibration of a reciprocating pump and noise may affect the semiconductor heater element 110 which places this, and may become jarring, and realization is difficult also from these surfaces.

[0016]In the 2nd cooling system, the heat dissipation header 114 contacted in the wall of the metal housing 116 has small heat dissipation area, its efficiency of heat transfer is bad, and a limit exists in cooling power. In order to raise cooling power, increasing heat dissipation area was also considered, but if area was increased more, the flow path became long and there was inconsistency that a circulating load caused increase and the increase in an output of the built-in reciprocating pump, and increased the thickness of the heat dissipation header 114 by this. Then, if a means to store a reciprocating pump in the metal housing 116 independently is provided, new space will have to be spared for the notebook type personal computer body which decreased space useless to a limit, it will assemble, and work will also become troublesome. Thus, the 2nd cooling system has a limit to the miniaturization of a notebook sized personal computer etc., and thinning. And when the capability of CPU improves like these days and increasingly big refrigeration capacity is required, in the 2nd conventional cooling system that had such a problem, a question remains with possibilities.

[0017]Since the conventional pump with a heat exchange function is cooling the refrigerant by another cooling water, Since the second heat exchanger which takes heat from the second pump which a cooling channel is required in a pump, it enlarges, and pump structure becomes complicated, and is made to circulate through cooling water, or cooling water is required, Bad [a system is complicated, and a miniaturization is difficult and / the number of parts or workability] therefore, the good thing could not expect thermal efficiency, either but it had the problem that it was high-cost.

[0018]Then, improving cooling efficiency, it can miniaturize and the present invention can be thinned, and structure is easy and aims at providing the cooling system of low cost.

[0019]The present invention can be miniaturized and thinned, and structure is easy and aims at providing the electronic device of low cost.

[0020]

[Means for solving problem]In order to solve this problem the cooling system of the present invention, A contact-heat-exchange type pump is contacted by the heat releasing electronic part, and takes heat

from this heat releasing electronic part by the heat exchange actions of an internal refrigerant, While being a cooling system which performs heat dissipation from a radiator and forming the pump case of a contact-heat-exchange type pump with the material of high heat conductivity, to a pump case, A heat-receiving surface is formed in the side surface along an internal pump room, and this heat-receiving surface is formed in the three-dimensional form of the upper surface of a heat releasing electronic part, and complementary form in the contact position.

[0021]It can miniaturize and thin by this, improving cooling efficiency, and structure is easy and can realize the cooling system of low cost.

[0022]The first housing in which the electronic device of the present invention stored the electronic circuit and memory storage containing a central processing unit, and the keyboard was provided by the upper surface, It has the second housing provided with the display device, and the second housing is attached to the first housing pivotable, and in order to cool the heat releasing electronic part containing a central processing unit, the above-mentioned cooling system is provided.

[0023]Thereby, it can miniaturize and thin, and structure is easy and the electronic device of low cost can be provided.

[0024]

[Mode for carrying out the invention]A contact-heat-exchange type pump connects with piping and the radiator which constitute the closed circuit which circulates through a refrigerant, and the invention of the present invention according to claim 1 is provided, The aforementioned contact-heat-exchange type pump is contacted by the heat releasing electronic part, and takes heat from this heat releasing electronic part by the heat exchange actions of an internal refrigerant, And while being a cooling system which circulates a refrigerant and performs heat dissipation from the aforementioned radiator and forming the pump case of the aforementioned contact-heat-exchange type pump with the material of high heat conductivity, A heat-receiving surface is formed in the side surface which was along the internal pump room at the aforementioned pump case, Since this heat-receiving surface is the cooling system currently forming in the three-dimensional form of the upper surface of the aforementioned heat releasing electronic part, and complementary form in a contact position, a contact-heat-exchange type pump can serve as a condensator, and the miniaturization of a cooling system and low cost-ization are attained.

[0025]Since the invention of the present invention according to claim 2 is the cooling system according to claim 1, wherein auxiliary heat conduction members are provided by the heat-receiving surface, it can promote heat transfer by passing the auxiliary heat conduction members of the material of thermal conductivity higher than a pump case.

[0026]In the invention of the present invention according to claim 3, in a contact position, the upper surface form and the lower surface of a heating member agree [auxiliary heat conduction members], Since it is the cooling system according to claim 2 being the plate in which the form and the upper surface of the heat-receiving surface agreed, heat transfer can be promoted by passing the auxiliary heat conduction members of the plate of thermal conductivity higher than a pump case.

[0027]Since auxiliary heat conduction members are the cooling systems according to claim 2 being the heat pipe provided by the side surface along the pump room of the pump case, the invention of the present invention according to claim 4 can promote heat transfer with a heat pipe.

[0028]A heat-receiving surface is formed in the side surface which its thickness of the impeller was thin

since the invention of the present invention according to claim 5 was the cooling system according to claim 1 to 4, wherein a contact-heat-exchange type pump is a peripheral pump, and met the pump flow, Turbulent flow heat exchange of the heat transfer heat [the method of outside] centering on a heat releasing electronic part is carried out by the flow of an impeller periphery, and it can cool effectively, and the miniaturization of a cooling system and low cost-ization are attained, improving cooling efficiency.

[0029]The ring shape impeller for which the many grooved blade was formed in the periphery for the contact-heat-exchange type pump as for the invention of the present invention according to claim 6, and the rotor magnet was provided by inner circumference, While the cylindrical part arranged between the motor stator provided at the inner circumference side of a rotor magnet, this motor stator, and a rotor magnet is formed, It has a pump case which accommodates an impeller in an inside and has a suction opening and a discharge port, Since the cylindrical part is the cooling system according to claim 5 being the peripheral pump which supported the ring shape impeller pivotally rotatably, The motor portion of a contact-heat-exchange type pump cannot build a projection part to a heat-receiving surface, and it can be considered as an ultra thin pump, and since turbulent flow heat exchange of the heat by which heat transfer is carried out is violently carried out to a refrigerant on an impeller periphery, the further thinning of a cooling system and low cost-ization are attained, improving cooling efficiency.

[0030]Since the invention of the present invention according to claim 7 is the cooling system according to any one of claims 1 to 6, wherein a heat-receiving surface is a plane, it can equip a flat upper surface substrate with a heat-receiving surface.

[0031]Since it is the cooling system according to any one of claims 6 to 7, wherein the invention of the present invention according to claim 8 carries out the mold of the motor stator provided inside the cylindrical part by mold material with high thermal conductivity, While promoting heat transfer by carrying out a mold by mold material, a motor stator can be waterproofed completely.

[0032]Since the invention of the present invention according to claim 9 is the cooling system according to any one of claims 6 to 8 making surface roughness in a pump room into a split face, it can promote heat transfer by carrying out turbulent flow heat exchange.

[0033]The invention of the present invention according to claim 10 to a cylindrical part, Since it is the cooling system according to any one of claims 6 to 9, wherein a radial dynamic pressure generating means is provided by the opposite side surface to the direction and axial center of radial thrust which act on a ring shape impeller, a ring shape impeller can rotate smoothly. [0034]It comes out of the invention of the present invention according to claim 11 that miniaturize and a contact-heat-exchange type pump thins while it improves cooling efficiency, Since the thickness is the cooling system according to any one of claims 1 to 10, wherein 3-15 mm and a radial representation dimension are 10-70 mm.

[0035]The first housing in which the invention of the present invention according to claim 12 stored the electronic circuit and memory storage containing a central processing unit, and the keyboard was provided by the upper surface, It has the second housing provided with the display device which can display the processing result by a central processing unit, The second housing is the electronic device

attached to the first housing pivotable, Since it is an electronic device, wherein the cooling system according to claim 1 to 11 is provided in order to cool the heat releasing electronic part containing a central processing unit, The miniaturization of an electronic equipment body is still attained by making the electronic device which has the first housing that mounted the keyboard, and the second housing that has a display device cool.

[0036]A contact-heat-exchange type pump contacts a heat-receiving surface on the central processing unit upper surface, and the invention of the present invention according to claim 13 is installed, Since it is the electronic device according to claim 12 characterized by what the radiator was arranged for by the display-device back surface in the second housing, the miniaturization of an electronic equipment body is still attained by arranging a contact-heat-exchange type pump in the first housing, and arranging a radiator in the second housing.

[0037]Hereafter, it describes about an embodiment of the invention using Fig.9 from Fig.1.The description which gives the same code to the same component in these Drawings, and overlapped is omitted.

[0038](Embodiment 1) The electronic device provided with the cooling system and it in embodiment 1 connects a radiator with a contact-heat-exchange type pump for flexible piping which permits rotation of the second housing and the first housing. An electronic device is apparatus which a notebook sized personal computer etc. can fold up. The entire configuration figure of the electronic device incorporating a cooling system [in / in Fig.1 / the embodiment 1 of the present invention], The cross sectional view of a contact-heat-exchange type pump [in / in Fig.2 / the embodiment 1 of the present invention], the exploded perspective view of a contact-heat-exchange type pump [in / in Fig.3 / the embodiment 1 of the present invention], and Fig.4 are the essential part cross sectional views showing the flow of the refrigerant in the contact-heat-exchange type pump in the embodiment 1 of the present invention.

[0039]The keyboard with which 1 was provided by the first housing, such as a notebook sized personal computer, and 2 was provided by the upper surface of the first housing 1 in Fig.1, Heat releasing electronic parts, such as CPU by which 3 was stored in the first housing 1, the substrate in which 4 mounted the heat releasing electronic part 3, The second housing in which 5 becomes a lid of the first housing 1, a display device which displays the arithmetic processing result by CPU by which 6 was provided at the inner surface side of the second housing 5, The contact-heat-exchange type pump made to circulate through the refrigerant X while sticking 7 to the heat releasing electronic part 3, and the heat releasing electronic part 3 and the refrigerant X performing heat exchange and cooling the heat releasing electronic part 3, A reserve tank for the radiator which 8 is arranged by the back surface of the display device 6, and removes heat from the refrigerant X, the refrigerant passage where 8a moved in a zigzag direction repeatedly, and 8b to fill up the refrigerant X, and 9 are piping which connects these. As the refrigerant X, the harmless propylene glycol aqueous solution used for a food additive etc. is suitable, and when using aluminum, copper, etc. as casing materials so that it may mention later further, it is desirable to add the corrosion prevention additive agent for improving the anti-corrosiveness to these.

[0040]Since the radiator 8 needs to remove heat from the refrigerant X in wide space where the width of the back surface of the display device 6 is narrow, thermal conductivity comprises thin plate materials, such as a good high material of heat dissipation nature, for example, copper, and aluminum,

and as shown in Fig.1, the refrigerant passage 8a and the reserve tank 8b are formed in the inside. A fan may be provided, in order to apply and cool air forcibly to the radiator 8 and to increase a chilling effect. The piping 9 comprises rubber tubes, such as the rubber which is flexible and has little gas permeation nature, for example, isobutylene isoprene rubber etc., in order to secure the flexibility of a piping layout. This is to prevent air bubbles from mixing in a tube.

[0041]Then, the composition of the contact-heat-exchange type pump 7 is described. The contact-heat-exchange type pump 7 of this embodiment 1 uses the peripheral pump (called the WESCO type pump, a regenerative pump, and a friction pump). In Fig.2 and 3, the grooved blade of the ring shape impeller 11 by which 11 was formed in the ring shape impeller of a peripheral pump, and much 12 was formed in the periphery, and 13 are the rotor magnets provided by the inner circumference of the ring shape impeller 11. The motor stator by which 14 was provided at the inner circumference side of the rotor magnet 13, The pump case which the ring shape impeller 11 carries out the pressure recovery of the kinetic energy given to the fluid, and is led to a discharge port at the same time 15 accommodates the ring shape impeller 11, The pump room for the heat-receiving surface which 15a contacts the heat releasing electronic part 3, and takes heat, and 15b carrying out the pressure recovery of the kinetic energy given by the blade 12, and leading to a discharge port, After 16 making a part of pump case 15 and storing the ring shape impeller 11, the casing cover for sealing the pump room 15b and 17 are the cylindrical parts for the pump case 15 providing and supporting the ring shape impeller 11 pivotally rotatably. The thickness of a shaft direction is 5-10 mm, and the radial representation dimension of the contact-heat-exchange type pump 7 of this embodiment 1 is a pump whose 40-50 mm and rotational speed are 1200 rpm and whose part for 0.08 - 0.12L/and head flow rate is about 0.35-0.45m. And 3-15 mm in thickness, the radial representation dimension of 10-70 mm, and the flow rate of the specifications of the pump of the present invention are a part for 0.01 - 0.5L/, and about head 0.1-2m including the value of this embodiment 1. When this is said with a specific rate, it is a pump of 24 to 28 (unit: a part for m and m^3/, rpm) degree, and the conventional pump is a small thin pump of the completely isolated size.

[0042]And the heat exchange function was not conventionally made into the object of examination as what has efficiency of heat transfer bad [the pump which contacts a side surface and carries out heat exchange]. It was thought that utilization of the pump which has a flat heat-receiving surface with a thin shape triggered by the difficulty of constituting a side surface from a pump for a flat was impossible. However, the inventors are adding improvement explained in full detail below paying attention to a peripheral pump, The knowledge that a heat exchange function will become sufficient and will become realizable when the point of a flat heat-receiving surface also unites a part of driving part with an impeller and arranges the whole to plate-like if turbulent flow heat exchange of the heat by which heat transfer is carried out from the heat releasing electronic part 3 is carried out on a peripheral pump periphery is reached. When the heat transfer amount to the area of the heat-receiving surface over flow rate and flow rate is furthermore considered at this time, it is because this small thin pump can have sufficient value for cooling unlike the pump of the usual size.

[0043]That is, the flow in the pump case 15 of the contact-heat-exchange type pump 7 is a flow of the spiral shape peculiar to a vortex type by stirring of the blade 12, and flows along the pump room 15b of ring shape macroscopically. In order to take the heat by which heat transfer is carried out from a heat source by the peripheral part of the ring shape impeller 11 to the method of outside by this flow,

carrying out a counterflow to the heat transfer direction partially like Fig.4 microscopically, even if it does not independently provide a condensator, it becomes possible to make it function as a heat exchanger. However, since cooling power is reinforced, it is possible to put an auxiliary condensator side by side. Since it unites with the ring shape impeller 11, and the rotor magnet 13 serves as ring shape and is supported pivotally with the cylindrical part 17, inertial mass of the ring shape impeller 11 can be made small, the calorific value of a driving part can be stopped by this, and the weight saving of the contact-heat-exchange type pump 7 can be carried out with small size and a thin shape. And in order to urge heat transfer, the pump case 15 and the casing cover 16 need to choose materials, such as copper with high thermal conductivity, and aluminum. And although it is appropriate to use a metallic material with sufficient thermal conductivity, such as copper and aluminum, fundamentally, in a place with little influence on heat conduction, using resin with high thermal conductivity, etc. does not interfere, either. When aluminum is chosen as a material of the pump case 15 for weight reduction etc., it is good to attach to the lower surface of the pump case 15 the copper plate whose thermal conductivity is still higher than aluminum. If a heat pipe is attached to the lower surface (heat-receiving surface side 15a) of the pump case 15 or it embeds in the part, the heat which received heat can be more efficiently transmited even to the peripheral part of the ring shape impeller 11 of the pump case 15. This copper plate and a heat pipe are auxiliary heat conduction members of the present invention. It is also good to build auxiliary heat conduction members with it not only attaching a plate material, but melting a cylindrical copper material by friction welding, and cutting a garbage. It is preferable for the pump case 15 and the casing cover 16 to give unevenness of fin shape to an outer surface, and to also make heat exchange with the open air perform positively.

[0044]This contact-heat-exchange type pump 7 becomes possible [making completely the heat-receiving surface 15a of the pump case 15 into a flat]. Namely, by making the side surface of the pump case 15 correspond between a pump room 15b side surface and motor stator 14 side surface, and accommodating the motor stator 14 in the dent in the cylindrical part 17, The heat-receiving surface 15a of the contact-heat-exchange type pump 7 can be flattened, and the heat releasing electronic part 3 (the upper part is usually constituted by the flat) can be made to contact exactly. If thickness is changed, form can be made to be able to agree and it can be made to contact without a gap, when the upper form of the heat releasing electronic part 3 has unevenness. It is good to fix without interposing bonding resin and rubber of high heat conductivity like an above-mentioned copper plate, and lowering efficiency of heat transfer as much as possible between the heat-receiving surface 15a and the upper form of the heat releasing electronic part 3. Making the upper form of the heat releasing electronic part 3 agreeing here is giving the three-dimensional form of the upper surface of the heat releasing electronic part 3, and complementary form to the heat-receiving surface 15a, and it is that the curved surface has agreed in the state which can be placed on the heat releasing electronic part 3. And it is although there are many differences in the size of the heat releasing electronic parts 3, such as CPU, form and the size of the heat-receiving surface 15a, and form (the contact-heat-exchange type pump 7 of the present invention is dramatically small, and). Usually, the direction of the heat releasing electronic part 3 has a large size, and form is also usually a quadrangle to the ability of the contact-heat-exchange type pump 7 of the present invention to adopt various form. It means that the curved surface has agreed at least in the fitting location (contact position). in order to perform heat transfer effectively, it is necessary to make it not form the layer of air between the heat-receiving surface 15a and the heat

releasing electronic part 3, and the following is never a preferable thing, but a case so that a small dent may be formed in one side for example, is included.

[0045]And in the case of the embodiment 1 of the present invention, the motor stator 14 accommodates and carries out heat transfer to the dent portion of the center formed of the cylindrical part 17 of the pump case 15, and the another side side is opened wide by the atmosphere and radiates heat in the open air. Therefore, the heat generated from a driving part is small from the first, and also in order to radiate heat also in the open air, it enables the contact-heat-exchange type pump 7 to cool the heat releasing electronic part 3 chiefly. However, it is better for that it is placed to avoid the heat releasing electronic parts 3, such as CPU, to the motor stator 14 neighborhood generating heat for cooling of the heat releasing electronic part 3. That is, although based also on the size of the heat releasing electronic part 3, and the size of the heat-receiving surface 15a, a difference comes out in rate of heat transfer by where arrangement of the heat releasing electronic part 3 is carried out. Since there is generation of heat of a motor, in the direction of the portion near the suction opening 19 and the discharge port 20, heat-receiving efficiency becomes high also in the side surface which sandwiched the wall of the inside of the heat-receiving surface 15a, or the pump room 15b, its neighborhood, or the heat-receiving surface 15a. It is most effective for heat dissipation to arrange the center of the heat releasing electronic part 3 also in the heat-receiving surface 15a especially to the region surrounded in the suction opening 19, the discharge port 20, and the pump room 15b.

[0046]If the mold of the dent portion in which the motor stator 14 was accommodated is carried out with high silicon resin, urethane resin, etc. of thermal conductivity, even if there is generation of heat by the motor stator 14, heat transfer happens to the pump room 15b through this mold part, and it is **. The heat of the heat releasing electronic part 3 which received heat from the heat-receiving surface 15a can be transmited to the refrigerant X in the pump room 15b from this mold part. Thereby, rate of heat transfer can be gathered further. Since the winding part along which not only promotion of the heat dissipation from the heat releasing electronic part 3 but the electrical and electric equipment passes is completely waterproofed when the mold of the motor stator 14 which contains winding in this way is carried out by mold material, the measures against water leakage of the motor stator 14 can be taken a thoroughgoing thing.

[0047]The contact-heat-exchange type pump 7 of this embodiment 1 can suppress the thrust of the axial direction generated hydrodynamically and a radial direction, in order to continue smooth operation for a long time, and it can be made to rotate it by non-contact. As for 18, in Fig.2 and Fig.3, a suction opening and 20 are discharge ports a thrust plate and 19.The thrust dynamic pressure generating groove which has the spiral shape groove pattern in which 22 was formed in the both side surfaces of the ring shape impeller 11, and 23 are radial dynamic pressure generating grooves which were similarly formed in the inner peripheral surface of the ring shape impeller 11 and which pass and have a ring bone-like groove pattern.

[0048]Since the pressure of the discharge port 20 neighborhood is larger than the pressure of the suction opening 19 neighborhood in a peripheral pump, the balance of radial thrust will collapse. Then, the spiral shape groove pattern of the thrust dynamic pressure generating groove 22 is made into the form which makes the pump action which extrudes a fluid to the inner circumference side of the slot concerned with rotation of the ring shape impeller 11, forms liquid membrane in the both side surfaces of the ring shape impeller 11, and supports the thrust of the axial direction with dynamic pressure. The

ring bone-like groove pattern is made into the form which makes the pump action which extrudes a fluid to the axial direction central site of the slot concerned with rotation of the ring shape impeller 11 to that of the radial dynamic pressure generating groove 23, this forms liquid membrane, and the thrust of the radial direction concerning the ring shape impeller 11 is supported with dynamic pressure. The thrust dynamic pressure generating groove 22 is not the ring shape impeller 11 side, may be formed in the thrust plate 18 side of the pump case 15 or the casing cover 16, and may form the radial dynamic pressure generating groove 23 in the cylindrical part 17 side of the pump case 15.

[0049]Fig.5 (a) is a generation table figure of the thrust of the radial direction concerning the ring shape impeller in the embodiment 1 of the present invention, and an explanatory view of the thrust of the radial direction which requires Fig.5 (b) for the ring shape impeller in the embodiment 1 of the present invention. Since the pressure of the discharge port 20 neighborhood is larger than the pressure of the suction opening 19 neighborhood in a peripheral pump as shown in Fig.5 (b), radial thrust acts in the direction of theta used as the opposite side of the discharge port 20. Therefore, form the radial dynamic pressure generating groove 23 only in A portion (thick line portion of the cylindrical part 17 of the pump case 15) of the about 20-discharge port cylindrical part 17, or. If the operation which dynamic pressure makes the channel depth of A portion the depth which becomes high, and a fluid extrudes is made to strengthen even when it forms in the whole circumference, radial thrust can be prevented from contacting the ring shape impeller 11 to the cylindrical part 17, and a pump can be operated stably. As the data of Fig.5 (a) shows, A portion can determine the range of the A section by the region to be used, in order that the direction of the power of acting on the ring shape impeller 11 with the size of the pressure differential of the discharge port 20 and the suction opening 19 may change.

[0050]Thus, according to the contact-heat-exchange type pump 7, the driving part of a peripheral pump is separated into the rotor magnet 13 and the motor stator 14, the rotor magnet 13 is united with the ring shape impeller 11, and an entire configuration can be arranged [1st] to plate-like with the motor stator 14. The formation of the big heat-receiving surface 15a on a pump side surface is attained in a flat by this. Since turbulent flow heat exchange of the heat by which heat transfer is carried out [2nd] from the heat releasing electronic part 3 is carried out on a pump periphery, being transmitted and carrying out the counterflow of the heat-receiving surface 15a to the heat transfer direction partially by a spiral flow, the contact-heat-exchange type pump 7 functions sufficiently as a condensator. The water seal of the ring shape impeller 11 can be completely carried out by providing the cylindrical part 17, load can be made into the minimum by making it rise to surface by non-contact within the pump case 15, generation of heat from a driving part can be suppressed, and a cooling function can be improved [3rd]. The conventional condensator not only becomes unnecessary, but this contact-heat-exchange type pump 7 becomes unnecessary [the work which is assembling the condensator] the 4th in order to serve as a condensator to the 4th. In addition, when equipping the heat releasing electronic part 3 with this contact-heat-exchange type pump 7 very thing, neither a separately troublesome assembly nor a special structure is required, and it is sufficient as it to contact the heat-receiving surface 15a and to just merely fix it, and it is very effective also in respect of an assembly of a cooling system or cost.

[0051]Next, it describes about operation of the cooling system in the embodiment 1 of the present invention, and the electronic device provided with it. If electric power is supplied from an external power, the current controlled by the semiconductor switching circuit provided by the contact-heat-exchange type pump 7 will flow into the coil of the motor stator 14, and a revolving magnetic field will

occur. If this revolving magnetic field acts on the rotor magnet 13, physical force will occur to the rotor magnet 13. The rotor magnet 13 is united with the ring shape impeller 11 at this time, since the ring shape impeller 11 is rotatably supported pivotally by the cylindrical part 17 of the pump case 15, a rotational torque acts on the ring shape impeller 11, and the ring shape impeller 11 begins rotation by this rotational torque. Kinetic energy is given to the fluid which flowed from the suction opening 19 by rotation of the ring shape impeller 11, the pressure of the fluid in the pump case 15 is gradually raised by the kinetic energy, and the blade 12 provided by the periphery of the ring shape impeller 11 is breathed out from the discharge port 20.

[0052]Here, by the pump action of the thrust dynamic pressure generating groove 22 accompanying rotation of the ring shape impeller 11, a fluid is extruded to the inner circumference side of the thrust dynamic pressure generating groove 22, and thrust dynamic pressure occurs between the both side surfaces of the ring shape impeller 11, and the thrust plate 18. For this reason, the ring shape impeller 11 rotates smoothly, without contacting the thrust plate 18 by liquid membrane. By the pump action of the radial dynamic pressure generating groove 23 accompanying rotation of the ring shape impeller 11, a fluid is extruded to the axial direction central site of the radial dynamic pressure generating groove 23, and radial dynamic pressure occurs between the inner peripheral surface of the ring shape impeller 11, and the cylindrical part 17. For this reason, the ring shape impeller 11 surfaces without contacting the cylindrical part 17, and rotates smoothly. The ring shape impeller 11 has small moment of inertia, and a response becomes very good. This becomes very lightweight [the weight of the pump itself].

[0053]The contact-heat-exchange type pump 7 absorbs the refrigerant X smoothly in this state. The absorbed refrigerant X is stirred by the ring shape impeller 11 in space surrounded by the pump case 15 and the casing cover 16, as shown in Fig.4, it forms the flow in the pump room 15b peculiar to a peripheral pump, and it is discharged, voltage-increasing. At this time, the refrigerant X performs turbulent flow heat exchange violently with the pump case 15 and the casing cover 16 which became an elevated temperature with the heat transfer from the heat releasing electronic part 3. This turbulent flow heat exchange can be promoted by making coarse surface roughness of a pump room 15b internal surface by shot blasting, a shot peening process, etc. This is considered with since the turbulent flow became intense and heat transfer became largely while a heat transfer area becomes largely, when surface roughness becomes coarse. Since the transmission area from the pump case 15 to the refrigerant X will increase while making smooth the flow in the pump room 15b if similarly the fin 15C projected towards the ring shape impeller 11 from a pump room 15b internal surface is provided as shown in Fig.6, heat exchanging quantity can be made to increase. Fig.6 is an essential part cross sectional view showing the flow of the refrigerant in the contact-heat-exchange type pump which provided the fin in the embodiment 1 of the present invention.

[0054]Thus, it is sent to the radiator 8 through the piping 9, and is cooled with the radiator 8, after carrying out the temperature reduction of the refrigerant X which took the heat of the heat releasing electronic part 3 by turbulent flow heat exchange, and carried out the temperature rise, it returns to the contact-heat-exchange type pump 7 through the piping 9 again, and it repeats this.

[0055]The heat emitted from the radiator 8 is discharged in the outside of the second housing 5, since the temperature of first housing 1 inside is kept constant, the skin temperature of the first housing 1 with many opportunities for a user to touch rises, and it does not give a user displeasure. Thus, the contact-heat-exchange type pump 7 can circulate the refrigerant X, can take heat from the heat

releasing electronic part 3, and can maintain the heat releasing electronic part 3 at the permissive temperature.

[0056]The cooling system of the embodiment 1 of the present invention and the electronic device provided with this are serving both as a pump and a condensator with the contact-heat-exchange type pump 7, and piping which does not need to install a pump and a condensator independently and connects a condensator with a pump also becomes unnecessary, and can realize miniaturization of a cooling system, and low cost-ization. It becomes unnecessary [the assembling work of a condensator]. In addition, when equipping the heat releasing electronic part 3 with this contact-heat-exchange type pump 7 very thing, it is sufficient for neither a troublesome assembly nor a special structure to be needed separately, to merely place simply, and just to make it contact, and it is very useful also in respect of an assembly of a cooling system or cost.

[0057]By what is considered as the peripheral pump of the ultra thin type which unifies the blade 12, the rotor magnet 13, and the axis of rotation for the pump of the contact-heat-exchange type pump 7, forms the ring shape impeller 11, and inserts the motor stator 14 into it, Since turbulent flow heat exchange of the refrigerant is violently carried out inside a pump, the further thinning of a cooling system and low cost-ization are attained improving the cooling efficiency in a condensator.

[0058]A lot of gas can be prevented from the refrigerant X in a cooling system evaporating outside over a long period of time, and mixing in a cooling system by using piping 9 as a rubber tube with little gas permeation nature, securing the flexibility of a piping layout. The miniaturization of main parts, such as a notebook sized personal computer, is still attained by arranging the contact-heat-exchange type pump 7 in the first housing 1, and arranging the radiator 8 in the second housing 5.

[0059](Embodiment 2) The electronic device provided with the cooling system and it in the embodiment 2 of the present invention connects a radiator with a contact-heat-exchange type pump by the member rotates which permits rotation of piping, the second housing, and the first housing. An electronic device is apparatus which a notebook sized personal computer etc. can fold up. And as compared with embodiment 1, there is no difference in the composition of a contact-heat-exchange type pump. a member rotates [in / in the cross sectional view of a member rotates / in / in the entire configuration figure of the electronic device incorporating a cooling system / in / in Fig.7 / the embodiment 2 of the present invention /, and Fig.8 / the embodiment 2 of the present invention /, and Fig.9 / the embodiment 2 of the present invention] -- one-touch -- it is a cross sectional view at the time of uniting with a removable connector.

[0060]In Fig.7 -- 1 -- the first housing and 2 -- a keyboard and 3 -- a heat releasing electronic part and 4 -- a substrate and 5 -- the second housing and 6 -- as for a refrigerant passage and 8b, a contact-heat-exchange type pump and 8 are [a radiator and 8a / piping by the side of the contact-heat-exchange type pump 7 and 9b of a reserve tank and 9a] piping by the side of the radiator 8 a display device and 7. 30 is provided in the connection part of the first housing 1 and the second housing 5, is a member rotates which has a rotatable structure with rotation of the second housing 5, and is connected to the piping 9a by the side of the contact-heat-exchange type pump 7, and the piping 9b by the side of the radiator 8.

[0061]Next, this member rotates 30 is described. In Fig.8, the outer cylinder in the air which one end is connected with piping 31 and connected with the inner cylinder 32 of the after-mentioned [the other end], the inner cylinder in the air which 31a falls out, and is inserted and connected to the outer cylinder 31 notching for prevention and 32, and 32b are projections which fall out and are inserted in

the notching 31a for prevention. Hollow sections serve as a passage of the refrigerant X. They are the slot where 32a was provided by the periphery of the inner cylinder 32, and an O-ring-shape elastic member which 33 is provided between the outer cylinder 31 and the inner cylinder 32, and is inserted in the slot 32a. It prevents the O-ring-shape elastic member 33 supporting the outer cylinder 31 and the inner cylinder 32 rotatable, carrying out the seal of between each passage of the outer cylinder 31 and the inner cylinder 32, and outside, and the refrigerant X in a passage leaking outside. A lot of gas is prevented from the refrigerant X in a cooling system evaporating outside over a long period of time, and mixing in a cooling system by furthermore arranging the O-ring-shape elastic member 33 to two rows. It cuts to the projection 32b and outer cylinder 31 side, and 31a is provided at the inner cylinder 32 side in order to prevent the outer cylinder 31 and the inner cylinder 32 falling out.

[0062]In Fig.9, the valve by which 31b was provided in the outer cylinder 31 of the member rotates 30, the spring with which 31c energizes the valve 31b, the valve by which 32c was provided in the inner cylinder 32, and 32 d are springs which energize the valve 32c. The valve 31b and the valve 32c seal the passage of each inside with outside, where the outer cylinder 31 and the inner cylinder 32 are separated and removed, and each passage is connected when the outer cylinder 31 and the inner cylinder 32 are connected.

[0063]Since the composition and operation of the contact-heat-exchange type pump 7 are the same as the embodiment 1 of the present invention, a description is omitted here.

[0064]Next, it describes about operation of the cooling system in the embodiment 2 of the present invention, and the electronic device provided with it. The refrigerant X absorbed by the contact-heat-exchange type pump 7, Turbulent flow heat exchange is violently performed with the pump case 15 and the casing cover 16 which were stirred by the ring shape impeller 11 within the contact-heat-exchange type pump 7, and became an elevated temperature with the heat transfer from the heat releasing electronic part 3, As a result, temperature rise is carried out, it is sent to the radiator 8 through the flow path in the piping 9 and the member rotates 30, a temperature reduction is cooled and carried out with the radiator 8, it returns to the contact-heat-exchange type pump 7 through the flow path in the piping 9 and the member rotates 30, and this is repeated. Thus, the refrigerant X is circulated, the heat releasing electronic part 3 is cooled, and the heat releasing electronic part 3 is maintained at the permissive temperature.

[0065]When a user opens and closes the second housing 5 in electronic devices, such as a notebook sized personal computer, the second housing 5 rotates to the circumference of the hinge of the first housing 1, but. Since the outer cylinder 31 and the inner cylinder 32 of the member rotates 30 rotate to each with the rotation, The second housing 5 can be rotated smoothly, and since it is connected by the member rotates 30, the piping 9a by the side of the contact-heat-exchange type pump 7 in the first housing 1 and the piping 9b by the side of the radiator 8 in the second housing 5 do not deform, and it can prevent barring the flow of an internal refrigerant.

[0066]It becomes possible, when a member rotates is united with a connector, as shown in Fig.9 to assemble independently the contact-heat-exchange type pump and radiator side, Since the first housing 1 and the second housing 5 are connectable after incorporating each in the first housing 1 and the second housing 5 and carrying out the sub assembly of the first housing 1 and the second housing 5, a manufacturing cost can be reduced.

[0067]As described above, according to the embodiment 2 of the present invention, it can prevent being

able to rotate the second housing 5 smoothly, and piping deforming, and barring the flow of an internal refrigerant by providing the member rotates 30 for piping between the first housing 1 and the second housing. By providing the connector in which the one-touch connection with piping which connects the contact-heat-exchange type pump 7 and the radiator 8 is possible, it becomes possible to assemble independently the contact-heat-exchange type pump 7 and radiator 8 side, and a manufacturing cost can be reduced. The miniaturization of main parts, such as further notebook sized personal computer, and low cost-ization are attained by unifying the member rotates 30 and a connector.

[0068]

[Effect of the invention]As mentioned above, according to the cooling system of the present invention, piping which does not need to install a pump and a condensator independently and connects a condensator with a pump because a contact-heat-exchange type pump serves as a condensator also becomes unnecessary, and the miniaturization of a cooling system and low cost-ization of it are attained. It becomes easy [an assembly].

[0069]Since the contact-heat-exchange type pump is a peripheral pump, a heat-receiving surface is formed in the side surface which the thickness of the impeller was thin and met the pump flow, Turbulent flow heat exchange of the heat transfer heat [the method of outside] centering on a heat releasing electronic part is carried out by the flow of an impeller periphery, and it can cool effectively, and the miniaturization of a cooling system and low cost-ization are attained, improving cooling efficiency.

[0070]The ring shape impeller by which the rotor magnet was provided for the contact-heat-exchange type pump by inner circumference, It has a motor stator and a pump case which has the cylindrical part arranged between rotor magnets, Since the cylindrical part is the peripheral pump which supported the ring shape impeller pivotally rotatably, The motor portion of a contact-heat-exchange type pump cannot build a projection part to a heat-receiving surface, and it can be considered as an ultra thin pump, and since turbulent flow heat exchange of the heat by which heat transfer is carried out is violently carried out to a refrigerant on an impeller periphery, the further thinning of a cooling system and low cost-ization are attained, improving cooling efficiency.

[0071]Since the heat-receiving surface comprises a whole side surface of the pump case, a heat-receiving surface can take largely taking advantage of a pump case to the maximum. Since a heat-receiving surface is a plane, a flat upper surface substrate can be equipped with a heat-receiving surface. While promoting heat transfer by carrying out a mold by mold material, a motor stator can be waterproofed completely.

[0072]According to the electronic device of the present invention, the second housing is attached to the first housing pivotable, Since the cooling system was provided in order to cool the heat releasing electronic part containing a central processing unit, the miniaturization of an electronic equipment body is still attained by making the electronic device which has the first housing that mounted the keyboard, and the second housing that has a display device cool.

[0073]Since the contact-heat-exchange type pump contacted the heat-receiving surface on the central processing unit upper surface, and was installed and the radiator was arranged by the display-device back surface in the second housing, the miniaturization of an electronic equipment body is still attained by arranging a contact-heat-exchange type pump in the first housing, and arranging a radiator in the second housing.

[Brief Description of the Drawings]

[Drawing 1]The entire configuration figure of the electronic device incorporating the cooling system in the embodiment 1 of the present invention

[Drawing 2]The cross sectional view of the contact-heat-exchange type pump in the embodiment 1 of the present invention

[Drawing 3]The exploded perspective view of the contact-heat-exchange type pump in the embodiment 1 of the present invention

[Drawing 4]The essential part cross sectional view showing the flow of the refrigerant in the contact-heat-exchange type pump in the embodiment 1 of the present invention

[Drawing 5](a) The generation table figure of the thrust of the radial direction concerning the ring shape impeller in the embodiment 1 of the present invention

(b) The explanatory view of the thrust of the radial direction concerning the ring shape impeller in the embodiment 1 of the present invention

[Drawing 6]The essential part cross sectional view showing the flow of the refrigerant in the contact-heat-exchange type pump which provided the fin in the embodiment 1 of the present invention

[Drawing 7]The entire configuration figure of the electronic device incorporating the cooling system in the embodiment 2 of the present invention

[Drawing 8]The cross sectional view of the member rotates in the embodiment 2 of the present invention

[Drawing 9]the member rotates in the embodiment 2 of the present invention -- one-touch -- the cross sectional view at the time of uniting with a removable connector

[Drawing 10]The configuration diagram of the 1st cooling system of the conventional electronic device

[Drawing 11]The configuration diagram of the 2nd cooling system of the conventional electronic device

[Drawing 12]The partial crushing perspective view of the conventional pump with a heat exchange function

[Explanations of letters or numerals]

1 The first housing

2,109 Keyboard

3,101 Heat releasing electronic part

4,102 Substrate

5 The second housing

6 Display device

7 Contact-heat-exchange type pump

8,104 Radiator

8a Refrigerant passage

8b Reserve tank

9, 9a, 9b, and 106 Piping

11 Ring shape impeller

12 Blade

13 Rotor magnet

14 Motor stator
15 Pump case
15a Heat-receiving surface
15b Pump room
16 Casing cover
17 Cylindrical part
18 Thrust plate
19 Suction opening
20 Discharge port
22 Thrust dynamic pressure generating groove
23 Radial dynamic pressure generating groove
30 Member rotates
31 Outer cylinder
31a Notching
32 Inner cylinder
32a Slot
32b Projection
33 O-ring-shape elastic member
100 Housing
103 Condensator
105 Pump
107 Fan
108 Wiring board
110 Semiconductor heater element
111 Disk unit
112 Display device
113 Heat-receiving header
114 Heat dissipation header
115 Flexible tube
116 Metal housing
120 Motor
121 Heat exchanger
122 Cooling channel
122a Discharge port
122b Suction opening
123 Centrifugal pump
124 Casing
125 Impeller

(57)[Claim(s)]

[Claim 1]A contact-heat-exchange type pump connects with piping and a radiator which constitute a closed circuit which circulates through a refrigerant, and it provides, The aforementioned contact-heat-exchange type pump is contacted by heat releasing electronic part, and takes heat from this heat releasing electronic part by heat exchange actions of an internal refrigerant, And while being a cooling system which circulates a refrigerant and performs heat dissipation from the aforementioned radiator and forming a pump case of the aforementioned contact-heat-exchange type pump with material of high heat conductivity, A cooling system which carries out that a heat-receiving surface is formed in a side surface along an internal pump room, and this heat-receiving surface is formed in three-dimensional form of the upper surface of the aforementioned heat releasing electronic part, and complementary form in a contact position to the aforementioned pump case with the characteristics.

[Claim 2]The cooling system according to claim 1, wherein auxiliary heat conduction members are provided by the aforementioned heat-receiving surface.

[Claim 3]The cooling system according to claim 2, wherein the aforementioned auxiliary heat conduction members are the plates in which upper surface form and a lower surface of the aforementioned heating member agreed in a contact position, and form and the upper surface of the aforementioned heat-receiving surface agreed.

[Claim 4]The cooling system according to claim 2, wherein the aforementioned auxiliary heat conduction members are the heat pipes provided by side surface along the aforementioned pump room of the aforementioned pump case.

[Claim 5]The cooling system according to any one of claims 1 to 4, wherein the aforementioned contact-heat-exchange type pump is a peripheral pump.

[Claim 6]The cooling system according to claim 5 being the peripheral pump characterized by comprising the following which was provided with a pump case, and with which the aforementioned cylindrical part supported the aforementioned ring shape impeller pivotally rotatably.

A ring shape impeller by which a many grooved blade was formed in a periphery for the aforementioned contact-heat-exchange type pump, and a rotor magnet was provided by inner circumference.

A motor stator provided at the inner circumference side of the aforementioned rotor magnet.

While a cylindrical part arranged between this motor stator and the aforementioned rotor magnet is formed, the aforementioned impeller is accommodated in an inside, and they are a suction opening and a discharge port.

[Claim 7]The cooling system according to any one of claims 1 to 6, wherein the aforementioned heat-receiving surface is a plane.

[Claim 8]The cooling system according to any one of claims 6 to 7 carrying out the mold of the motor stator provided inside the aforementioned cylindrical part by mold material with high thermal conductivity.

[Claim 9]The cooling system according to any one of claims 6 to 8 making surface roughness in the aforementioned pump room into a split face.

[Claim 10]The cooling system according to any one of claims 6 to 9 which carries out that a radial dynamic pressure generating means was provided by the opposite side surface to a direction and an axial center of radial thrust which act on the aforementioned ring shape impeller to the aforementioned

cylindrical part with the characteristics.
[Claim 11]The cooling system according to any one of claims 1 to 10 with which, as for the aforementioned contact-heat-exchange type pump, thickness is characterized by 3-15 mm and a radial representation dimension being 10-70 mm. [Claim 12]The first housing that stored an electronic circuit and memory storage containing a central processing unit and in which a keyboard was provided by the upper surface.
A display device which can display a processing result by the aforementioned central processing unit.
In an electronic device which was provided with the second housing provided with the above and with which said second housing was attached to said first housing pivotable,
An electronic device in order to cool a heat releasing electronic part containing the aforementioned central processing unit, wherein the cooling system according to any one of claims 1 to 11 is provided.

[Claim 13]The electronic device according to claim 12 characterized by what the aforementioned contact-heat-exchange type pump contacted a heat-receiving surface on the aforementioned central processing unit upper surface, and was installed, and the aforementioned radiator was arranged for by display-device back surface in said second housing.

Electronic Acknowledgement Receipt	
EFS ID:	20846219
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	Elizabeth A Shah/James Charlesworth
Filer Authorized By:	Elizabeth A Shah
Attorney Docket Number:	10494.0003-03000
Receipt Date:	02-DEC-2014
Filing Date:	12-APR-2013
Time Stamp:	18:30:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		IDS.pdf	204816 cb43faa03dabee95dada1e4311519cb6db9 02291	yes	4

	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Transmittal Letter		1	3	
	Information Disclosure Statement (IDS) Form (SB08)		4	4	
Warnings:					
Information:					
2	Foreign Reference	EP_0105687.pdf	1056113 20f70e0bd6e317cf8ab70453339f3f19fc2ba6c3	no	23
Warnings:					
Information:					
3	Foreign Reference	JP3452059.pdf	2394690 3daa45ba73533b0ceb7607098bcb8b8549274af8	no	31
Warnings:					
Information:					
4	Non Patent Literature	NOA_13269234_05_23_2012.pdf	569722 582817c901891f9ed80ad1bf57738ac9af157330	no	8
Warnings:					
Information:					
5	Non Patent Literature	OA_13269234_12_20_2011.pdf	479347 ad0b02e38adc4c12ee27b971e1be74ac4c22f67e	no	9
Warnings:					
Information:					
6	Non Patent Literature	OA_13269234_03_13_2012.pdf	565058 d5b4bdecfeb0a6c60b8864b8fe3ea439cbb8b926	no	11
Warnings:					
Information:					
7	Non Patent Literature	OA_11919974_03_27_2012.pdf	683386 e8421cf531c46238c88473f1f4c0c917f34a0273	no	16
Warnings:					
Information:					
8	Non Patent Literature	Order_re_Claim_Construction.pdf	1268416 8103eba8bbf8a5cd739c220ccde2734cc685ecf5	no	18
Warnings:					
Information:					

9	Non Patent Literature	Third_Party_Observation_8-15-2014_EP20080100686.pdf	480537 7ed79a6e20e1a17ee7947a95cff2ad832d14aee1	no	8
Warnings:					
Information:					
10	Non Patent Literature	Third_Party_Observation_8-18-2014_EP20080100686.pdf	453362 509cc092f692f6d7242d37a47bac34d331dbc697	no	7
Warnings:					
Information:					
			Total Files Size (in bytes):	8155447	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT
Customer No. 22,852
Attorney Docket No. 10494.0003-03000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
André Sloth ERIKSEN	)	Group Art Unit: 3744
	)	
Application No.: 13/861,593	)	
	)	Examiner: Judy J. Swann
Filed: April 12, 2013	)	
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	Confirmation No.: 3473
	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.97(b)

Pursuant to 37 C.F.R. §§ 1.56 and 1.97(b), Applicant brings to the attention of the Examiner the documents included on the attached listing. This Information Disclosure Statement is being filed before the mailing date of a first Office Action on the merits for the above-referenced application.

Copies of the listed foreign and non-patent literature documents are attached. A translation of the non-English document is provided. Copies of the U.S. patent publications are not enclosed pursuant to 37 C.F.R. § 1.98(a)(2)(ii).

The United States Court of Appeals for the Federal Circuit held in *Dayco Products, Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 66 U.S.P.Q.2d 1801 (Fed. Cir. 2003), that an "adverse decision" by another examiner may meet the materiality standard under the amended Rule 56, and thus applicants should disclose prior

rejections of "substantially similar claim[s]" to the Office. *See also* M.P.E.P. § 2001.06(b). Accordingly, although Applicant is not representing that the Office Actions in the related applications are material to the present application and Applicant is not admitting that any of the other claims are substantially similar, out of an abundance of caution, Applicant has listed the substantive Office Actions in related applications on the form submitted herewith. Copies of these materials are also provided. *See* M.P.E.P. § 609.04(a)(II) (9th ed., March 2014).

Applicant respectfully requests that the Examiner consider the listed documents and indicate that they were considered by making appropriate notations on the attached form.

This submission does not represent that a search has been made or that no better art exists and does not constitute an admission that each or all of the listed documents are material or constitute "prior art." If the Examiner applies any of the documents as prior art against any claim in the application and Applicant determines that the cited documents do not constitute "prior art" under United States law, Applicant reserves the right to present to the U.S. Patent and Trademark Office the relevant facts and law regarding the appropriate status of such documents.

Applicant further reserves the right to take appropriate action to establish the patentability of the disclosed invention over the listed documents, should one or more of the documents be applied against the claims of the present application.

Cooler Master Co., Ltd. Exhibit 1006, Page 175 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

If there is any fee due in connection with the filing of this Statement, please charge the fee to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.

Dated: December 2, 2014

By: Elizabeth Shah
Reg. No. 62,404
(617) 452-1693

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
				Art Unit	3744
				Examiner Name	Travis C. Ruby
Sheet	1	of	1	*Attorney Docket Number*	10494.0003-03000

U.S. PATENTS					
Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

U.S. PUBLISHED PATENT APPLICATIONS					
Examiner Initials*	Cite No.[3]	Document Number Number-Kind Code[4] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

Note: Submission of copies of U.S. Patents and published U.S. Patent Applications is not required.

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[5] Number[6] Kind Code[7] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[8]
	1.	CN M24451	09-21-2004	3R System Co., LTD		Yes
	2.	JP 2002-151638 A	05-24-2002	HITACHI LTD		Yes
	3.	TW M256682 U	02-01-2005	SONICEDGE INDUSTRIES CORPORATION TW		Yes

NONPATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

新型專利說明書

〔本說明書格式，順序及粗體字，請勿任意更動，※號部份請勿填寫〕

※申請案號：

※申請日期： **※IPC分類：**

一、新型名稱：

應用於電腦介面卡之水冷式散熱裝置 /THE WATER COOLER DEVICE FOR INTERFACE CARD OF COMPUTER

二、申請人：共 人

指定 為應受送達人

三、創作人：

◎專利代理人：

四、聲明事項

□主張專利法第二十二條第二項

第一款或 第二款規定之事實，其事實發生日期為：

□ 主張專利法第二十七條第一項國際優先權：

□ 主張專利法第二十九條第一項國內優先權：

□ 主張專利法第二十六條微生物：

□ 熟習該項技術者易於獲得，不須寄存

五、中文發明摘要：

本創作係有關一種應用於電腦介面卡之水冷式散熱裝置，其包括由一水冷器、一循環幫浦和散熱器所組成，經散熱器冷卻的水循環到水冷器，以冷卻晶片所產生的熱氣且由水冷器之排出部湧出，利用循環泵浦將排出部的水排出，並循環至散熱器進行熱交換；該循環泵浦，其葉輪內壁環設一磁塊，以及藉一壓板將葉輪定位於水冷器之排出部上方，又壓板上方設置至少有二極之繞組，當啟動電源，電路板切換該二繞組產生極性變化，並推斥磁塊帶動葉輪驅轉，令排出部的水被葉輪之迴轉力量排出至排水口而循環至散熱器，藉此得降低其高度，以提供介面卡上之晶片有效散熱者。

六、英文發明摘要：

七、指定代表圖：

(一)本案指定代表圖為：

(二)本代表圖之元件代表符號簡單說明：

3、、、散熱裝置
31、、、水冷器
311、、、入水口
313、、、排水口
323、、、壓板
324、、、電路板
33、、、散熱器
4、、、介面卡

八、新型說明：

[新型所屬之技術領域]

Cooler Master Co., Ltd. Exhibit 1006, Page 178 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

本創作一種應用於電腦介面卡之水冷式散熱裝置，主要係大幅降低散熱裝置之高度，以克服介面卡安裝空間的限制，以及利用磁力驅動循環泵浦產生迴轉力量，使經散熱器冷卻的水能進入冷卻器吸收晶片產生的熱氣，且由循環泵浦排送散熱器，進而冷卻介面卡上之晶片者。

[先前技術]

現行有關晶片(cpu)之散熱技術中，除了傳統式採氣冷式散熱方式外，較先進的技術乃有利用水冷的方式來提供晶片更優異的散熱效果，其中如第一圖所示，該水冷器1是設在介面卡11之晶片上方，散熱器12係為一箱體且包含風扇13、複數個金屬散熱片14和泵浦15，經散熱器12冷卻的水送至水冷器1並提供晶片散熱，且由泵浦15循環至散熱器12進行熱交換，該種型式除構件眾多、體積龐大，同時水冷器1和散熱器12及其泵浦15係採分離式，除電腦機箱內無足夠空間外，其裝設也相當繁瑣；另在同一申請人前所提呈之第92208939號專利案(如第二、三圖)中，係揭露散熱器2冷卻的水循環到電腦晶片上之水冷器21進而冷卻晶片，以及利用馬達22通電後，磁極軸221被磁推斥葉輪23之金屬軸231驅轉，藉此令葉輪23將水冷器21的水排出且循環到散熱器2，以完成熱交換，其主要的特色就是利用磁力驅動葉輪23之非物理性接觸的方式，達到循環水流散熱的效能，但就該案中係較習用者減少許多零組件，而且把葉輪23和水冷器21整合成一單體，同時該馬達22採磁力驅動葉輪23除了更能防止水份滲漏，也提昇了其使用壽命，但由於其機構仍需佔據一定高度，所以其可以應用於主機板之晶片散熱，但對於一般的VGA顯示卡或介面卡，因為其分設於插槽中且相鄰的間距相當接近，所以並無充裕的空間足以供給其安裝，因此為滿足前述之使用要求，乃需進一步的改善。

[新型內容]

本創作之主要目的，係提供一種應用於電腦介面卡之水冷式散熱裝置，利用散熱器冷卻的水循環到水冷器，進而對晶片提供散熱，因此具較佳的散熱效能。
本創作之次要目的，係提供一種應用於電腦介面卡之水冷式散熱裝置，其中水冷器和循環泵浦組合後，係為一單體式之結構，大幅降低其高度，所以可以安裝在介面卡之晶片上，而冷卻晶片之熱氣。
本創作之再一目的，係提供一種應用於電腦介面卡之水冷式散熱裝置，其中該循環泵浦係採用非物理接觸之磁激式驅動葉輪轉動，故結構上得以更精簡耐用，具較佳的可信賴度。

[實施方式]

首請參閱第四～八圖所示，本創作一種應用於電腦介面卡之水冷式散熱裝置，其中該散熱裝置3係設於電腦介面卡4之晶片(圖未示)上方，包括由一鋁材成型之水冷器31、一循環泵浦32和鋁材質的散熱器33所組成，經散熱器33冷卻的水，循環到介面卡4晶片上的水冷器31之入口311，經水冷器31內部密閉之循環水道，以冷卻晶片所產生的熱氣，且由水冷器31之排出部312湧出，利用循環泵浦32以迴轉力量將排出部31的水排至水冷器31之排水口313、並循環至散熱器33進行熱交換；該循環泵浦32，其

Cooler Master Co., Ltd. Exhibit 1006, Page 179 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

葉輪321略呈一盤形體，並恰可與排出部312對應蓋合，葉輪321內壁環設一磁塊322，以及藉一壓板323將葉輪321定位於水冷器31之排出部312上方，使葉輪321被壓板323限位，且於排出部312中呈自由狀轉動，又壓板323上方設置至少有二極之繞組R1、R2，其電路板324接引電源同時將繞組R1、R2封合於壓板323上方，當啟動電源電路板324切換該二繞組R1、R2產生極性變化，並推斥磁塊322帶動葉輪321驅轉，令排出部312的水被葉輪321之迴轉力量排出至排水口313而循環至散熱器33進行熱交換。

又，請參閱第四、八圖所示，在實際製造時，該水冷器31之入水口311係設於相低準位，排水口313係設於相對較高準位，經散熱器33冷卻的水自入水口311進入冷水冷器31內部之密閉水道吸收晶片41之熱氣，並循環至排出部313湧出，以及藉循環泵浦32排至排水口313，這樣子的作法，是能讓水冷器31內冷卻的水能充份有效的吸收晶片41之熱氣使其散熱。
續請參閱第九圖，係本本創作散熱器之另一安裝實施例參考圖，基於空間和安裝便利性的考量，該散熱器33係安裝在另一個空卡5上，以及該空卡5係設置在與介面卡4相鄰的插槽(slot)上，藉此可利用閒置的插槽提供散熱器33安裝，使散熱器33能達到最佳的散熱功效。

[圖式簡單說明]

第一圖、係習用水冷式散熱器之裝置示意圖。
第二圖、係第92208839號專利案裝置於電腦機箱內之示意圖。
第三圖、係第92208839號專利案之馬達和葉輪從下面看的立體圖。
第四圖、係本創作之立體外觀圖。
第五圖、係本創作安裝在電腦介面卡上方之裝置示意圖。
第六圖、係本創作水冷器和循環泵浦之立體分解圖。
第七圖、係本創作水冷器和循環泵浦之組合立體體圖。
第八圖、係本創作水冷器和循環泵浦之組合剖視圖。
第九圖、係本創作散熱器之另一安裝實施例參考圖。

九、申請專利範圍：

1.一種應用於電腦介面卡之水冷式散熱裝置，其中該散熱裝置係設於電腦介面卡之晶片上方，包括由一水冷器、一循環泵浦和散熱器所組成，經散熱器冷卻的水，循環到介面卡晶片上的水冷器之入口，經水冷器內部密閉之循環水道，以冷卻晶片所產生的熱氣，且由水冷器之排出部湧出，利用循環泵浦以迴轉力量將排出部的水排至水冷器之排水口，並循環至散熱器進行熱交換；該循環泵浦，其葉輪略呈一盤形體，並恰可與排出部對應蓋合，葉輪內壁環設一磁塊，以及藉一壓板將葉輪定位於水冷器之排出部上方，使葉輪被壓板限位，且於排出部中呈自由狀轉動，又壓板上方設置至少有二極之繞組，其電路板接引電源同時將繞組封合於壓板上方，當啟動電源電路板切換該二繞組產生極性變化，並推斥磁塊帶動葉輪驅轉，令排出部的水被葉輪之迴轉力量排出至排水口而循環至散熱器。

2.如申請專利範圍第1項所述之應用於電腦介面卡之水冷式散熱裝置，其中該水冷器係採用鋁材為最佳。

Cooler Master Co., Ltd. Exhibit 1006, Page 180 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

3.如申請專利範圍第1項或第2項所述之應用於電腦介面卡之水冷式散熱裝置，其中該水冷器之入水口係設於相低準位，排水口係設於相對較高準位，經散熱器冷卻的水自入水口進入冷水器內部之密閉水道吸收晶片之熱氣，並循環至排出部湧出，以及藉循環泵浦排至排水口。

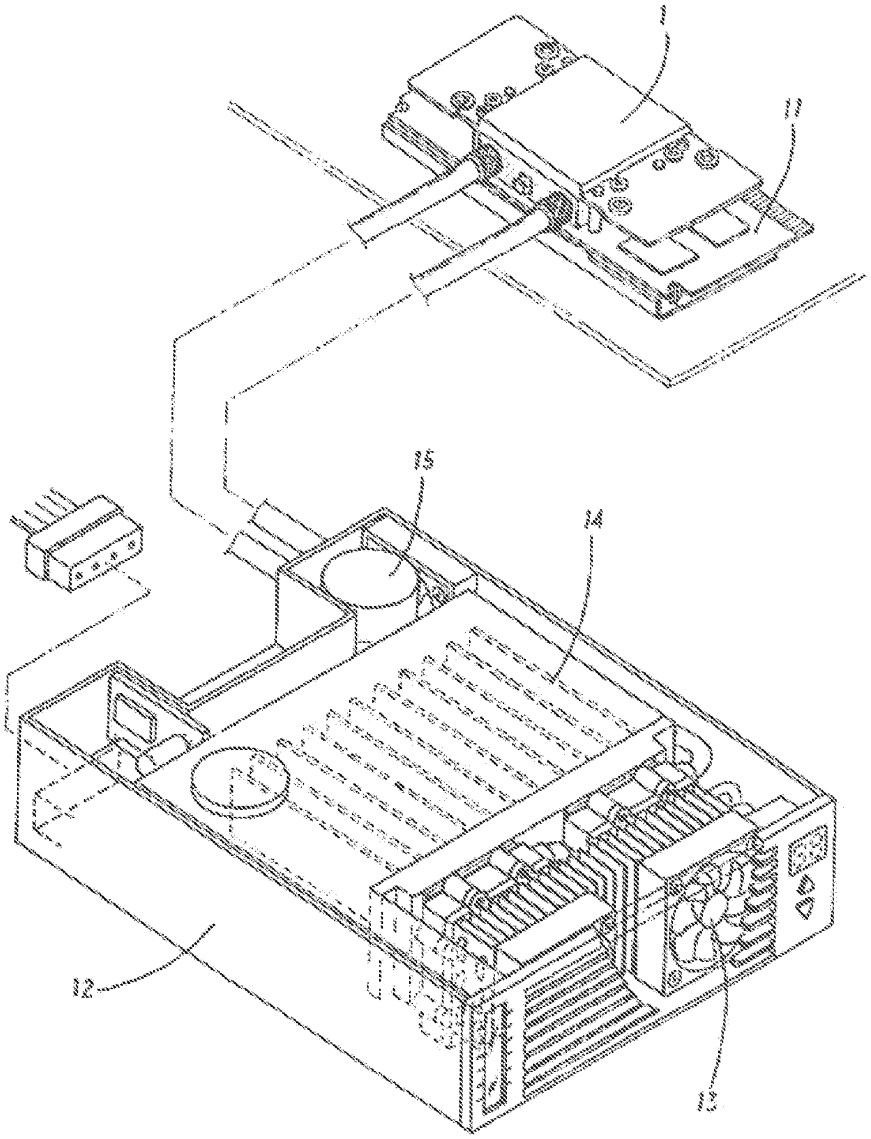
4.如申請專利範圍第1項所述之應用於電腦介面卡之水冷式散熱裝置，其中該散熱器係採用鋁材質者。

5.如申請專利範圍第1項或第4項所述之應用於電腦介面卡之水冷式散熱裝置，其中該散熱器係安裝在介面卡上者。

6.如申請專利範圍第1項或第4項所述之應用於電腦介面卡之水冷式散熱裝置，其中該散熱器係安裝在另一個空卡上，以及該空卡係設置在與介面卡相鄰的插槽(slot)上。

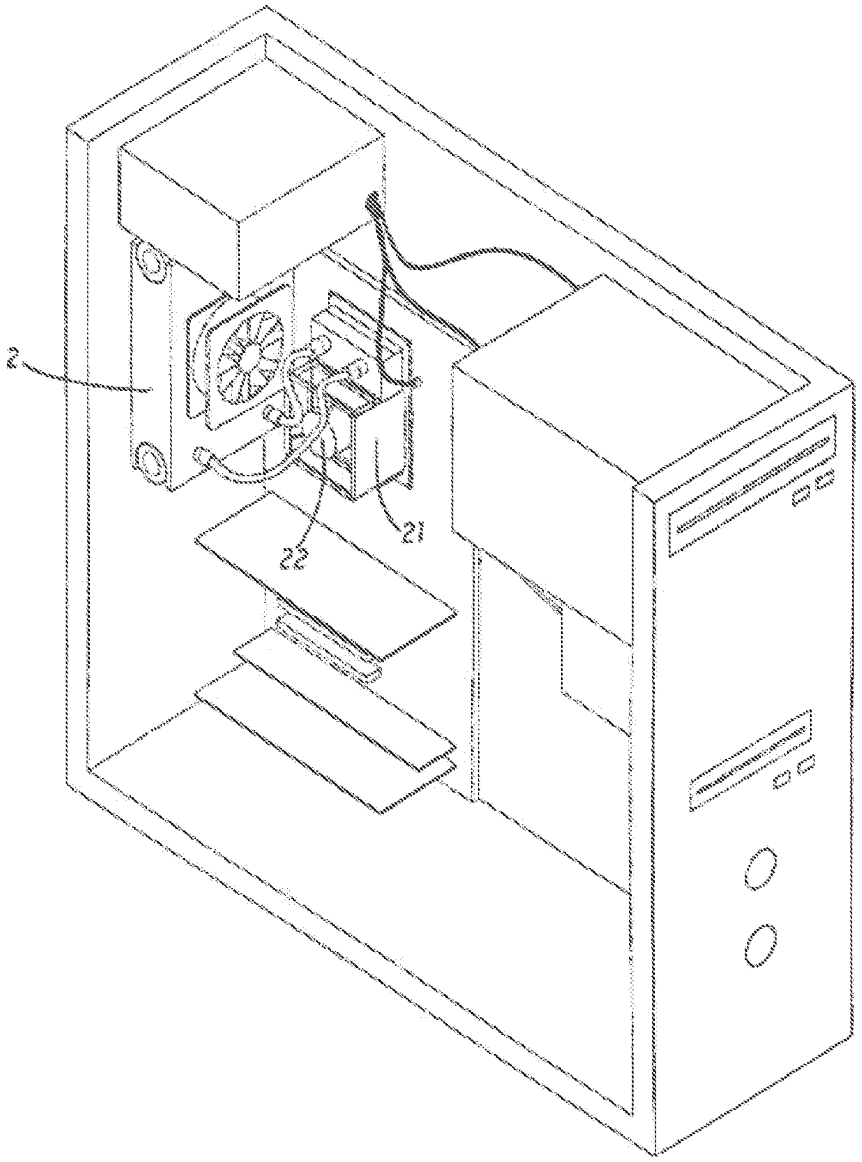
十、圖式：

Cooler Master Co., Ltd. Exhibit 1006, Page 181 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



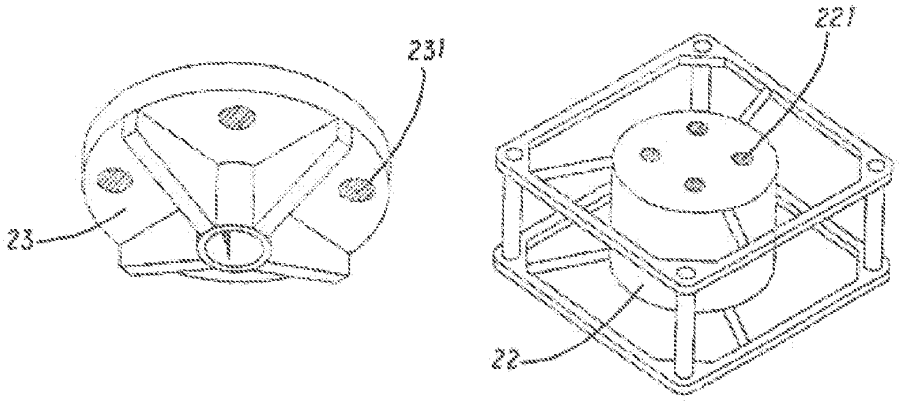
第一圖

Cooler Master Co., Ltd. Exhibit 1006, Page 182 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



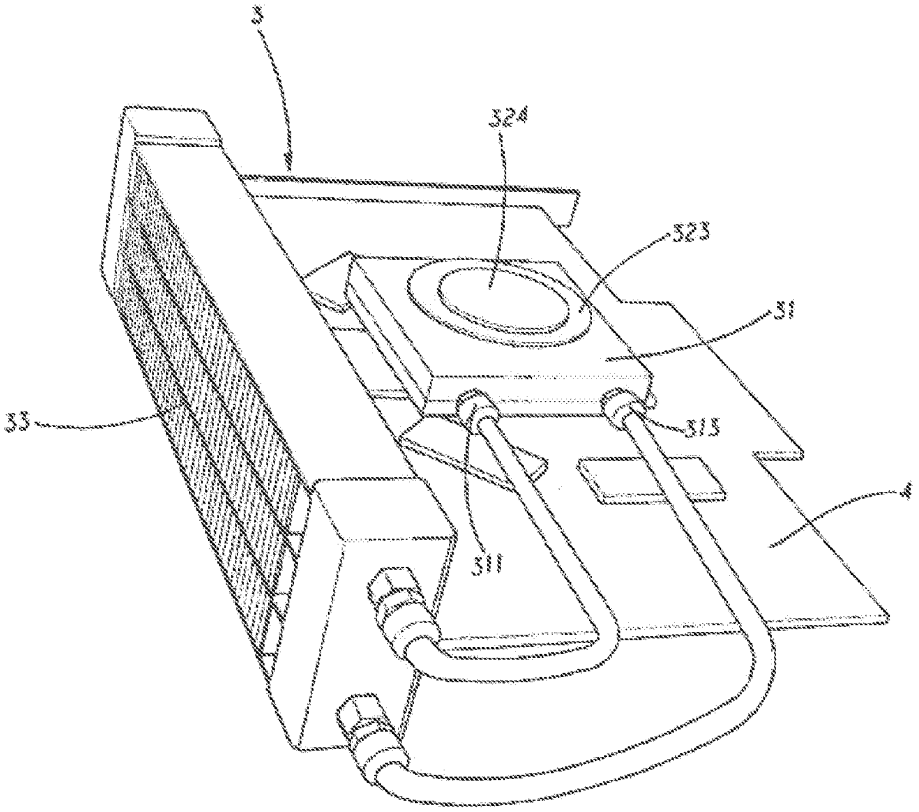
第二圖

Cooler Master Co., Ltd. Exhibit 1006, Page 183 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



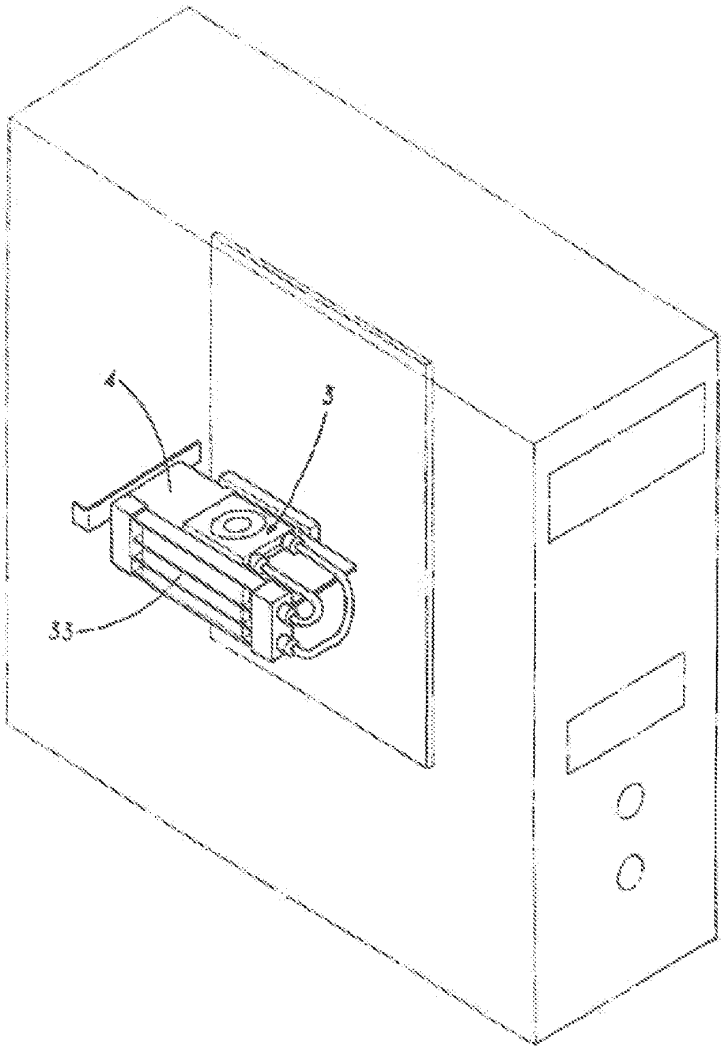
第三圖

Cooler Master Co., Ltd. Exhibit 1006, Page 184 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



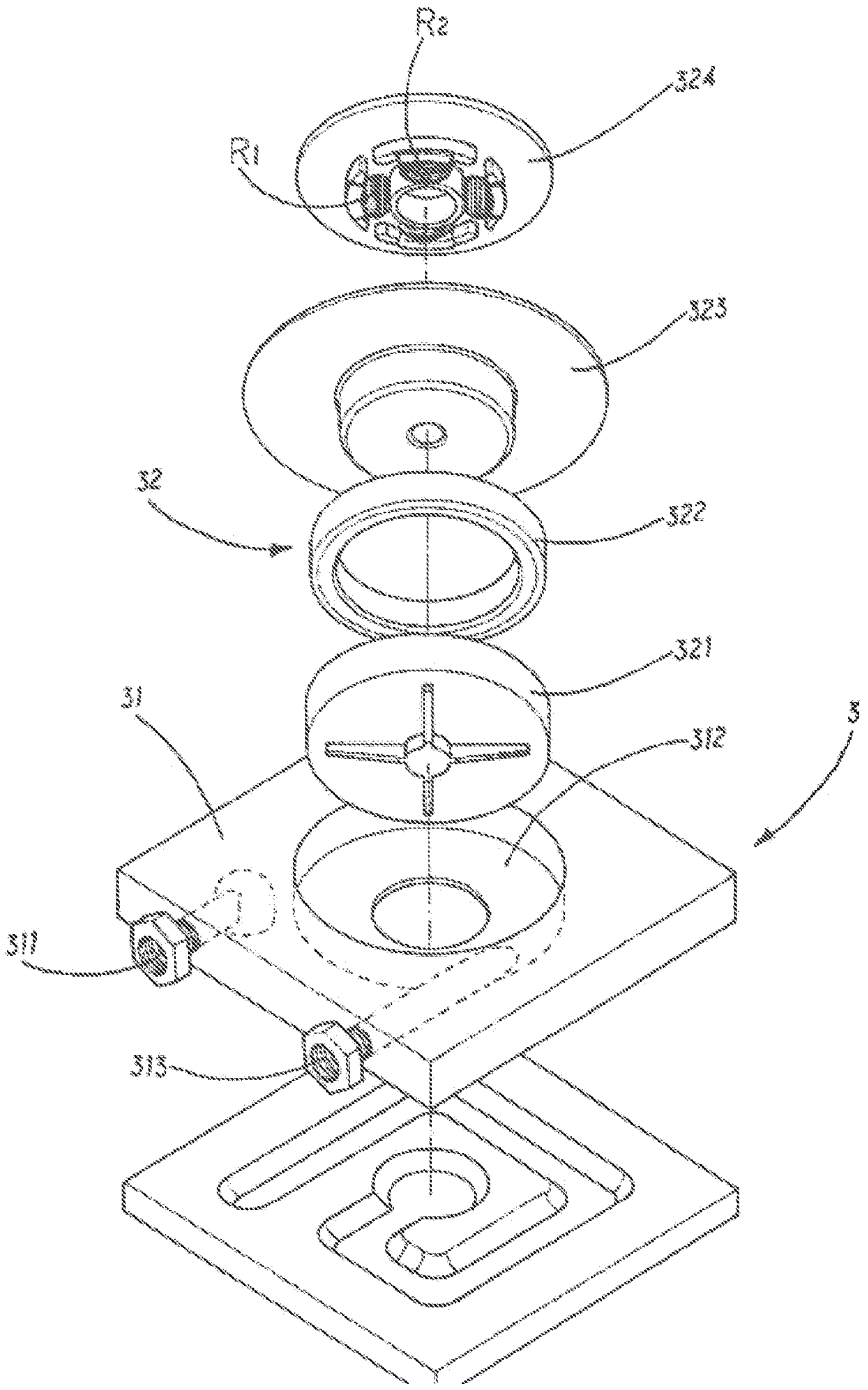
第四圖

Cooler Master Co., Ltd. Exhibit 1006, Page 185 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

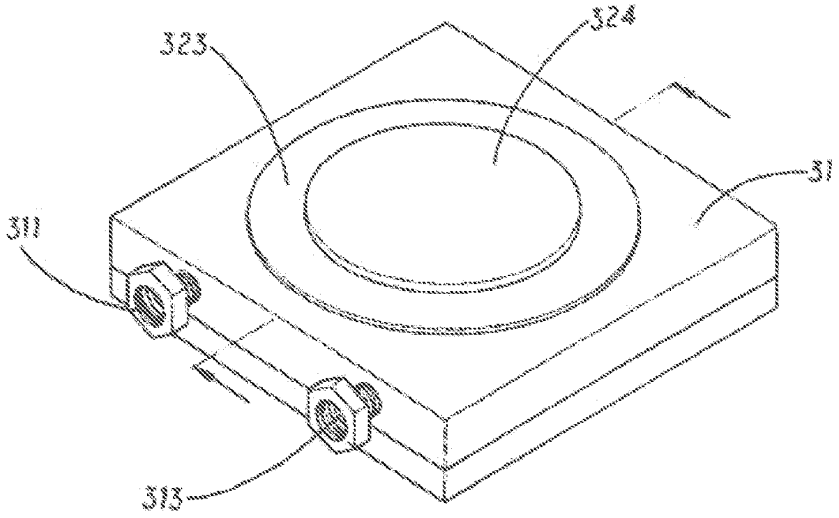


第五圖

Cooler Master Co., Ltd. Exhibit 1006, Page 186 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

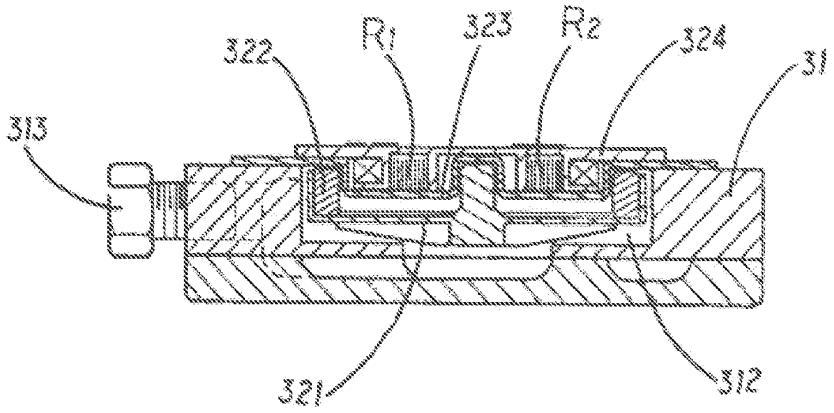


Cooler Master Co., Ltd. Exhibit 1006, Page 187 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



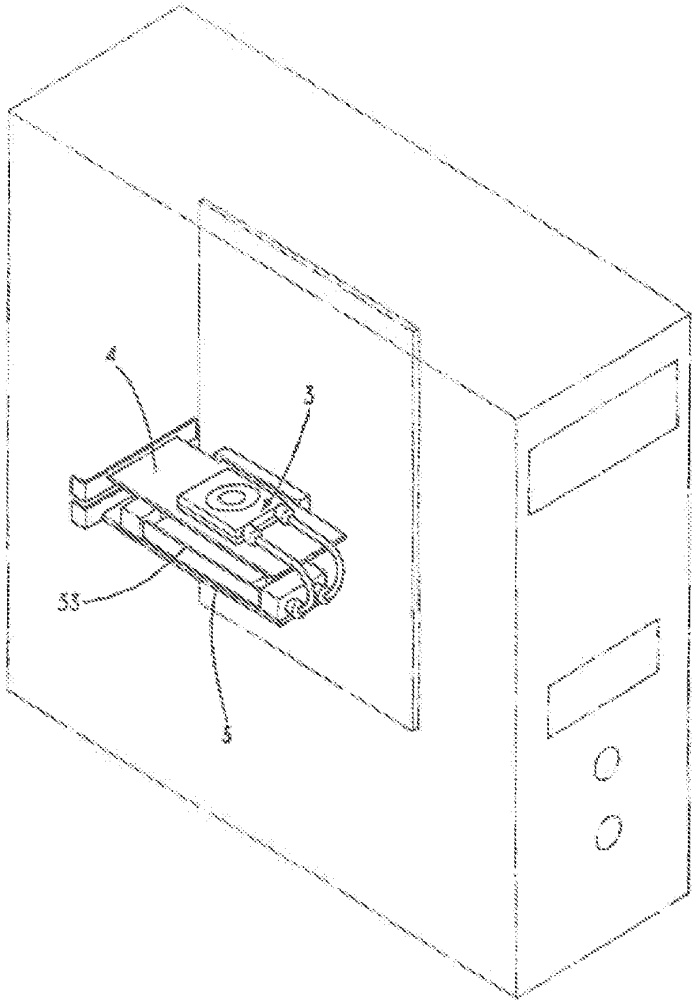
第七圖

Cooler Master Co., Ltd. Exhibit 1006, Page 188 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



第八圖

Cooler Master Co., Ltd. Exhibit 1006, Page 189 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



第九圖

Cooler Master Co., Ltd. Exhibit 1006, Page 190 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

ANLAGE E10a/MST15a

[19] Republic Of China [12] Patent Gazette (U)
[11] Patent No.: M24451
[45] Publication Date: Republic Of China Sept. 21, 2004
[51] Int. Cl.[7]: G06F1/20
H05K7/20

Utility Model Total 9 pages

[54] Title: The water cooler device for interface card of computer

[21] Appln. No.: 092216860 [22]Appln. Date: Sept. 19, 2003

[72] Inventor:
RYU JEONG MOO
[71] Applicant:
3R SYSTEM CO., LTD
[74] Agent: MR. XUE MINGHONG

The water cooler device for interface card of computer

Claims

1. A water cooler device for interface card of computer, wherein the water cooler device is arrange on chips of interface card of computer, and includes a water cooler, a circulating pump and a radiator; water cooled by the radiator circulates so as to arrive at an inlet of the water cooler on chips of interface card of computer, passes through a closed circulating water channel inside the water cooler so as to cool down heat produced by the chips, and gushes via a discharging part of the water cooler; water at the discharging part is delivered to a water outlet of the water cooler by cornering force of the circulating pump, and circulates so as to arrive at the radiator for heat exchange; blade of the circulating pump has a disc shape, and can correspondingly cover the discharging part; on the inner wall of the blade is arranged with a ring of magnet; the blade is positioned on the discharging part of the water cooler by means of a pressing board, so that the position of the blade is limited by the pressing board and the blade can freely rotate in the discharging part; windings having at least two polarities are arranged on the pressing board; the windings are sealed and combined on the pressing board while its circuit board is connected to a power supply; when the power supply is powered up, the circuit board switches the two windings to produce polarity change, and repels the magnet to bring the blade to rotate, so that water at the discharging part is delivered to a water outlet of the water cooler by cornering

force of the circulating pump, and circulates so as to arrive at the radiator.

2. A water cooler device for interface card of computer according to claim 1, wherein the water cooler is preferably made of aluminum material.

3. A water cooler device for interface card of computer according to claim 1 or claim 2, wherein the water inlet of the water cooler is set at a lower level and the water outlet is set at a higher level; water cooled by the radiator enters through the water inlet, absorbs heat of chips along the closed circulating water channel of the water cooler, and circulates so as to arrive at the discharging part to gush out, and is expelled to the water outlet by means of the circulating pump.

4. A water cooler device for interface card of computer according to claim 1, wherein the radiator is preferably made of aluminum material.

5. A water cooler device for interface card of computer according to claim 1 or claim 4, wherein the radiator is located on the interface card.

6. A water cooler device for interface card of computer according to claim 1 or claim 4, wherein the radiator is located on another empty card, and the empty car is arranged on a slot adjacent to the interface card.

Brief Description of the Drawings

Figure 1 is a device diagram of a water cooler device of prior art.

Figure 2 is a diagram of a device of patent application No.92208939 arranged in a computer case.

Figure 3 is a diagram of motor and blade of patent application No.92208939 viewing from the bottom.

Figure 4 is a stereoscopic exterior view of the application.

Figure 5 is a device diagram of the application mounted on an interface card of computer.

Figure 6 is a stereoscopic exploded graphic of the water cooler and the circulating pump of the application.

Figure 7 is a stereoscopic combined graphic of the water cooler and the circulating pump of the application.

Figure 8 is a combined sectional graphic of the water cooler and the circulating pump of the application.

Figure 9 is a reference diagram of the radiator of another embodiment of the application.

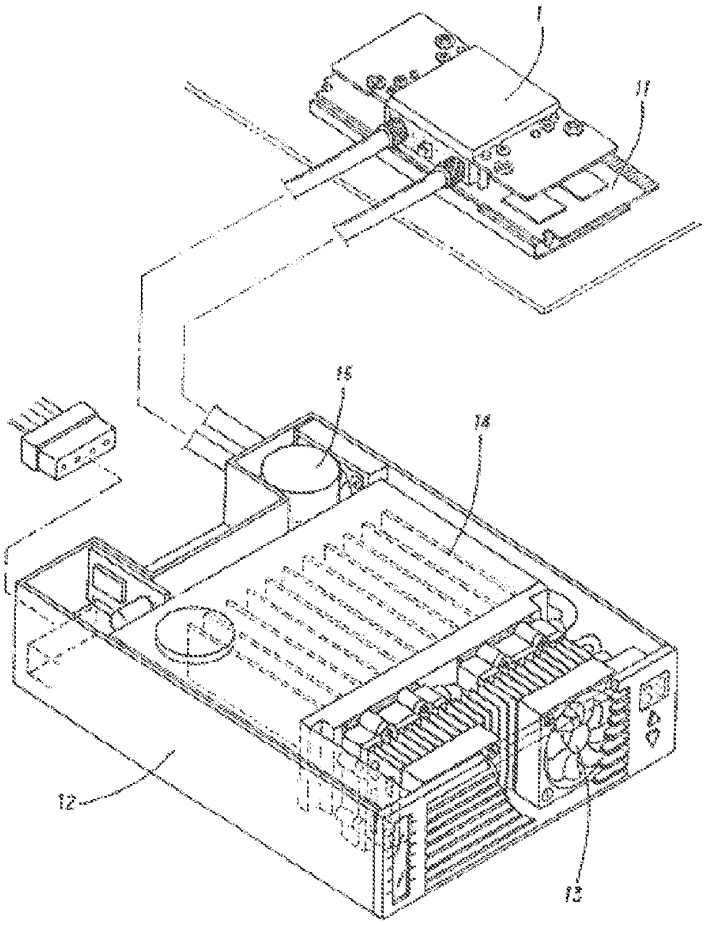


Fig .1

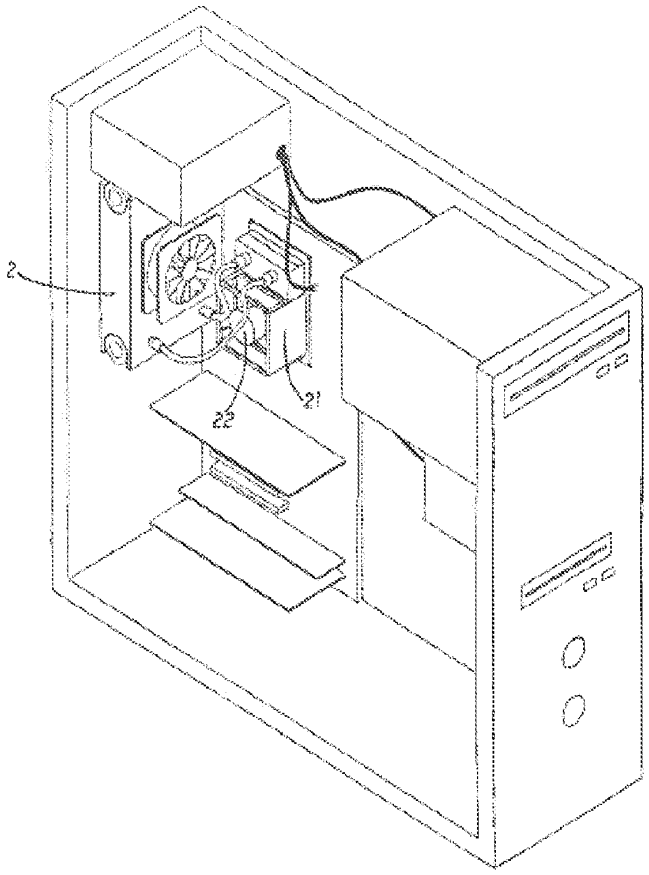


Fig. 2

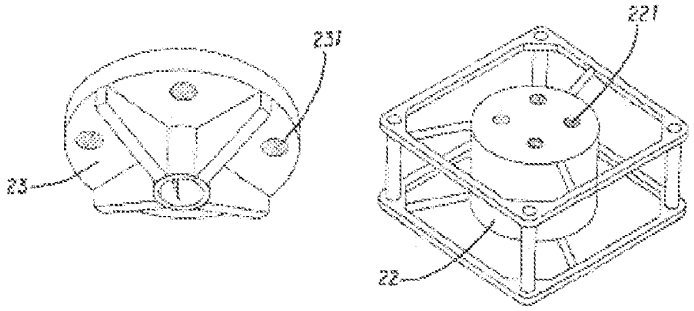


Fig. 3

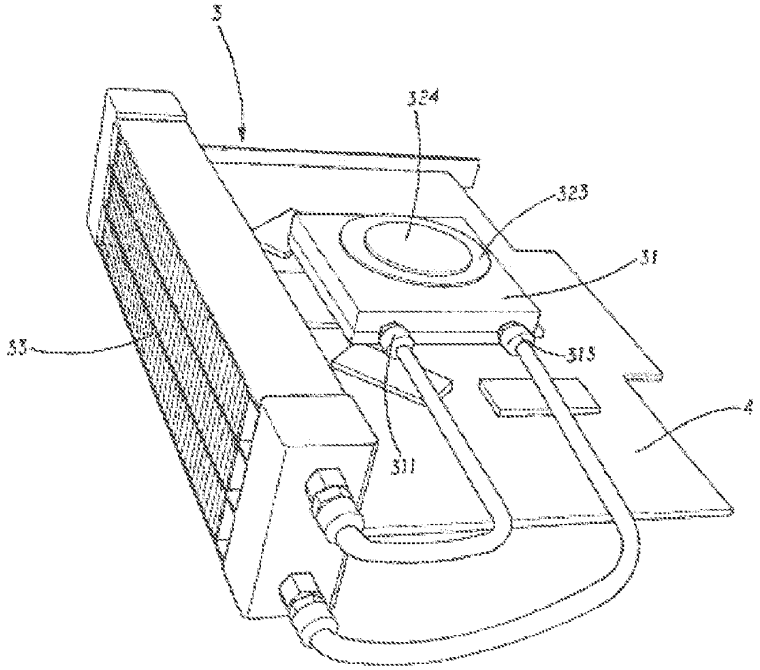


Fig. 4

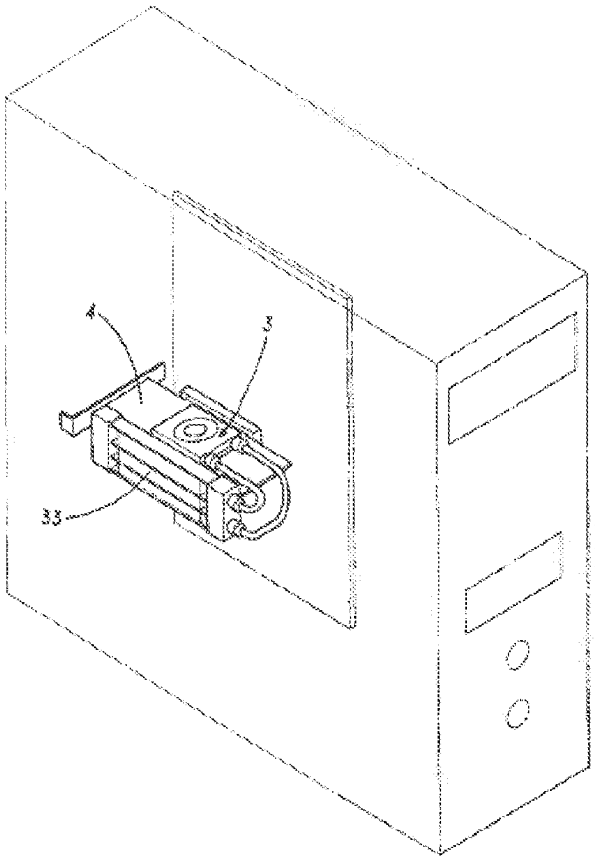


Fig. 5

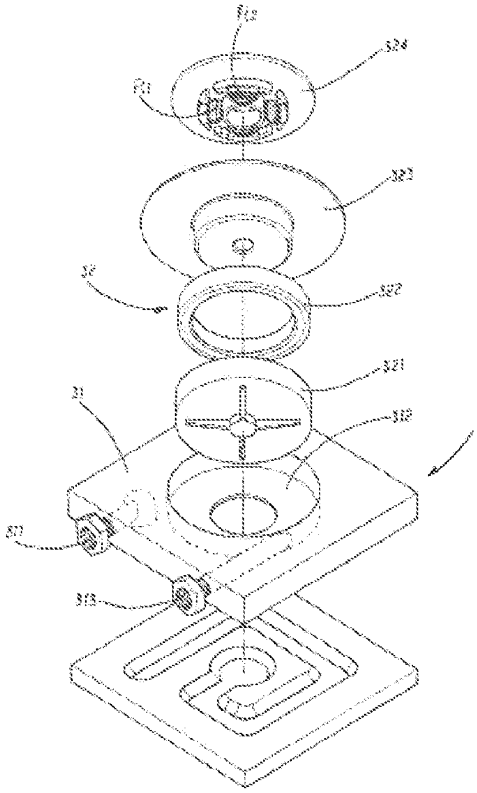


Fig. 6

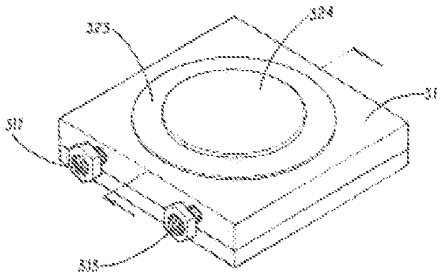


Fig. 7

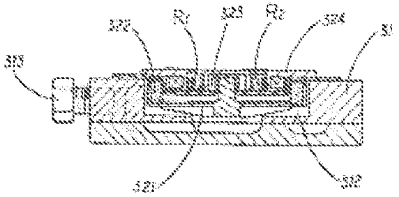


Fig. 8

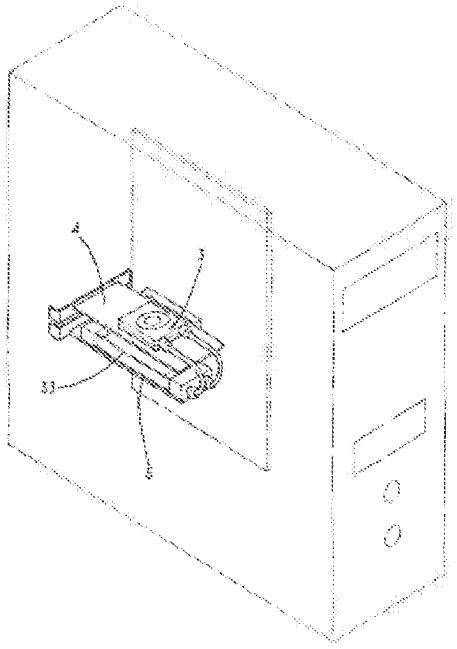


Fig. 9

ANLAGE E11/AST16

(19)日本国特許庁（ＪＰ）　(12) 公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－151638
（P2002－151638A）
(43)公開日　平成14年５月24日(2002.5.24)

(51)Int.Cl.[7]	識別記号	ＦＩ		テーマコード*(参考)
Ｈ０１Ｌ　23/473		Ｈ０５Ｋ　7/20	Ｎ	５Ｅ３２２
Ｈ０５Ｋ　7/20		Ｈ０１Ｌ　23/46	Ｚ	５Ｆ０３６

審査請求　未請求　請求項の数１　ＯＬ　（全　５　頁）

(21)出願番号　特願2000－345470(P2000－345470)

(22)出願日　平成12年11月８日(2000.11.8)

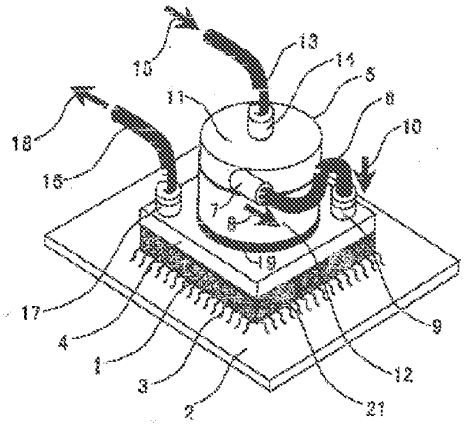
(71)出願人　000005108
株式会社日立製作所
東京都千代田区神田駿河台四丁目６番地
(72)発明者　新　隆之
茨城県土浦市神立町502番地　株式会社日立製作所機械研究所内
(74)代理人　100075096
弁理士　作田　康夫

Ｆターム(参考)　5E322 AA07 AA11 AB02 AB06 DA01 FA01 FA05
5F036 AA01 BA05 BB01 BB43 BC35

(54)【発明の名称】　電子機器の冷却装置

(57)【要約】　（修正有）
【課題】液体冷却ヒートシンクとポンプとを筐体内にコンパクトに実装するための冷却構造。
【解決手段】ポンプ５が液体冷却ヒートシンク４の上部に搭載され、ポンプ５と液体冷却ヒートシンク４とを一体構造として取扱える構造にし、液体冷却システムを電子機器筐体内にコンパクトに搭載でき、現状の空冷方式の電子機器筐体構造を大きく変えることなく、冷却性能が高く、かつ低騒音で、信頼性の高い液体冷却システムを実現できる。

図１



【特許請求の範囲】
【請求項１】配線基板と、該配線基板上に搭載されたＬＳＩ等の電子回路部品を含む発熱体と、該発熱体上に熱的に接触して搭載された液体冷却ヒートシンクと、液体冷媒を加圧して循環させるポンプとからなる電子機器の冷却装置であって、該ポンプが該液体冷却ヒートシンクの上部に搭載されることを特徴とする電子機器の冷却装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、配線基板上に搭載されたＬＳＩ等の発熱電子回路部品を、液体冷却するための冷却構造に係り、特に液体冷却ヒートシンクとポンプとをコンパクトに実装するための冷却構造に関する。
【０００２】
【従来の技術】近年、コンピュータや通信機器、マルチメディア機器等に代表される電子機器の発熱量は著しく増加する傾向にあり、特に演算処理を集中して行うＣＰＵや、画像処理用ＬＳＩ、パワーアンプ等の冷却は非常に重要な課題となってきた。
【０００３】また、冷却方式としては、従来から、空冷フィンとファンを組合せた空冷方式が数多く用いられてきた。しかしながら、空冷方式は、液冷方式に比較して冷却限界が低いため、最近、ＣＰＵ等の高発熱ＬＳＩのみを水等の液体冷媒により液冷する方式が検討されている。
【０００４】例えば、特開平8-32262号公報には、図４に示すような液冷方式が開示されている。発熱量の大きくない空冷可能なＬＳＩ５１と、発熱量が大きいため水冷ヒートシンク４０で冷却されるＬＳＩとが、同じ配線基板５０上に搭載されている。空冷可能なＬＳＩ５１は２つのファン４７により空冷される。冷却空気は４８に示すように外部から供給され、４９に示すように排気される。発熱量の大きいＬＳＩに搭載された水冷ヒートシンク４０はホース４１でを介して出口配管４２に連結され、４０で温められた冷却水は熱交換器４３においてファン４７の空気により冷却される。冷却された冷却水は冷媒配管４４を経由してポンプ４５に流れ、加圧された後に入口配管４６を通って再び水冷ヒートシンク４０に供給される。
【０００５】
【発明が解決しようとする課題】特開平8-32262号公報に開示された冷却構造では、ポンプ４５が配線基板５０や水冷ヒートシンク４０と離れて設置されているため、ポンプ４５を実装するスペースとポンプ４５に接続する配管スペースが筐体内に別途必要となり、電子機器筐体をコンパクトにすることができないという問題点があった。
【０００６】本発明の目的は、コンパクトで、低騒音で、冷却性能に優れ、かつ信頼性の高い電子機器の冷却構造を提供することである。
【０００７】
【課題を解決するための手段】上記目的を達成するため、本発明では、配線基板と、配線基板上に搭載されたＬＳＩ等の電子回路部品を含む発熱体と、発熱体上に熱的に接触して搭載された液体冷却ヒートシンクと、液体冷媒を加圧して循環させるポンプとからなる電子機器の冷却装置を前提とし、ポンプが液体冷却ヒートシンクの上部に搭載される構造とした。
【０００８】また、ポンプが液体冷却ヒートシンクの上部に固定され、さらにポンプと液体冷却ヒートシンクとを一体構造として取扱える構造とした。
【０００９】また、ポンプの液体冷媒吐出し部が液体冷却ヒートシンクに配管等で直接連結された構造とした。
【００１０】さらに、ポンプが直流電源で動作する構成とした。
【００１１】さらに、ポンプが振動吸収部材等を介して液体冷却ヒートシンクに固定される構造とした。
【００１２】
【発明の実施の形態】本発明の第一の実施例について図１を用いて説明する。ＬＳＩ等の電子回路部品を含む発熱体１は、配線基板２上に配線用ピン３や半田ボール等を介して電気的に接続されて搭載されている。発熱体１は、例えばコンピュータ用のＣＰＵや、画像処理用ＬＳＩ、ＦＥＴパワーアンプ等である。発熱体１上には、発熱体１を液冷するための液体冷却ヒートシンク４が、熱伝導コンパウンド２１や熱伝導グリース、または熱伝導シート等を介して熱的に接続されて搭載されている。さらに、液体冷却ヒートシンク４の上部には、液体冷媒を加圧して循環させるポンプ５が搭載されている。
【００１３】本実施例では、ポンプ５が振動吸収部材１９を介して液体冷却ヒートシンク４に固定される構造を採っている。そのためポンプ５の振動が直接ＣＰＵ等の電子部品に影響を及ぼし難い構造となっている。ポンプ５はフレキシブルなホース６により液体冷却ヒートシンク４と接続されている。ホース６は一端がポンプ５の冷媒吐出し部カプラ７に接続され、他端が液体冷却ヒートシンク４の給水カプラ９に接続されており、加圧された液体冷媒は８のように流れた後に１０のように直接液体冷却ヒートシンク４に流入する。液体冷媒は、液体冷却ヒートシンク４内に流入した後に、ヒートシンク内に構成された複数の流路に別れて蛇行状に流れ、発熱体１の熱を吸収する。加熱された液体冷媒は排水カプラ１７、ホース１６を経て、液体冷媒を冷却する熱交換部（図示せず）に１８に示すように流れる。熱交換部で冷却された液体冷媒は、１５のように戻ってきて、ホース１３、冷媒吸込み部カプラ１４を介してポンプ５に吸込まれ、再び加圧されて液体冷却ヒートシンク４に供給される。
【００１４】なお、前述したカプラ７，９，１４，１７によってホース６，１３，１６は脱着が容易になってい

るため、組立て性やメンテナンス性が良い構造を実現している。

【００１５】上記のように、ポンプ５が液体冷却ヒートシンク４の上部に搭載される構造とすることにより、ポンプ５を別途設置するスペースを電子機器筐体内に用意する必要が無くなり、またポンプから液体冷却ヒートシンク４までのホースを短くできるので、液体冷却システムを電子機器筐体内にコンパクトに搭載できる。そのため、現状の空冷方式の電子機器筐体構造を大きく変えることなく、冷却性能が高く、かつ低騒音の液体冷却システムを搭載することが可能となる。

【００１６】また、ポンプ５が液体冷却ヒートシンク４の上部に固定され、ポンプと液冷ヒートシンクとを一体構造として取扱えるようにすると、組立て時の部品点数が低減し、さらに、現状パソコン等で多用されているファン付き空冷ヒートシンクの代わりに、このポンプと液冷ヒートシンクの一体部品キットを組付けることができるため、液体冷却システムを無理なく電子機器に導入可能である。

【００１７】また、ポンプ５の冷媒吐出し部７が液体冷却ヒートシンク４の給水カプラ９に配管等で直接連結された構造とした。そのため、ポンプ５から液体冷却ヒートシンク４までのホースを非常に短くできるので、ホースでの液体冷媒の流動損失を小さくでき、その結果ポンプ５の揚程能力を小さくでき、最終的にモータの能力をより小さくし、ポンプを小型化することができる。

【００１８】ポンプ５は羽根車ケース１１とモータ１２から構成される。本実施例において、ポンプ５は羽根車ケース１１内に設置された羽根車を回転させて液体冷媒を加圧する遠心型の例を示したが、ダイヤフラムなどを用いて機械的容積変化により液体冷媒を加圧する容積型ポンプであっても良い。また、本実施例においては、モータと羽根車の軸が液体冷却ヒートシンク４の上面にほぼ垂直になるように搭載されており、よって、モータの底面が液体冷却ヒートシンク４の上面に振動吸収部材１９を介して面同士で接合されるため、モータの座りが良い構造を実現できる。

【００１９】モータ１２は直流電源で駆動するＤＣモータである。ＤＣモータとすることにより、ＤＣ電圧を変化させて容易にモータの回転数を変えられるので、冷却能力の制御も可能になる。さらに、モータをＤＣブラシレスモータとすることにより、低騒音でかつ高寿命のポンプを実現することができる。

【００２０】液体冷媒の流量が０.１（リットル／分）のオーダーのように比較的小さい場合には、駆動電圧を例えば １～1.５（Ｖ）程度の乾電池でも駆動可能なものとすれば、ポンプのバッテリー駆動が可能となり、信頼性の高い液体冷却システムを構築できる。また、液体冷媒の流量が１（リットル／分）のオーダーのように比較的大きい場合には、駆動電圧を例えば２～１２（Ｖ）程度の電子機器のＤＣ電源で供給可能な電圧とすると、ポンプ用の専用電源を用意する必要がないためコンパクトで安価に液体冷却システムを構築できる。ただし、本発明は、モータ１２を必ずしもＤＣモータに限定するものではなく、例えば１００（Ｖ）や 200（Ｖ）の交流電源で駆動するＡＣモータであっても構わない。

【００２１】液体冷媒は入手が容易な水が良く、特に純水であると熱容量が大きいので冷却性能を高くでき、さらに腐食に強く、不純物が流路内に堆積し難いので信頼性の高い液体冷却システムを実現することができる。また、液体冷媒として、水にエチレングリコール等を添加した不凍液を使えば、寒冷時の液体冷媒凍結による流路部破損を防止できる。また、液体冷媒にパーフルオロカーボン等の非電導性冷媒を使えば、万一の液漏れ時にも電子回路のショート等の事故を防ぐことができる。

【００２２】本発明の第二の実施例について図２を用いて説明する。本実施例においては、モータ５と羽根車の軸が液体冷却ヒートシンク４の上面にほぼ平行になるように搭載されている。それにより、モータ出力が高く、そのためモータの軸方向長さが長い高出力ポンプでも、液体冷却ヒートシンク４上にコンパクトに搭載できる。本実施例では、ポンプ５は液体冷却ヒートシンク４上にブラケット２０で固定されている。ブラケット２０は、材質が振動吸収部材であるか、その一部に振動吸収部材を用いることにより、ポンプ５の振動が直接ＣＰＵ等の電子部品に影響を及ぼし難い構造とすることができる。第二の実施例は、上記以外は第一の実施例と同様である。

【００２３】本発明の第三の実施例について図３を用いて説明する。本実施例は、第一の実施例で示したポンプと液冷ヒートシンク一体型の液体冷却システムを、実際の電子機器筐体内に搭載した例を示している。

【００２４】ＬＳＩ等の発熱体１は、マザーボードである配線基板２上に搭載されている。発熱体１上には、発熱体１を液冷するための液体冷却ヒートシンク４が搭載されている。さらに、液体冷却ヒートシンク４の上部には、ポンプ５が搭載されている。配線基板２上には、発熱体１以外に、メモリＬＳＩやドライバＬＳＩなどの空冷で冷却可能な発熱体２２ａ，２２ｂ，２２ｃや、ＩＯカード、メモリカード、ハードディスク等のカード実装基板２３等が搭載されている。配線基板２は、電子機器筐体のケース２４内に収められている。ケース２４には空冷用のファン３４が取付けられており、前記多数の空冷部品を冷却風２５で空冷している。

【００２５】液体冷却ヒートシンク４で加熱された液体冷媒は、ホース１６で１８に示すように流れ、筐体ケースの側板３２に取付けられた熱交換器２７に接続カプラ２６を介して接続される。本実施例では、熱交換器２７の配管が側板３２に熱的に接触して取付けられており、液体冷媒は熱交換器内で２８や２９のように蛇行しなが

ら上方へ流れる。液体冷媒の熱は側板３２全体に熱伝導により広げられた後に、電子機器筐体周囲の自然対流による空気流３３やファン３４による冷却風２５により放熱される。

【００２６】冷却された液体冷媒は、３０のように流れ、接続カプラ３１を介して戻り側のホース１３に接続され、１５のようにポンプ５に戻り、再び加圧されて液体冷却ヒートシンク４に供給される。

【００２７】側板３２と熱交換器２７の構成方法の一例として、側板３２をアルミニウムやマグネシウムや銅等の金属材料で構成し、さらに熱交換器の配管を金属材料で構成し、両者をろう付けや半田付け等の金属接合や熱伝導性接着剤等で接続する方法がある。この場合、熱伝導を良好にできるので、液体冷却システムの冷却性能を向上させることができる。また、２枚の金属板を熱交換器の蛇行流路を空けた状態で接合させて、側板と熱交換器を一体成形するロールボンド等の製法を用いれば、より安価に熱交換器を製造できる。ただし、側板３２が樹脂製等の非金属材料であったり、熱交換器２７の配管が非金属材料であっても、本発明の効果は実現できるものである。

【００２８】以上から、本実施例の構成とすることにより、ポンプ５を別途設置するスペースを電子機器筐体内に用意する必要が無くなり、またポンプから液体冷却ヒートシンク４までのホースを短くできるので、液体冷却システムを電子機器筐体内にコンパクトに搭載できる。

【００２９】さらに、現状の空冷方式の電子機器筐体構造を大きく変えることなく、熱交換器２７を備えた側板３２と、ポンプ一体型液冷ヒートシンクと、２本の接続ホース１３，１６を追加するだけで、冷却性能が高く、かつ低騒音の液体冷却システムを実現することが可能となる。

【００３０】また、現状パソコン等で多用されているファン付き空冷ヒートシンクの代わりに、このポンプと液冷ヒートシンクの一体部品キットを組付けることができるため、液体冷却システムを無理なく電子機器に導入可能である。ポンプの電源がファン付き空冷ヒートシンクのファン用電源と互換性があれば、さらに導入が容易となることは言うまでもない。

【００３１】

【発明の効果】以上説明したように、本発明によれば、第一に、液体冷却システムを電子機器筐体内にコンパクトに搭載できる。

【００３２】第二に、現状の空冷方式の電子機器筐体構造を大きく変えることなく、冷却性能が高く、かつ低騒音で、信頼性の高い液体冷却システムを搭載することができる。

【００３３】第三に、組立て時の部品点数が低減し、かつ、ファン付き空冷ヒートシンクの代わりに、ポンプと液冷ヒートシンクの一体部品キットを組付けることができるため、液体冷却システムを無理なく電子機器に導入できる。

【００３４】第四に、ポンプの揚程能力を小さくでき、モータの能力をより小さくし、小型化できる。

【００３５】第五に、ポンプの回転数を変化させて冷却能力を制御可能な液体冷却システムとすることができる。

【図面の簡単な説明】

【図１】本発明の第一の実施例である電子機器の冷却装置の斜視図。

【図２】本発明の第二の実施例である電子機器の冷却装置の斜視図。

【図３】本発明の第三の実施例である電子機器の冷却装置の斜視図。

【図４】従来例の電子機器の冷却装置を示す斜視図。

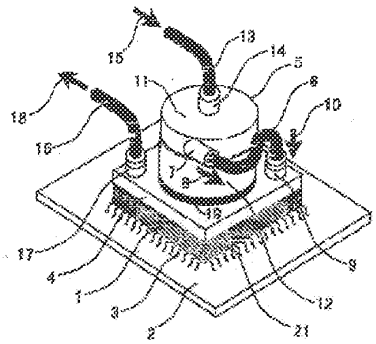
【符号の説明】

１…発熱体、２…配線基板、３…配線用ピン、４…液体冷却ヒートシンク、５…ポンプ、６…ホース、７…冷媒吐出し部カプラ、８…液体冷媒の流れ、９…給水カプラ、１０…液体冷媒の流れ、１１…羽根車ケース、１２…モータ、１３…ホース、１４…冷媒吸込み部カプラ、１５…液体冷媒の流れ、１６…ホース、１７…排水カプラ、１８…液体冷媒の流れ、１９…振動吸収部材、２０…ブラケット、２１…熱伝導性コンパウンド、２２ａ…空冷で冷却可能な発熱体、２２ｂ…空冷で冷却可能な発熱体、２２ｃ…空冷で冷却可能な発熱体、２３…カード実装基板、２４…電子機器筐体のケース、２５…冷却風、２６…接続カプラ、２７…熱交換器、２８…蛇行する液体冷媒の流れ、２９…蛇行する液体冷媒の流れ、３０…液体冷媒の流れ、３１…接続カプラ、３２…側板、３３…空気流、３４…ファン、４０…水冷ヒートシンク、４１…ホース、４２…出口配管、４３…熱交換器、４４…冷媒配管、４５…ポンプ、４６…入口配管、４７…ファン、４８…冷却空気、４９…冷却空気、５０…配線基板、５１…空冷可能なＬＳＩ。

Cooler Master Co., Ltd. Exhibit 1006, Page 203 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

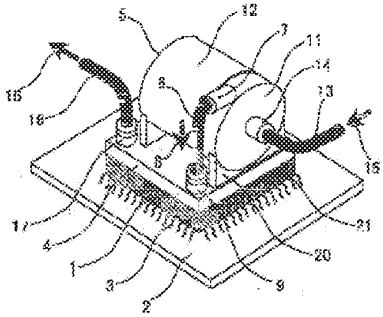
【図1】

図 1



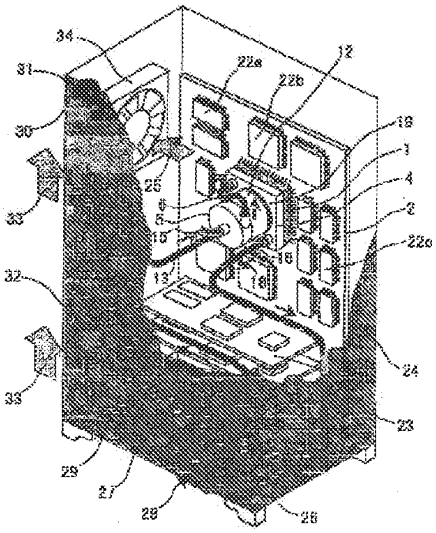
【図2】

図 2



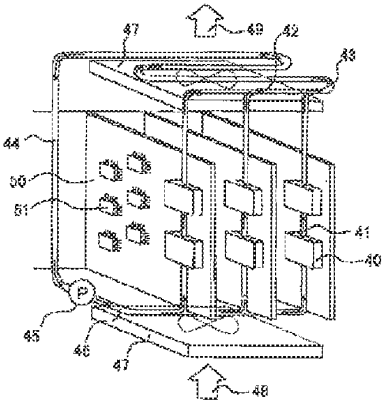
【図3】

図 3



【図4】

図 4



ANLAGE E44a/ASTM16a

Japanese Top page Help list Site map JPO

J-PlatPat
Japan Platform for Patent Information

Help desk (9:00-21:00)
(+81)3-6666-8801
helpdesk@j-platpat.inpit.go.jp

National Center for Industrial Property Information and Training

Patent & Utility Model Design Trademark

Top page Patent& Utility Model Patent& Utility Model Number Search

Patent & Utility Model Number Search

Back Search List

You can retrieve a variety of patent and utility model gazettes by their numbers.

Selected Gazette

Previous Document 1/1 Next Doc

JP,2002-151638,A

PAJ Detail | Image

CLAIMS DETAILED DESCRIPTION

TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS CORRECTION OR AMEN

*** NOTICES ***

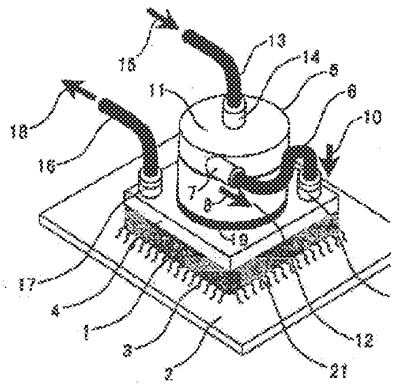
JPO and INPIT are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The perspective view of the cooling system of the electronic device which is a first working example of the present invention.
[Drawing 2]The perspective view of the cooling system of the electronic device which is a second working example of the present invention.
[Drawing 3]The perspective view of the cooling system of the electronic device which is a third working example of the present invention.
[Drawing 4]The perspective view showing the cooling system of the electronic device of a conventional case.
[Explanations of letters or numerals]
1 -- heating element, 2 -- wiring substrate, 3 -- pin for wiring, 4 -- liquid cooling heat sink, 5 -- a pump and 6 -- a hose -- carrying out 7 -- refrigerant discharge -- A part coupler and 8 -- the flow of a liquid refrigerant -- 9 -- feed water coupler, 10 -- flow of a liquid refrigerant, 11 -- impeller case, 12 -- motor, 13 -- hose, 14 -- refrigerant sink part coupler, 15 -- flow of a liquid refrigerant, 16 -- hose, 17 -- wastewater coupler, 18 -- flow of a liquid refrigerant, 19 -- oscillation absorbing member, 20 -- bracket, 21 -- thermally conductive compound, 22 a -- heating element which can be cooled with air cooling, 22 b -- heating element which can be cooled with air cooling, 22 c -- heating element which can be cooled with air cooling, 23 -- card mounting board, 24 -- case of electronic equipment casing, 25 -- cooling wind, 26 -- connecting coupler, 27 -- heat exchanger, 28 -- flow of the liquid refrigerant which moves in a zigzag direction, 29 -- flow of the liquid refrigerant which moves in a zigzag direction, 30 -- flow of a liquid refrigerant, 31 -- connecting coupler, 32 -- side board, 33 -- airstream, 34 -- fan, 40 -- watercooling heat sink, 41 -- hose, 42 -- outlet piping, 43 -- heat exchanger, 44 -- refrigerant piping, 45 -- pump, 46 -- entrance line, 47 -- fan, 48 -- cooling air, 49 -- cooling air, 50 -- wiring substrate, 51 -- LSI in which air cooling is possible.

図 1



Representative drawing

Representative drawing | 1 | 2 | 3 | 4 |

Previous Document 1/1 Next Doc

Return to the top of

Notice of Liability Privacy Policy Copyright Notice

[Translation done.]

Cooler Master Co., Ltd. Exhibit 1006, Page 205 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

J-PlatPat
Japan Platform for Patent Information

Help desk (9:00-21:00)
(+81)3-6666-6801

Japanese Top page Help list Site map JPO

Patent & Utility Model Design Trademark

Top page Patent& Utility Model Patent& Utility Model Number Search

Patent & Utility Model Number Search

Back

Search Act

You can retrieve a variety of patent and utility model gazettes by their numbers.

Selected Gazette

Previous Document 1/1 Next Doc

JP,2002-151638,A

PAJ Detail Image

CLAIMS DETAILED DESCRIPTION

TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS CORRECTION OR AMEN

*** NOTICES ***

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]The present invention relates to the cooling structure for starting the cooling structure for carrying out liquid cooling of the exothermic electronic circuit part articles, such as LSI mounted on the wiring substrate, especially mounting a liquid cooling heat sink and a pump compactly.

[0002]

[Description of the Prior Art]The calorific value of the electronic device represented by a computer, communication equipment and multimedia apparatus, etc. tends to increase remarkably in recent years, and cooling of CPU which concentrates and performs especially data processing, image processing LSI and power amplification, etc. has been a very important issue.

[0003]As cooling system, many air systems which combined the air-cooling fin and the fan have been used from the former. However, since the cooling limit of an air system is low as compared with a liquid cooling system, the system which carries out liquid cooling only of the high exothermic LSI, such as CPU, with liquid refrigerants, such as water, is considered these days.

[0004]For example, JP,H8-32262,A has disclosed a liquid cooling system as shown in Fig.4. LSI51 which does not have calorific value largely and in which air cooling is possible, and LSI cooled with the watercooling heat sink 40 since calorific value is large are mounted on the same wiring substrate 50. Air cooling of the LSI51 in which air cooling is possible is carried out by the two fans 47. Cooling air is supplied from the outside, as shown in 48, and as shown in 49, it is exhausted. The watercooling heat sink 40 mounted on LSI with large calorific value is connected with the outlet piping 42 via hose 41 **, and the cooling water warmed by 40 is cooled by the air of the fan 47 in the heat exchanger 43. The cooled cooling water flows into the pump 45 via the refrigerant piping 44, and after being pressurized, it is again supplied to the watercooling heat sink 40 through the entrance line 46.

[0005]

[Problem to be solved by the invention]In the cooling structure disclosed in JP,H8-32262,A, Since the pump 45 separated with the wiring substrate 50 and the watercooling heat sink 40 and was installed, the piping space linked to the space which mounts the pump 45, and the pump 45 was needed separately in the housing, and there was a problem that electronic equipment casing could not be downsized.

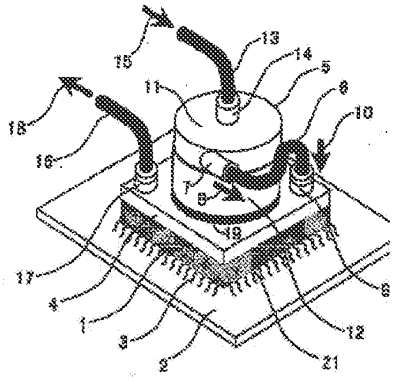
[0006]The object of this invention is compact, is a low noise, and is excelling in a cooling capability and providing the cooling structure of a reliable electronic device.

[0007]

[Means for solving problem]The heating element which contains electronic circuit part articles, such as LSI mounted on the wiring substrate and the wiring substrate, in the present invention in order to achieve the above-mentioned object, It was considered as the structure where a pump is mounted on the upper part of a liquid cooling heat sink on the assumption that the cooling system of the electronic device which consists of a liquid cooling heat sink which contacted thermally and was mounted on the heating element, and a pump made to pressurize and circulate through a liquid refrigerant.

[0008]The pump was fixed to the upper part of the liquid cooling heat sink, and considered it as the structure where a pump and a liquid cooling heat sink can be further dealt with as integral construction.

Fig. 1



drawing1

Representative drawing | 1 | 2 | 3 | a

Cooler Master Co., Ltd. Exhibit 1006, Page 206 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

[0009]It was considered as the structure where the pump carried out liquid refrigerant discharge and the part was directly connected with the liquid cooling heat sink for piping etc.
[0010]The pump had composition which operates by DC power supply.
[0011]It was considered as the structure where a pump is fixed to a liquid cooling heat sink via an oscillation absorbing member etc.
[0012]
[Mode for carrying out the invention]It describes using Fig.1 about the first working example of the present invention. On the wiring substrate 2, via the pin 3 for wiring, the solder ball, etc., it is electrically connected and the heating element 1 containing electronic circuit part articles, such as LSI, is mounted. The heating elements 1 are CPU for computers, image processing LSI and FET power amplification, etc., for example. On the heating element 1, via the heat-conduction compound 21, heat-conduction grease or a heat conduction sheet, etc., it is connected thermally and the liquid cooling heat sink 4 for carrying out liquid cooling of the heating element 1 is mounted. The pump 5 made to pressurize and circulate through a liquid refrigerant is mounted on the upper part of the liquid cooling heat sink 4.
[0013]In this example, the structure where the pump 5 is fixed to the liquid cooling heat sink 4 via the oscillation absorbing member 19 is taken. Therefore, it has the structure where vibration of the pump 5 cannot affect electronic components, such as direct CPU, easily. The pump 5 is connected with the liquid cooling heat sink 4 by the flexible hose 6. After the liquid refrigerant in which the pump 5 carries out refrigerant discharge, one end is connected to the part coupler 7, the other end is connected to the feed water coupler 9 of the liquid cooling heat sink 4, and the hose 6 was pressurized flows like 8, it flows into the liquid cooling heat sink 4 directly like ten. After a liquid refrigerant flows in the liquid cooling heat sink 4, it separates to a plurality of flow paths constituted in the heat sink, flows into meandering state, and absorbs the heat of the heating element 1. The heated liquid refrigerant flows, as shown in the heat exchange section (not shown) which cools a liquid refrigerant through the wastewater coupler 17 and the hose 16 18. The liquid refrigerant cooled by the heat exchange section returns like 15, is absorbed by the pump 5 via the hose 13 and the refrigerant sink part coupler 14, is pressurized again, and is supplied to the liquid cooling heat sink 4.
[0014]With the couplers 7, 9, 14, and 17 mentioned above, since desorption is easy, the hose 6, 13, and 16 have realized structure with assembly nature or sufficient maintainability.
[0015]As mentioned above, by considering it as the structure where the pump 5 is mounted on the upper part of the liquid cooling heat sink 4, Since the necessity of preparing the space in which the pump 5 is installed separately in electronic equipment casing is lost and the hose from a pump to the liquid cooling heat sink 4 can be shortened, a liquid cooling system can be compactly carried in electronic equipment casing. Therefore, a cooling capability turns into that it is high and it is possible to mount the liquid cooling system of a low noise, without changing largely the electronic equipment casing structure of the present air system.
[0016]If the pump 5 is fixed to the upper part of the liquid cooling heat sink 4 and it enables it to deal with a pump and a liquid cooling heat sink as integral construction, The number of parts at the time of an assembly decreases, and since the integral-part kit of this pump and a liquid cooling heat sink can be further attached instead of the air cooling heat sink with a fan currently used abundantly with the actual condition personal computer etc., a liquid cooling system can be introduced into an electronic device reasonable.
[0017]It was considered as the structure where the pump 5 carried out refrigerant discharge and the part 7 was directly connected with the feed water coupler 9 of the liquid cooling heat sink 4 for piping etc. Therefore, since the hose from the pump 5 to the liquid cooling heat sink 4 can be shortened dramatically, the flow loss of the liquid refrigerant in a hose can be made small, as a result, head capability of the pump 5 can be made small, capability of a motor can be eventually made smaller, and a pump can be miniaturized.
[0018]The pump 5 comprises the impeller case 11 and the motor 12. In this example, although the pump 5 showed the example of the centrifugal type which rotates the impeller installed in the impeller case 11, and pressurizes a liquid refrigerant, it may be a positive displacement pump which pressurizes a liquid refrigerant by mechanical volume change using diaphragm etc. In this example, it mounts so that the axis of a motor and an impeller may become substantially vertical to the upper surface of the liquid cooling heat sink 4, and therefore, since the bottom surface of a motor is joined to the upper surface of the liquid cooling heat sink 4 in surfaces via the oscillation absorbing member 19, structure with the sufficient stability of a motor is realizable.
[0019]The motor 12 is a DC motor driven by DC power supply. Since DC voltage is changed and the rotational speed of a motor can be easily changed by considering it as a DC motor, control of refrigeration capacity is also attained. By using a motor as a DC brushless motor, it is a low noise and can realize the pump of a high lifetime.
[0020]The flow rate of a liquid refrigerant can build the liquid cooling system of 0.1 (a part for the liter /) reliable if it makes a drive voltage into what can drive also by the dry cell of a 1 - 1.5 (V) degree like an order in being comparatively small battery-operated [whose / of a pump] becomes possible. The flow rate of a liquid refrigerant like the order of 1 (a part for the liter /) in being comparatively large, If a drive voltage is made into the voltage which can be supplied by the DC power supply of the electronic device of 2 - 12(V) degree, since it is not necessary to prepare the exclusive power supply for pumps, a liquid cooling system can be built compactly and inexpensive. It is ** and the present invention may be an AC motor which does not necessarily limit the motor 12 to a DC motor, and it drives, for example by the AC power supply of 100(V)s or 200(V).
[0021]Since calorific capacity is large in water with easy acquisition being good and being especially pure water, the liquid refrigerant can make a cooling capability high, it is still stronger to corrosion, and since it is hard to deposit an impurity in a flow path, a reliable liquid cooling system is realizable. If the antifreeze solution which added ethylene glycol etc. is used for water as a liquid refrigerant, the passage part damage by liquid refrigerant freezing at the time of chill

Cooler Master Co., Ltd. Exhibit 1006, Page 207 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

can be prevented. If non-conductivity refrigerants, such as perfluorocarbon, are used for a liquid refrigerant, accidents, such as a short circuit of an electronic circuit, can be prevented also at the time of emergency liquid leakage.

[0022]It describes using Fig.2 about the second working example of the present invention. In this example, it mounts so that the axis of the motor 5 and an impeller may become substantially parallel to the upper surface of the liquid cooling heat sink 4. Thereby, it can carry compactly on the liquid cooling heat sink 4 also with a high-output pump with the long axial direction length of a motor highly [a motor output] therefore. In this example, the pump 5 is fixed with the bracket 20 on the liquid cooling heat sink 4. The bracket 20 can be made into the structure where a material is an oscillation absorbing member or vibration of the pump 5 cannot affect electronic components, such as direct CPU, easily by using an oscillation absorbing member for the part. The second working example is the same as a first working example except the above.

[0023]It describes using Fig.3 about the third working example of the present invention. This example shows the example which mounted the pump and the liquid cooling system of a liquid cooling heat sink integral type which were shown in the first working example in actual electronic equipment casing.

[0024]The heating elements 1, such as LSI, are mounted on the wiring substrate 2 which is a mother board. On the heating element 1, the liquid cooling heat sink 4 for carrying out liquid cooling of the heating element 1 is mounted. The pump 5 is mounted on the upper part of the liquid cooling heat sink 4. On the wiring substrate 2, the card mounting boards 23, such as the heating elements 22a, 22b, and 22c which can be cooled with air cooling, such as memory LSI and driver LSI, in addition to heating element 1, an IO card and a memory card, and a hard disk, etc. are mounted. The wiring substrate 2 is stored in the case 24 of electronic equipment casing. The fan 34 for air cooling is attached to the case 24, and air cooling of the above-mentioned many air cooling part article is carried out by the cooling wind 25.

[0025]The liquid refrigerant heated with the liquid cooling heat sink 4 flows, as the hose 16 shows to 18, and it is connected to the heat exchanger 27 attached to the side board 32 of a housing case via the connecting coupler 26. In this example, piping of the heat exchanger 27 contacts the side board 32 thermally, and is attached to it, and a liquid refrigerant flows upwards, moving in a zigzag direction like 28 or 29 within a heat exchanger. After being able to extend the heat of a liquid refrigerant by heat conduction to the side-board 32 whole, it radiates heat by the cooling wind 25 by the airstream 33 by a free convection and the fan 34 of the circumference of electronic equipment casing.

[0026]It flows like 30, and is connected to the hose 13 of a return end via the connecting coupler 31, and the cooled liquid refrigerant returns to the pump 5 like 15, is pressurized again, and is supplied to the liquid cooling heat sink 4.

[0027]There is the method of constituting the side board 32 from metallic materials, such as aluminum, magnesium, and copper, constituting piping of a heat exchanger from a metallic material further as an example of the constitution method of the side board 32 and the heat exchanger 27, and connecting both with metal junction, thermally conductive adhesives, etc., such as brazing and soldering. In this case, since heat conduction can be made good, the cooling capability of a liquid cooling system can be improved. The metal plate of two sheets is joined where the meandering passages of a heat exchanger are vacated, and if processes, such as a roll bond which forms a side board and a heat exchanger integrally, are used, a heat exchanger can be manufactured more inexpensive. However, even if the side boards 32 are nonmetal materials, such as a product made of resin, or piping of the heat exchanger 27 is a nonmetal material, the effect of the present invention is realizable.

[0028]As mentioned above, since the necessity of preparing the space in which the pump 5 is separately installed by having composition of this example in electronic equipment casing is lost and the hose from a pump to the liquid cooling heat sink 4 can be shortened, a liquid cooling system can be compactly carried in electronic equipment casing.

[0029]Without changing largely the electronic equipment casing structure of the present air system, only by adding the side board 32 provided with the heat exchanger 27, a pump integral-type liquid cooling heat sink, and the two connection hose 13 and 16, a cooling capability is high and it becomes possible to realize the liquid cooling system of a low noise.

[0030]Since the integral-part kit of this pump and a liquid cooling heat sink can be attached instead of the air cooling heat sink with a fan currently used abundantly with the actual condition personal computer etc., a liquid cooling system can be introduced into an electronic device reasonable. If the power supply of a pump has the power supply for fans and compatibility of an air cooling heat sink with a fan, it cannot be overemphasized that introducing becomes still easier.

[0031]

[Effect of the Invention]As described above, according to the present invention, a liquid cooling system can be compactly carried in electronic equipment casing in the first place.

[0032]Without changing largely the electronic equipment casing structure of the present air system, a cooling capability is high and can mount [second] a reliable liquid cooling system with a low noise.

[0033]Since the number of parts at the time of an assembly decreases, and the integral-part kit of a pump and a liquid cooling heat sink can be attached to the third instead of being an air cooling heat sink with a fan, a liquid cooling system can be introduced into an electronic device reasonable.

[0034]Head capability of a pump can be made small, capability of a motor is made smaller, and it can miniaturize [fourth].

[0035]The rotational speed of a pump can be changed and refrigeration capacity can be used [fifth] as a controllable liquid cooling system.

Previous Document 1/1 Next Doc

Cooler Master Co., Ltd. Exhibit 1006, Page 208 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

To return to the top of

Notice on Use Privacy Policy Disclaimer

[Translation done.]

Cooler Master Co., Ltd. Exhibit 1006, Page 209 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

ANLAGE E9/AST14

【19】中華民國　　【12】專利公報　（U）

【11】證書號數：　M256682
【45】公告日：　中華民國　94 (2005)　年　02 月 01 日
【51】Int. Cl.[7]：　H05K7/20
　　G06F1/20

新型　　全 8 頁

【54】名　稱：電子元件冷卻裝置

【21】申請案號：　093206300　　【22】申請日期：　中華民國　93　(2004)　年 04 月 23 日

【72】創 作 人：
陳世雄
林宥任
陳桂村
陳文彬
【71】申請人：
宣普科技股份有限公司
新竹縣湖口鄉八德路2段471號4樓
【74】代理人：謝佩玲 先生

1

[57]申請專利範圍：

1.一種電子元件冷卻裝置，包括：
一本體，設有第一容置室及第二容置室，於該第二容置室形成有一儲水空間；
一熱交換器，設於本體之第一容置室內，該熱交換器設有二導流孔；
一泵浦，設於本體之第二容置室內，該泵浦具有二水流孔；以及
二流道，連通熱交換器之導流孔與泵浦之水流孔的第一流道，及連通熱交換器之另一導流孔與第二容置室之儲水空間的第二流道。

2.如申請專利範圍第1項所述電子元件冷卻裝置，其中該本體之第二容置室具有一開口，該開口係供一蓋板覆蓋，該蓋板設有一連接孔，該連接孔係供連通於熱交換器之導流孔。

3.如申請專利範圍第2項所述電子元件冷卻裝置，其中該第二容置室之開

2

Cooler Master Co., Ltd. Exhibit 1006, Page 210 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

口周緣與蓋板間設有墊圈。

4.如申請專利範圍第2項所述電子元件冷卻裝置，其中該第二容置室之儲水空間係介於本體之蓋板與泵浦之間。

5.如申請專利範圍第1項所述電子元件冷卻裝置，其中該熱交換器係包含有底座及上板，該底座設有循環迴路及一導流孔，另該上板則設有另一導流孔，該等導流孔係分別設於循環迴路之前、後兩端。

6.如申請專利範圍第5項所述電子元件冷卻裝置，其中該底座之循環迴路內設有複數散熱鰭片。

7.如申請專利範圍第5項所述電子元件冷卻裝置，其中該熱交換器之上板與底座間設有一墊圈。

8.如申請專利範圍第1項所述電子元件冷卻裝置，其中該第一流道係位於本體之內部。

9.如申請專利範圍第1項所述電子元件冷卻裝置，其中該第二流道係位於本體之外部。

10.如申請專利範圍第9項所述電子元件冷卻裝置，其中該第二流道上設有一散熱器，該散熱器包含導管、散熱片及散熱風扇，以協助內部流體之散熱作用。

圖式簡單說明：

第一圖　係為習知冷卻裝置結構示意圖。

第二圖　係為本創作之立體分解圖。

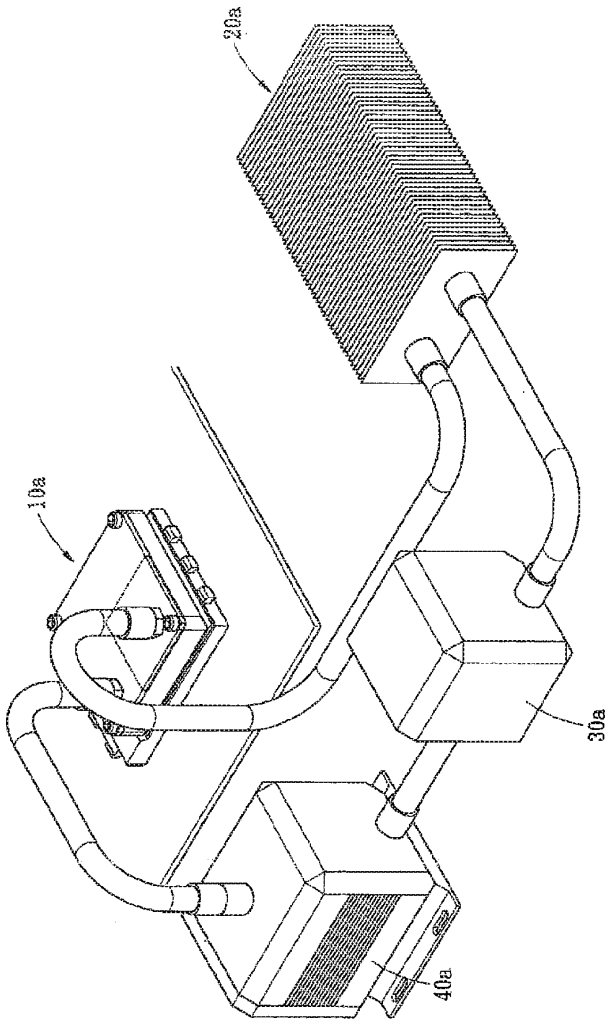
第三圖　係為本創作之組合示意圖。

第四圖　係為本創作之組合剖視圖。

第五圖　係為本創作應用於發熱元件之使用狀態圖。

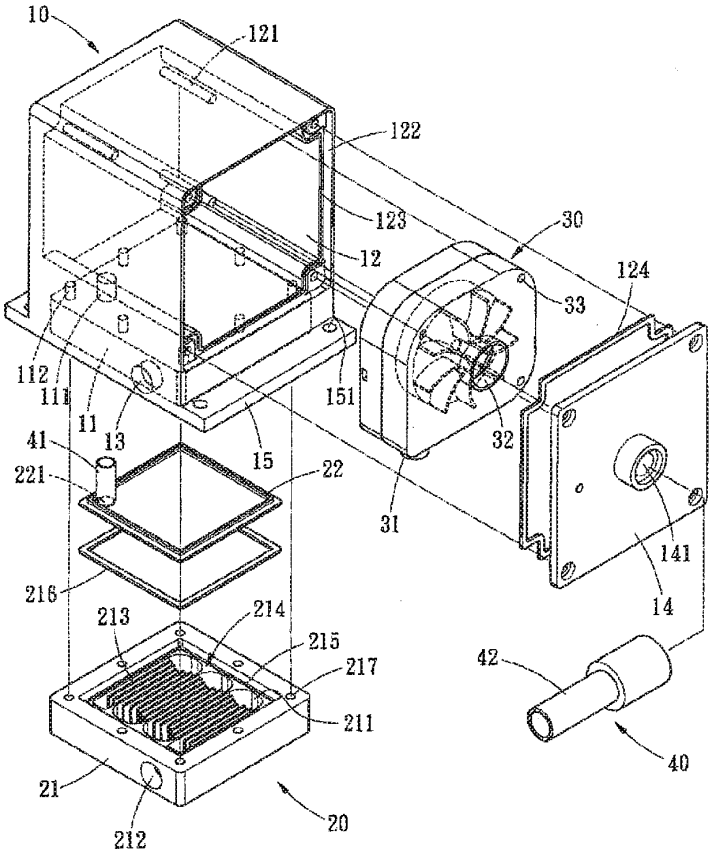
第六圖　係為本創作應用於發熱元件之使用狀態剖視圖。

Cooler Master Co., Ltd. Exhibit 1006, Page 211 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



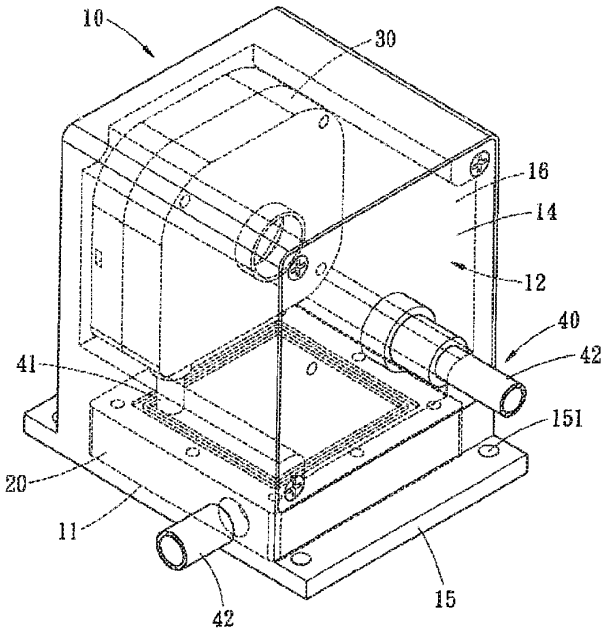
第一圖

Cooler Master Co., Ltd. Exhibit 1006, Page 212 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



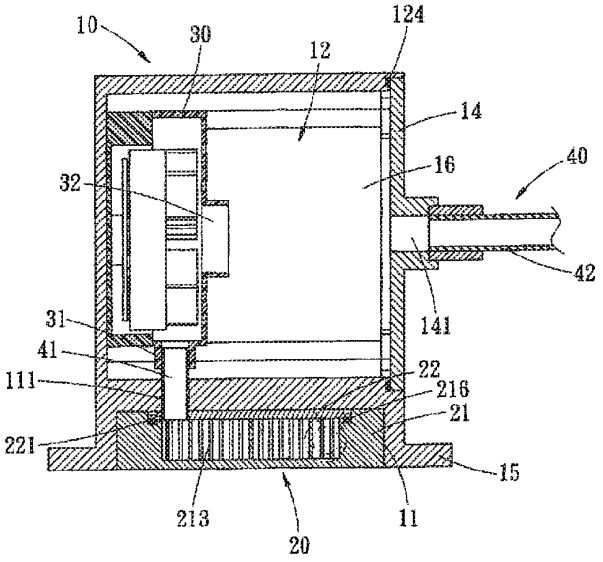
第二圖

Cooler Master Co., Ltd. Exhibit 1006, Page 213 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



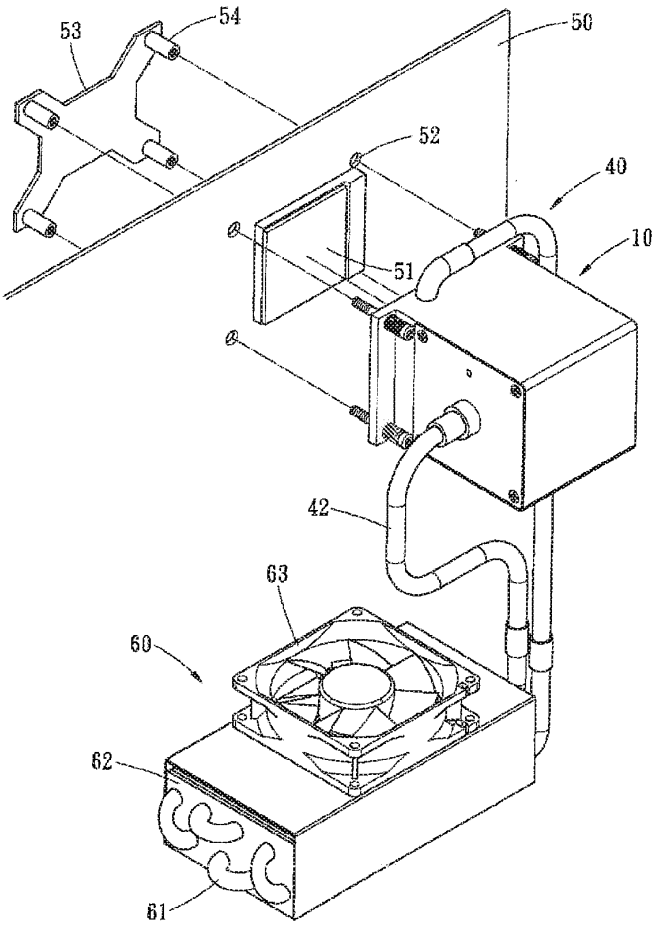
第三圖

Cooler Master Co., Ltd. Exhibit 1006, Page 214 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



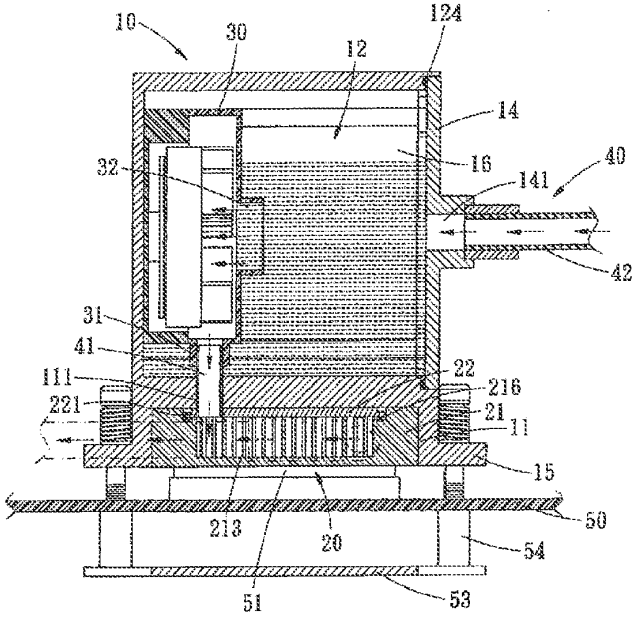
第四圖

Cooler Master Co., Ltd. Exhibit 1006, Page 215 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



第五圖

Cooler Master Co., Ltd. Exhibit 1006, Page 216 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497



第六圖

Cooler Master Co., Ltd. Exhibit 1006, Page 217 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

M256682

ANLAGE E9a/ASR14a

Publication	(an illegible stamp) M256682
Filing date: April 23, 2004	IPC classification
Application No. 93206300	H05K 7/20 G06 F 1/20

(the above table is completed by the Office) Specification of Utility Model		
I. Title of the utility model	Chinese	Cooling Device for Electronic Element
	English	
II. Inventors (four persons in total)	Name (Chinese)	1. Shi-Hsiong Chen 2. You-Jen Lin 3. Gui-Cun Chen
	Name (English)	1. 2. 3.
	Nationality (Chinese and English)	1.ROC TW 2. ROC TW 3. ROC TW
	Residential address (Chinese)	1. 8th floor, Unit 1, No. 66, Section 2, Nan Kan Rd., Luchu Township, Taoyuan County 2. 8th floor, Unit 1, No. 66, Section 2, Nan Kan Rd., Luchu Township, Taoyuan County 3. 8th floor, Unit 1, No. 66, Section 2, Nan Kan Rd., Luchu Township, Taoyuan County
	Residential address (English)	1. 2. 3.
III. Applicant (1 person in total)	Title of name (Chinese)	1.Simplo Technology Co. Ltd.
	Title of name (English)	1.
	Nationality(Chinese and English)	1. ROC TW
	Residential address(Business address) (Chinese)	1. 4th floor, No. 471, Section 2, Ba Te Rd., Hu Kou Township, Tsinchu County (this address is the same as the one previously filed with the Office)
	Residential address(Business address) (English)	
	Representative (Chinese)	1. Fu-Tsiang Song
	Representative (English)	1.



Filing date: April 23, 2004	
Application No.: 93206300	IPC Classification

(The above table is completed by the Office) Specification of Utility Model		
I. Title of the utility model	Chinese	
	English	
II. Inventors (four persons in total)	Name (Chinese)	4. Wen-Bin Chen
	Name (English)	4.
	Nationality (Chinese and English)	4.ROC TW
	Residential address (Chinese)	4. 8th floor, Unit 1, No. 66, Section 2, Nan Kan Rd., Luchu Township, Taoyuan County
	Residential address (English)	4.
III. Applicant (1 person in total)	Title or name (Chinese)	
	Title or name (English)	
	Nationality(Chinese and English)	
	Residential address(Business address) (Chinese)	
	Residential address(Business address) (English)	
	Representative (Chinese)	
	Representative (English)	



Cooler Master Co., Ltd. Exhibit 1006, Page 219 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

I. The present application has filed a patent application with country (region); filing date: application No.; claim the priority of Item 1, Article 24 under Article 105 of the Patent Law

NONE

II. □ Claim the priority of Paragraph 1, Article 25-1 under Article 105 of the Patent Law
Application No.:
Date: NONE

III. Claim that the present application meets the period prescribed in the proviso of Subparagraph 1 □ or subparagraph 2 □, Paragraph 1, Article 98 of the Patent Law

Date:

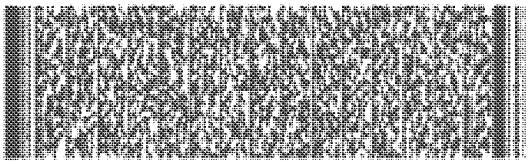


Cooler Master Co., Ltd. Exhibit 1006, Page 220 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IV. Abstract in Chinese (Title: Cooling device for electronic element)

Disclosed is a cooling device for an electronic element, comprising a main body, a heat exchanger, a pump and two channels, wherein the main body is provided with a first accommodating chamber and a second accommodating chamber, the first accommodating chamber being provided for arrangement of a heat exchanger having two guide holes, while the second accommodating chamber being provided for arrangement of a pump and having a water storage space. The pump has a water pore that is in communication with the guide hole of the heat exchanger to form a first channel, while the other guide hole is in communication with the water storage space of the second accommodating chamber to form a second channel. Whereby, by accommodating the heat exchanger and the pump inside the main body, the number of joints used between various elements and the number of paths in which the fluid flows both can be reduced, so that the leakage of fluid is effectively avoided and the size of the cooling device can be greatly reduced.

V. Abstract in English (Title:)



Cooler Master Co., Ltd. Exhibit 1006, Page 221 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

VI. Representative drawings

(I) Representative drawing of the application: Fig. 3

(II) Description of reference numbers of elements in the representative drawing

10: Main body

11: First accommodating chamber

12: Second accommodating chamber

14: Cover plate

141: Through hole

15: Extension plate

151: Bore

16: Water storage space

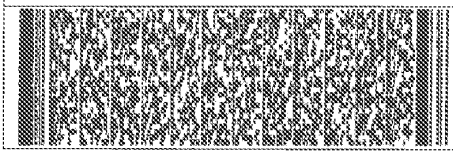
20: Heat exchanger

30: Pump

40: Channel

41: First channel

42: Second channel



Cooler Master Co., Ltd. Exhibit 1006, Page 222 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IV. Description (1)

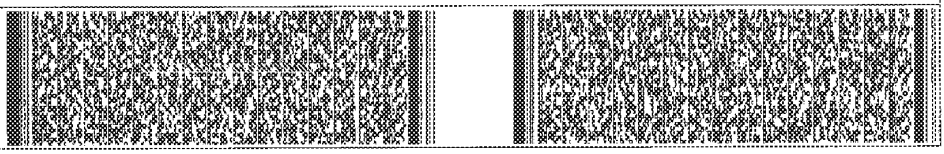
[Technical Field]

The disclosure provides a cooling device for an electronic element, in particular to a cooling device mounted on a CPU or heating element of a computer, in which the number of joints used between various elements and the number of paths in which the fluid flows both can be reduced, so that the leakage of fluid is effectively avoided and the size of the cooling device can be greatly reduced.

[Background of the Utility Model]

As the CPU of a computer in the prior art operates slowly, an air-cooled radiation device formed of a radiator and a cooling fan is sufficient to serve as a radiation apparatus. However, recently, the clock of the CPU had already been over 3GHz, and the clock is in direct proportion to heat. Therefore, limited by the space inside the chassis, such air-cooled radiation device becomes increasingly difficult to follow the operating speed of the CPU to effectively solve the cooling problem. In addition, the noise generated by a high-speed cooling fan is also unbearable. Therefore, a water-cooled radiation structure with high cooling effect and low noise is proposed to provide another solution for the cooling issue.

Referring to Fig. 1, shown is a cooling device for an electronic element in the prior art, mainly comprising a heat exchanger 10a, a radiator 20a, a water tank 30a and a pump 40a, wherein the heat exchanger 10a is disposed above a heating element, the radiator 20a, the water tank 30a and the pump 40a are connected in turn via various different guide pipes, and then one end of the pump 40a is connected to the heat exchanger 10a. When the pump 40a operates, it drives fluid inside the pump to circulate and flow continuously, so as to take heat generated by the operating of the heating element away, for the purpose of cooling.



Cooler Master Co., Ltd. Exhibit 1006, Page 223 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IV. Description (2)

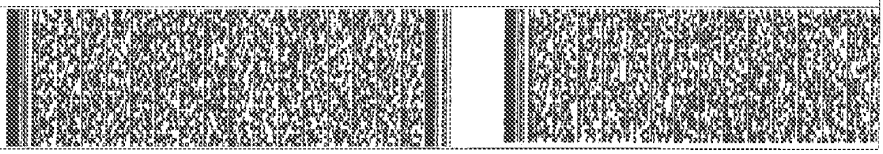
However, for a cooling device for an electronic element in the prior art as described above, as each element has two joints for connection of various different guide pipes and most of such guide pipes are made of flexible plastic or rubber hoses, such guide pipes are likely to be hardened or cracked after a period of time of use, as a result, fluid inside the guide pipes leaks from the cracks, and the damage of the surrounding electronic elements is further caused. In addition, as the elements are separated, the assembled cooling device will occupy most of the space after disposed on the circuit board, so that both the economic benefit and the practicability are reduced, against the development trend (light, thin, short and small)of electronic products.

Therefore, in view of the above problems, based on many years of research experience, on account of inconveniences and problems to be improved, the inventor devotes substantial attention to the research and development in aid of practical applications and finally proposes this disclosure that is rational in design and effectively improves the above problem.

[Summary of the Utility Model]

The major purpose of the disclosure is to provide a cooling device for an electronic element, in which by accommodating the heat exchanger and the pump inside the main body, the number of joints used between various elements and the number of paths in which the fluid flows both can be reduced, so that the leakage of fluid is effectively avoided and the size of the cooling device can be greatly reduced.

To realize the above purpose, the disclosure provides a cooling device for an electronic element, mounted on a CPU or heating element of a computer, comprising a main body, a heat exchanger, a pump and two channels, wherein the main body is provided with a first accommodating chamber and a second accommodating chamber, the first accommodating chamber being provided for arrangement of a heat exchanger having two guide holes, while the second accommodating chamber being provided for arrangement of a pump and having a water storage space. The pump has a water pore that is in communication with the guide hole of the heat exchanger to form a first channel, while the other guide hole is in communication with the water storage space of the second accommodating chamber to form a second channel. Then, the above purpose is realized.



Cooler Master Co., Ltd. Exhibit 1006, Page 224 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IV. Description (3)

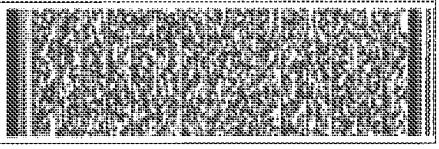
[Detailed Description of the Utility Model]

To further understand the features and technical contents of the disclosure, please refer to the detailed descriptions and accompanying drawings as below. All accompanying drawings are provided for reference, not for limiting the disclosure.

Referring to Fig. 2, Fig. 3 and Fig. 4, shown are exploded three-dimensional view, assembly view and sectional assembly view of the disclosure, respectively. The disclosure provides a cooling device for an electronic element, mainly comprising a main body 10, a heat exchanger 20, a pump 30 and two channels 40.

The main body 10 is rectangular, provided with a first accommodating chamber 11 and a second accommodating chamber 12. The first accommodating chamber 11 is located on the bottom of the main body 10, a vertical through hole 111 is provided between the first accommodating chamber 11 and the second accommodating chamber 12, and the first accommodating chamber 11 is provided with a transverse perforate 13 on one side and a plurality of screw holes 112 inside. The second accommodating chamber 12 is located above the first accommodating chamber 11, with multiple raised columns 121 extending inside the second accommodating chamber 12. A stepped opening 122 is provided on one side of the second accommodating chamber 12, and an annular groove 123 inside which a washer 124 may be accommodated is provided on the periphery of the opening 122. In addition, the opening 122 may be covered by a cover plate 14, the center of which is formed with a connection hole 141. Moreover, extension plates 15 are extended from two bottom ends of the main body 10, respectively, and bores 151 are provided at all corners of the extension plates 15, respectively.



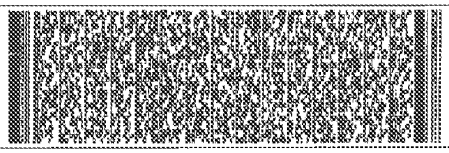


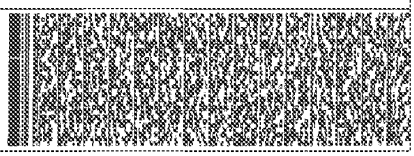
Cooler Master Co., Ltd. Exhibit 1006, Page 225 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IV. Description (4)

The heat exchanger 20 may be accommodated inside the first accommodating chamber 11 of the main body 10 and it comprises a base 21 and an upper plate 22. The base 21 is made of aluminum, copper or other materials with excellent heat conductivity, and is rectangular. A circulation loop 211 and a guide hole 212 are provided inside the base 21, the guide hole 212 being located at the tail end of the circulating loop 211 and corresponding to the position of the perforate 13 of the first accommodating chamber 11, and a plurality of cooling fins 213 being extended upward from the bottom of the circulation loop 211 to enhance the cooling effect of the heat exchanger 20. In addition, the base 21 has a stepped notch 214 located above the circulation loop 211, and a frame-shaped chute 215 inside which a washer 216 may be accommodated is provided around the outside of the circulation loop 211. In addition, the notch 214 may be covered by the upper plate 22, and the upper plate 22 is provided thereon with a guide hole 221, the guide hole 221 being perfectly corresponding to the through hole 111 of the main body 10 and located at the front end of the circulation loop 211. A plurality of fixed holes 217 are provided around the outside of the notch 214 of the base 21, and these fixed holes 217 are corresponding to the screw holes 112 of the first accommodating chamber 11 for locking and connecting of elements such as screws.

The pump 30 is a centrifugal pump having two water holes 31 and 32. Multiple perforates 33 are provided at corners of the pump 30. The perforates 33 correspond to the raised columns 121 of the second accommodating chamber 12 for the raised columns 121 to penetrate through for connection, and fasten and position the pump 30 inside the second accommodating chamber 12 of the main body 10. When the pump 30 is fixedly disposed on one side of the second accommodating chamber 12, the size of the pump 30 is far smaller than that of the second accommodating chamber 12. A water storage space 16 is formed on the other side of the second accommodating chamber 12, and the water storage space 16 is located between the cover plate 14 of the main body 10 and the pump 30.





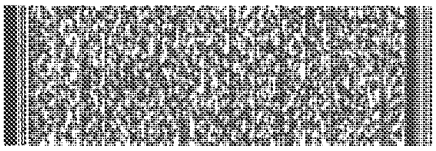
Cooler Master Co., Ltd. Exhibit 1006, Page 226 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

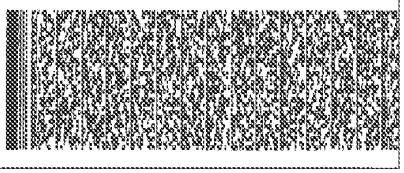
IV. Description (5)

The channel 40 comprises a first channel 41 and a second channel 42, the first channel 41 being a channel like a water pipe that is in communication with the guide hole 221 of the upper plate 22 from the water hole 31 of the pump 30, while the second channel 42 being also a channel like a water pipe that is in communication with the guide hole 212 of the heat exchange 20 from the connection hole 141 of the cover plate.

Referring to Fig. 5 and Fig. 6, shown are use state view and sectional view of the cooling device of the disclosure applied in a heating element. Via the combination of the above elements, the cooling device of the disclosure may be applied in a heating element 51 of an upright circuit board 50. Multiple through holes 52, disposed to be corresponding to the bores 151 of the main body 10, are provided on the outer periphery of the heating element 51. A fixed rack 53 is provided on the other side of the circuit board 50, and raised shafts 54 are extendedly provided at all corners of the fixed rack 53, respectively. The raised shafts 54 have screw holes, the diameter of the outer edge of which is larger than that of the through holes 52. The circuit board 50 and the heating element 51 may be clamped between the fixed rack 53 and the main body 10, with the top surface of the heating element 51 flatly laid on the base 21 of the heat exchanger 20, and then locked and connected by elements such as bolts. In addition, the second channel 42 may be connected with a radiator 61 comprising a conduit 61, a plurality of cooling fins 62 and a cooling fan 63, the conduit 61 being in series connected onto each of the cooling fins 62, the cooling fan 63 being fixedly disposed on the cooling fins 62, assisting in cooling the internal fluid.

When the pump 30 starts to operate, fluid will flow into the circulation loop 211 of the heat exchanger 20 via the first channel 41 from the water hole 31 of the pump 30, take the heat generated by the operating of the heating element 51 away, flow through the radiator 60 on the channel 40 to be cooled, and then flow back to the water storage space 16 of the second accommodating chamber 12. In this way, a circulating high-efficiency cooling device is formed.





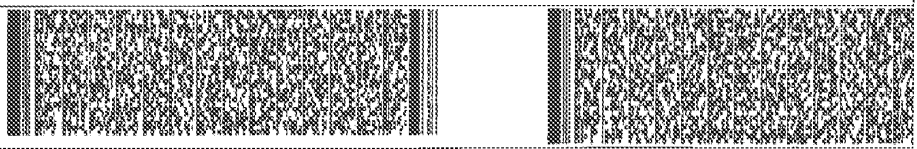
Cooler Master Co., Ltd. Exhibit 1006, Page 227 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IV. Description (6)

As described, the cooling device for an electronic element according to the disclosure at least has the following advantages. By accommodating the heat exchanger and the pump inside the main body, the number of joints used between various elements and the number of paths in which the fluid flows both can be reduced, so that the leakage of fluid is effectively avoided and the size of the cooling device can be greatly reduced. In addition, as multiple cooling fins are provided inside the circulation loop of the heat exchanger, the cooling area of the heat exchanger is increased. Moreover, as a radiator is provided on the second channel, fluid inside the channel is cooled, and the heat conductivity of the cooling device is further improved.

In conclusion, it should be understood that cooling device for an electronic element of the disclosure has possessed industrial applicability, novelty and inventiveness. The construction of the disclosure has not yet been known in similar products or used publicly, still not published in any journals before application. The application requirements of utility model patents have been completely met.

The above contents just describe the preferred and feasible embodiments of the disclosure and are not provided for limiting the protection scope of the disclosure. Therefore, any equivalent structure changes done according to the descriptions and drawings of the disclosure or direct or indirect applications of the disclosure in other related technical fields should be included in the scope of the disclosure.



Cooler Master Co., Ltd. Exhibit 1006, Page 228 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Brief Description of the Drawings

[Brief Description of the Drawings]

Fig. 1 is a structure diagram of a cooling device in the prior art;

Fig. 2 is an exploded three-dimensional view of the disclosure;

Fig. 3 is an assembly view of the disclosure;

Fig. 4 is a sectional assembly view of the disclosure; and

Fig. 5 is a use state view of the cooling device of the disclosure applied in a heating element;

Fig. 6 is a sectional use state view of the cooling device of the disclosure applied in a heating element.

[Description of Reference Numbers]

[Prior Art]

10a: Heat exchanger

20a: Radiator

30a: Water tank

40a: Pump

[The present invention]

10: Main body

11: First accommodating chamber

111: Through hole

112: Screw hole

12: Second accommodating chamber

121: Raised column

122: Opening

123: Groove

124: Washer

13: Perforate

14: Cover plate

141: Connection hole

15: Extension plate

151: Bore

20: Heat exchanger

21: Base

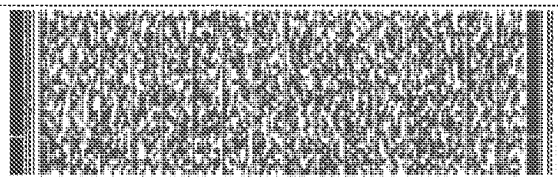
211: Circulation loop

212, 221: Guide hole

213: Cooling fin

214: Notch

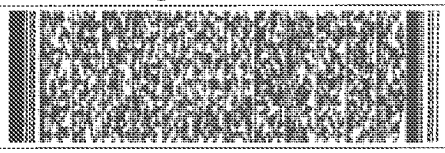
215: Chute



Cooler Master Co., Ltd. Exhibit 1006, Page 229 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Brief Description of the Drawings

216: Washer
217: Fixed hole
22: Upper plate
30: Pump
31, 32: Water hole
33: Perforate
40: Channel
41: First channel
42: Second channel
50: Circuit board
51: Heating element
52: Through hole
53: Fixed rack
54: Raised shaft
60: Radiator
61: Conduit
62: Cooling fin
63: Cooling fan



Cooler Master Co., Ltd. Exhibit 1006, Page 230 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

V. Claims

1. A cooling device for an electronic element, comprising:

a main body, provided with a first accommodating chamber and a second accommodating chamber in which a water storage space is formed;

a heat exchanger, disposed inside the first accommodating chamber, the heat exchanger being provided with two guide holes;

a pump, disposed inside the second accommodating chamber, the pump having two water holes; and

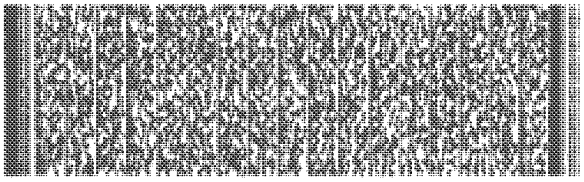
two channels, comprising a first channel in communication with a guide hole of the heat exchanger and a water hole of the pump and a second channel in communication with the other guide hole of the heat exchanger and the water storage of the second accommodating chamber.

2. The cooling device for an electronic element according to claim 1, wherein the second accommodating chamber of the main body has an opening that is covered by a cover plate; and the cover plate is provided with a connection hole that is in communication with the guide hole of the heat exchanger.

3. The cooling device for an electronic element according to claim 2, wherein a washer is provided between the periphery of the opening of the second accommodating chamber and the cover plate.

4. The cooling device for an electronic element according to claim 2, wherein the water storage space of the second accommodating chamber is located between the cover plate of the main body and the pump.

5. The cooling device for an electronic element according to claim 1, wherein the heat exchanger comprises a base provided thereon with a circulation loop and a guide hole, and an upper plate provided thereon with another guide hole; and these guide holes are disposed at the front end and the rear end of the circulation loop, respectively.



Cooler Master Co., Ltd. Exhibit 1006, Page 231 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

V. Claims

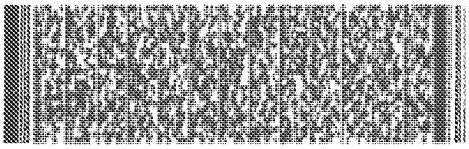
6. The cooling device for an electronic element according to claim 5, wherein multiple cooling fins are provided in the circulation loop of the base.

7. The cooling device for an electronic element according to claim 5, wherein a washer is provided between the upper plate of the heat exchanger and the base.

8. The cooling device for an electronic element according to claim 1, wherein the first channel is located inside the main body.

9. The cooling device for an electronic element according to claim 1, wherein the second channel is located outside the main body.

10. The cooling device for an electronic element according to claim 9, wherein the second channel is provided with a radiator comprising a conduit, cooling fins and a cooling fan, in assisting in cooling the internal fluid.



Cooler Master Co., Ltd. Exhibit 1006, Page 232 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Drawings:

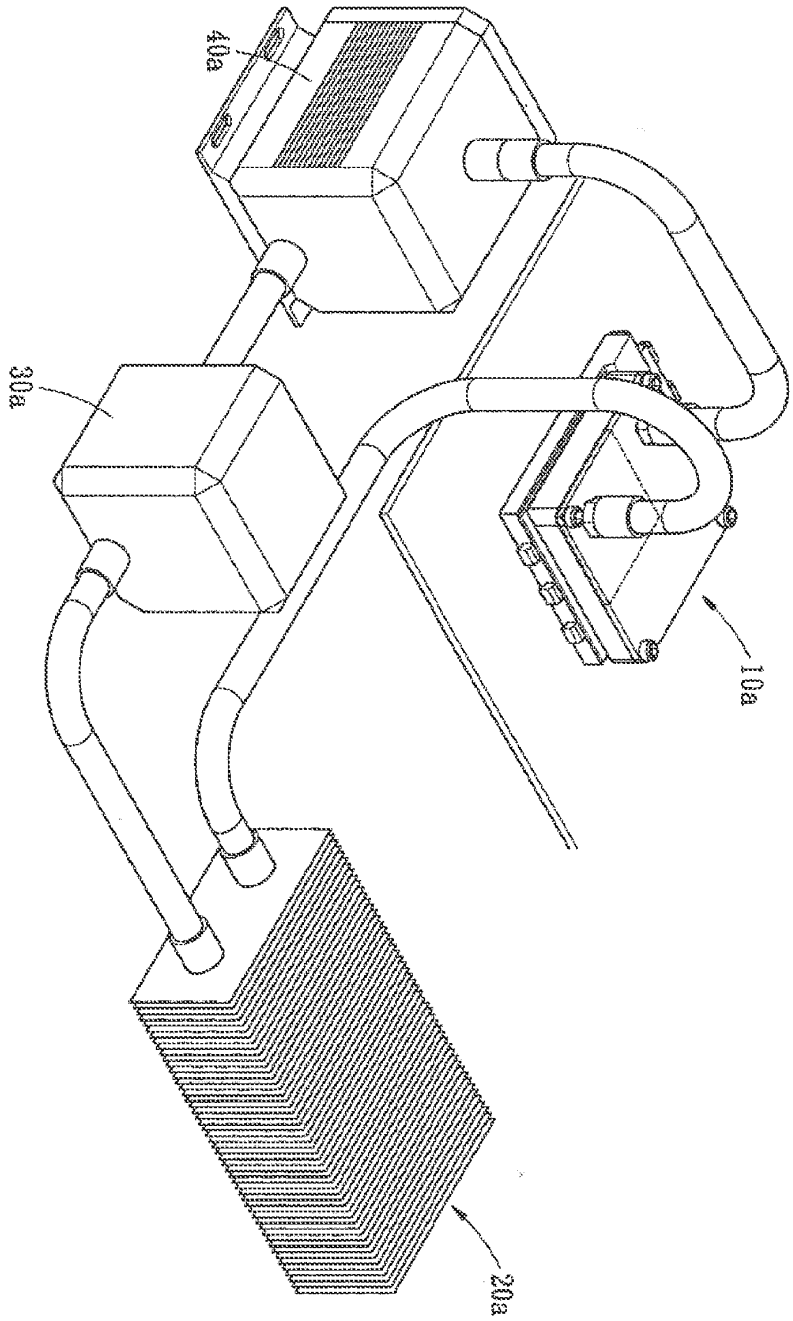


Figure 1

Cooler Master Co., Ltd. Exhibit 1006, Page 233 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Drawings

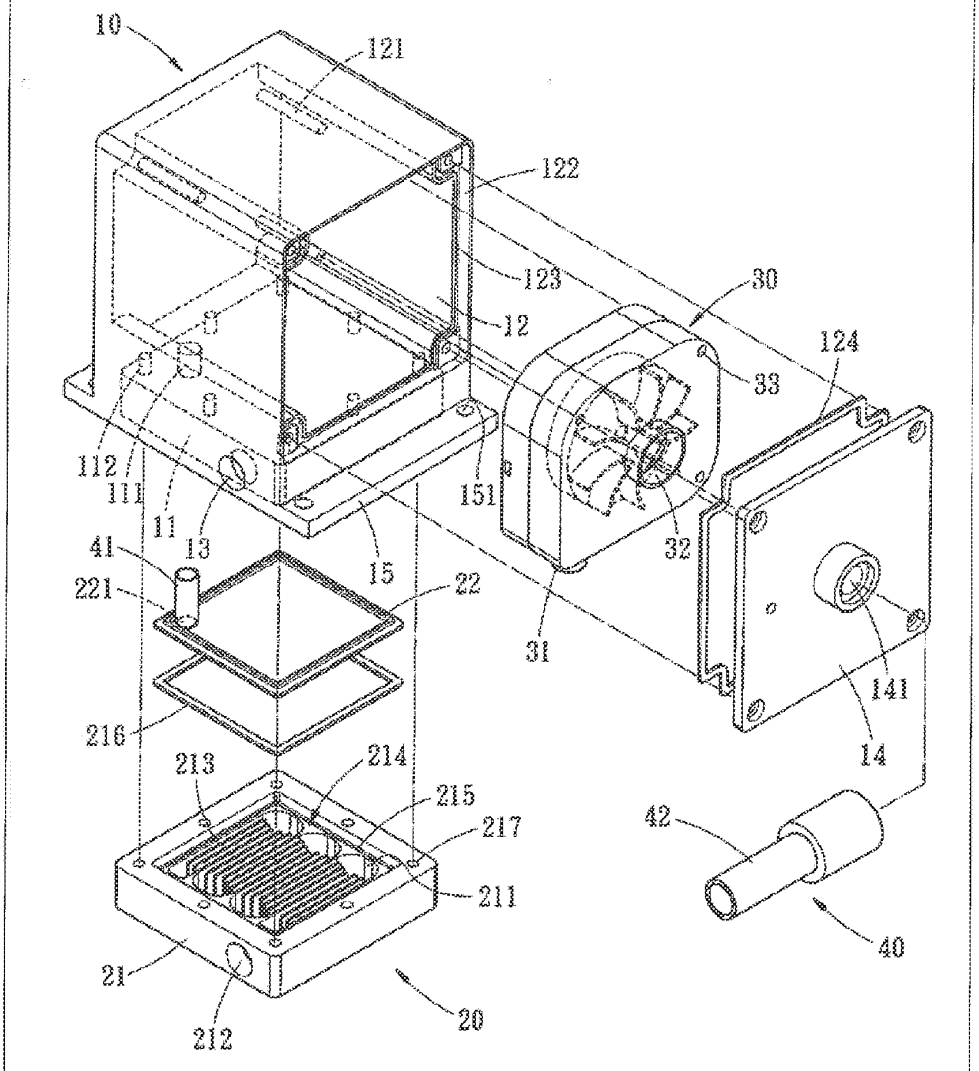


Figure 2

Drawings

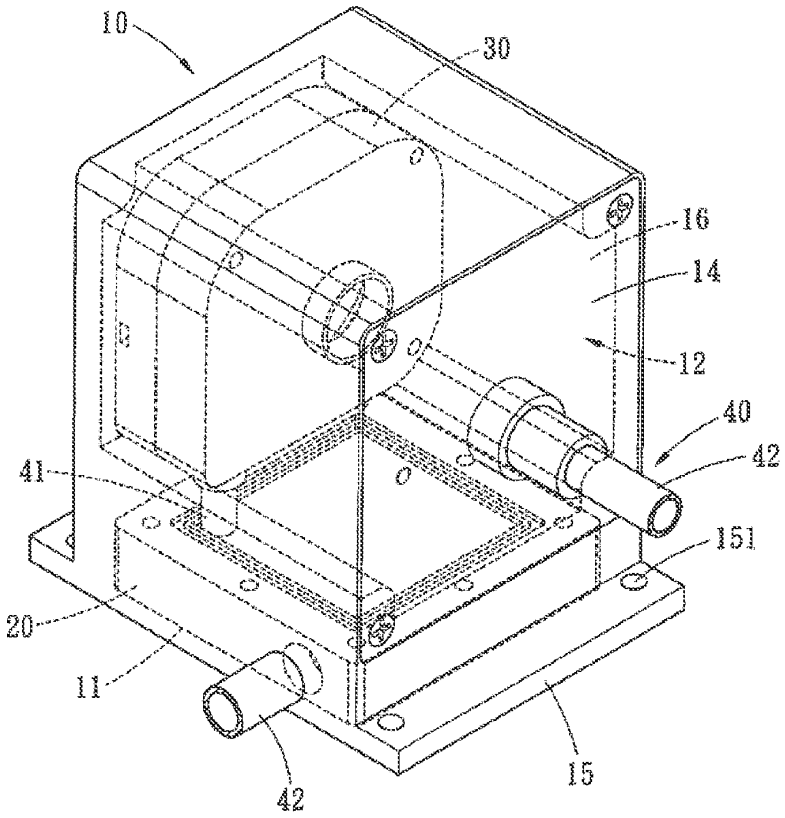


Figure 3

Cooler Master Co., Ltd. Exhibit 1006, Page 235 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Drawings

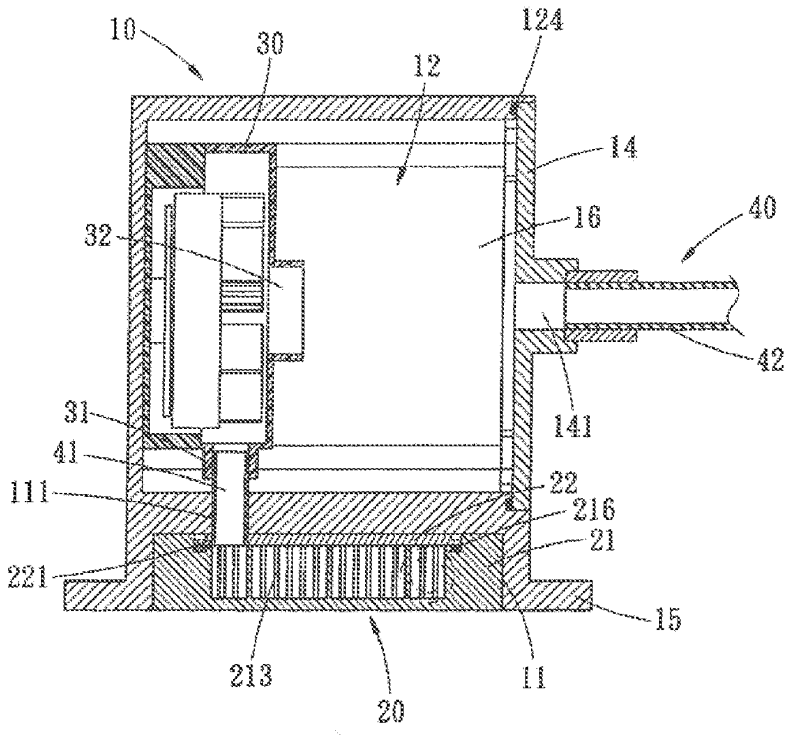


Figure 4

Cooler Master Co., Ltd. Exhibit 1006, Page 236 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Drawings

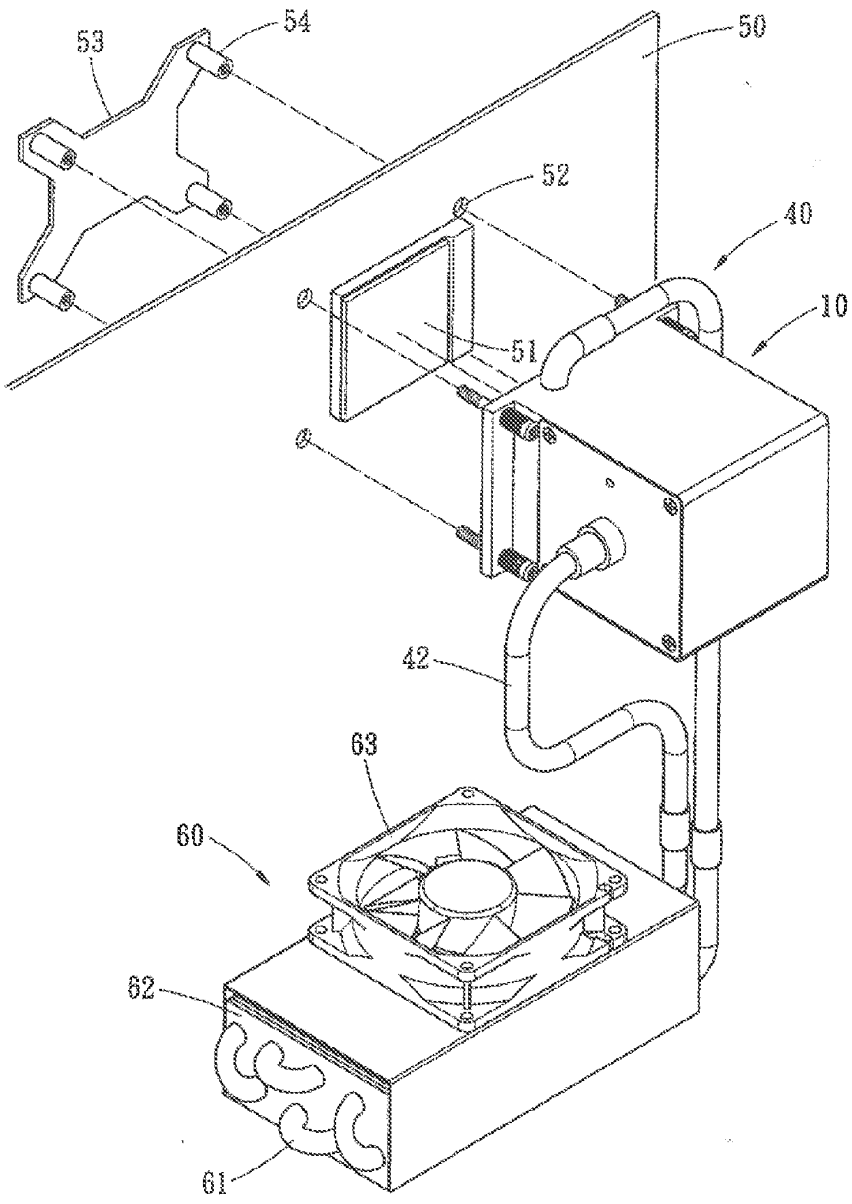


Figure 5

Cooler Master Co., Ltd. Exhibit 1006, Page 237 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Drawings

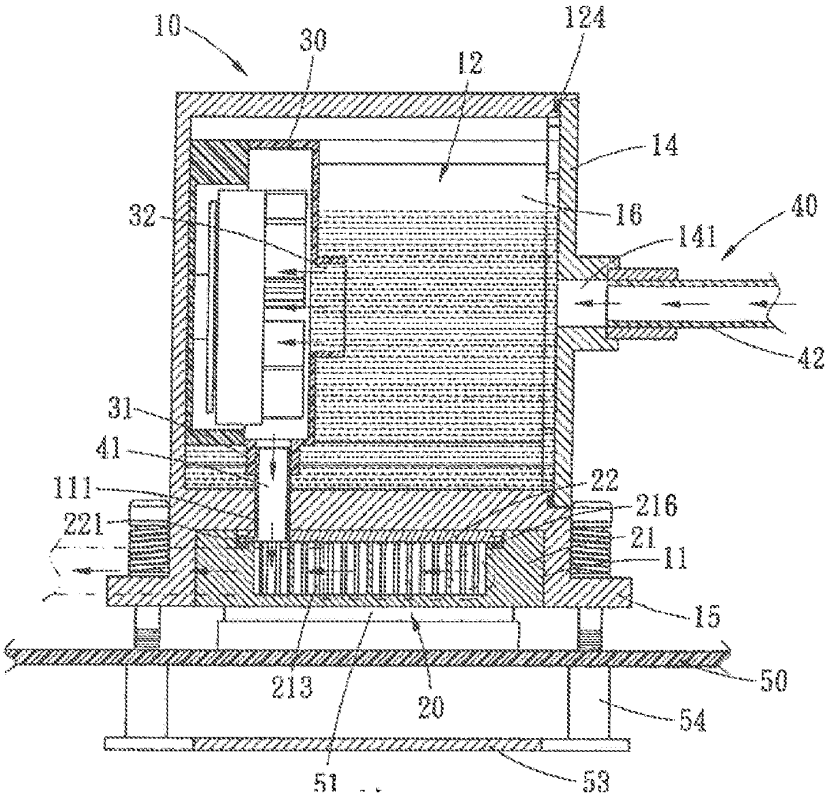


Figure 6

Cooler Master Co., Ltd. Exhibit 1006, Page 238 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Electronic Acknowledgement Receipt

EFS ID:	24435921
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	David Lefebvre/Julie Giordano
Filer Authorized By:	David Lefebvre
Attorney Docket Number:	10494.0003-03000
Receipt Date:	22-DEC-2015
Filing Date:	12-APR-2013
Time Stamp:	07:42:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	10494_0003_03_IDS_Transmittal.pdf	105789 88bbe1018c12cc7e78e3d720277e5f4fb9cfc37a	no	2

Warnings:	
Information:	

2	Information Disclosure Statement (IDS) Form (SB08)	10494_0003_03_IDS_SB08.pdf	94563 9d2a380697000522588 2a716551e0fb20d13b1b5	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	SB08_Ref_1_CN.pdf	876592 0fedaaba763e2e46bc80c1a89ed92400d089262a	no	13
Warnings:					
Information:					
4	Foreign Reference	SB08_Ref_1_Ab.pdf	497537 31675cfccbc40370f64780033c58c1edc13c0de5	no	9
Warnings:					
Information:					
5	Foreign Reference	SB08_Ref_2_JP.pdf	576127 ed664f2e77ca13b71afb7e8d6930ce5f9823d132	no	5
Warnings:					
Information:					
6	Foreign Reference	SB08_Ref_2_Ab.pdf	474373 1f6a3d10846b83ef06359ad873dbbc54ff06e6a6	no	5
Warnings:					
Information:					
7	Foreign Reference	SB08_Ref_3_TW.pdf	401386 b6d188b463b3e43cba236335ef474d1f7973a3a8	no	8
Warnings:					
Information:					
8	Foreign Reference	SB08_Ref_3_Ab.pdf	1462006 75eb645d146f25b328504bb814d9efab2c974c61	no	21
Warnings:					
Information:					
		Total Files Size (in bytes):	4488373		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT
Customer Number: 22,852
Attorney Docket No.: 10494.0003-03000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
André Sloth Eriksen	)	Group Art Unit: 3744
	)	
Application No.: 13/861,593	)	Examiner: Travis C. Ruby
	)	
Filed: April 12, 2013	)	Confirmation No.: 3473
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	***VIA EFS-WEB***
	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.97(b)

Pursuant to 37 C.F.R. §§ 1.56 and 1.97(b), Applicant brings to the attention of the Examiner the documents on the attached listing. To the undersigned's knowledge, this Information Disclosure Statement is being filed before the mailing date of a first Office Action on the merits for the above-referenced application.

Copies of the listed foreign documents are included with this submission.

Applicant respectfully requests that the Examiner consider the listed documents and indicate that they were considered by making appropriate notations on the attached form.

This submission does not represent that a search has been made or that no better art exists and does not constitute an admission that each or all of the listed documents are material or constitute "prior art." If the Examiner applies any of the documents as prior art against any claim

in the application and Applicant determines that the cited documents do not constitute "prior art" under United States law, Applicant reserves the right to present to the U.S. Patent and Trademark Office the relevant facts and law regarding the appropriate status of such documents.

Applicant further reserves the right to take appropriate action to establish the patentability of the disclosed invention over the listed documents, should one or more of the documents be applied against the claims of the present application.

If there is any fee due in connection with the filing of this Statement, please charge the fee to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: December 22, 2015

By: /David R. Lefebvre/
David R. Lefebvre
Reg. No. 72,868
(617) 646-1652

Cooler Master Co., Ltd. Exhibit 1006, Page 243 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

22852 7590 07/05/2016

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RUBY, TRAVIS C	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
07/05/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

regional-desk@finnegan.com

Office Action Summary	Application No. 13/861,593	Applicant(s) ERIKSEN, ANDRÉ SLOTH	
	Examiner TRAVIS RUBY	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *4/12/2013*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-18* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☐ Claim(s) _____ is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☒ Claim(s) *1-18* are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-7, drawn to a liquid cooling system having a double-sided chassis, classified in G06F1/206.

II. Claims 8-18, drawn to a cooling system having a centrifugal pump, classified in H01L23/473.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are directed to related products. The related inventions are distinct if: (1) the inventions as claimed are either not capable of use together or can have a materially different design, mode of operation, function, or effect; (2) the inventions do not overlap in scope, i.e., are mutually exclusive; and (3) the inventions as claimed are not obvious variants. See MPEP § 806.05(j). In the instant case, the inventions as claimed have a materially different design, mode of operation, function, or effect. Specifically, Invention I requires a double-sided chassis with a removable heat-exchanging interface, while Invention II requires a centrifugal pump. Furthermore, the inventions as claimed do not encompass overlapping subject matter and there is nothing of record to show them to be obvious variants.

3. Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and/or examination burden if restriction were not required because one or more of the following reasons apply:

(a) the inventions have acquired a separate status in the art in view of their different classification;

(b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;

(c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries).

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected invention.**

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103 or pre-AIA 35 U.S.C. 103(a) of the other invention.

4. This application contains claims directed to the following patentably distinct species:

Species A, as embodied in Figures 4-8, drawn to a single chambered reservoir;

Species B, as embodied in Figure 9-10, drawn to a channeled reservoir;

Species C, as embodied in Figures 11-13, drawn to an intermediate housing reservoir;

Species D, as embodied in Figure 14, drawn to a monolithic reservoir;

Species E, as embodied in Figures 15-16, drawn to a impeller in direct contact with channels of the reservoir;

Species F, as embodied in Figures 17 & 20, drawn to a conical reservoir;

5. The species are independent or distinct because the claims to the different species recite the mutually exclusive characteristics of such species. In addition, these species are not obvious variants of each other based on the current record.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species, or a single grouping of patentably indistinct species, for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, no claims are generic.

There is a search and/or examination burden for the patentably distinct species as set forth above because at least the following reason(s) apply:

(a) the inventions have acquired a separate status in the art in view of their different classification;

(b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;

(c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries).

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected species or grouping of patentably indistinct species**, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

The election may be made with or without traverse. To preserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the election of species requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected species or grouping of patentably indistinct species.

Should applicant traverse on the ground that the species, or groupings of patentably indistinct species from which election is required, are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing them to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the species unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103 or pre-AIA 35 U.S.C. 103(a) of the other species.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRAVIS RUBY whose telephone number is (571)270-5760. The examiner can normally be reached on Monday-Friday 9:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Allana Lewin can be reached on 571-272-5560. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	06/27/2016								
	1	÷								
	2	÷								
	3	÷								
	4	÷								
	5	÷								
	6	÷								
	7	÷								
	8	÷								
	9	÷								
	10	÷								
	11	÷								
	12	÷								
	13	÷								
	14	÷								
	15	÷								
	16	÷								
	17	÷								
	18	÷								

Cooler Master Co., Ltd. Exhibit 1006, Page 251 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
André Sloth Eriksen	)	Group Art Unit: 3744
	)	
Application No.: 13/861,593	)	Examiner: Travis C. Ruby
	)	
Filed: April 12, 2013	)	Confirmation No.: 3473
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	***VIA EFS-WEB***
	)	

Mail Stop Restriction
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

RESPONSE TO RESTRICTION REQUIREMENT

In a Restriction Requirement dated July 5, 2016, the period for response to which extends through September 5, 2016, the Examiner required restriction under 37 U.S.C. § 121 between:

Group I – Claims 1-7, drawn to a liquid cooling system having a double-sided chassis.
Group II – Claims 8-18, drawn to a cooling system having a centrifugal pump.

The Examiner further requires us to elect a single disclosed species or a single grouping of patentability indistinct species for prosecution on the merits:

Species A -	As embodied in Figures 4-8, drawn to a single chambered reservoir;
Species B -	As embodied in Figures 9 and 10, drawn to a channeled reservoir;
Species C -	As embodied in Figures 11-13, drawn to an intermediate housing reservoir;
Species D -	As embodied in Figure 14, drawn to a monolithic reservoir;
Species E -	As embodied in Figure 15 and 16, drawn to an impeller in direct contact with channels of the reservoir; and
Species F -	As embodied in Figures 17 and 20, drawn to a conical reservoir.

Applicant provisionally elects to prosecute claims 1-7, drawing to a liquid cooling system having a double-side chassis and Species F, embodied in Figures 17 and 20.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: August 15, 2016

By: /David R. Lefebvre/
David R. Lefebvre
Reg. No. 72,868
(617) 646-1652

Cooler Master Co., Ltd. Exhibit 1006, Page 253 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Electronic Acknowledgement Receipt

EFS ID:	26635831
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	David Lefebvre/Julie Giordano
Filer Authorized By:	David Lefebvre
Attorney Docket Number:	10494.0003-03000
Receipt Date:	15-AUG-2016
Filing Date:	12-APR-2013
Time Stamp:	08:46:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Response to Election / Restriction Filed	10494_0003_03_Response.pdf	94260 7eaef6f7c2d4206262d3e7462660304498db908b	no	2
Warnings:					

Information:	
Total Files Size (in bytes):	94260

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

22852 7590 10/06/2016

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RUBY, TRAVIS C	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
10/06/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

regional-desk@finnegan.com

Office Action Summary	Application No. 13/861,593	Applicant(s) ERIKSEN, ANDRÉ SLOTH	
	Examiner TRAVIS RUBY	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *8/15/2016*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-18* is/are pending in the application.

5a) Of the above claim(s) *8-18* is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-7* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *4/12/2013* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Election/Restrictions

2. Applicant's election without traverse of Invention I (Claims 1-7), Species F (Figures 17, 20) in the reply filed on 8/15/2016 is acknowledged.

3. Claims 8-18 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 8/15/2016.

Claim Rejections - 35 USC § 103

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

5. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1-7 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Batchelder (US6019165, as cited by applicant in the IDS) in view of Lenehan (US7591302B1, as cited by applicant in the IDS)

Re Claim 1. Batchelder teaches a liquid cooling system for cooling a heat-generating component (2) of a computer, comprising:

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor with a stator (56) and an impeller (54), the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid (Figure 7 illustrates the impeller located on the inside of a chassis with the stator located on the outside; Column 7 lines 46-63);

a reservoir (208) adapted to pass the cooling liquid therethrough (Figure 7 and 8), the reservoir including:

a pump chamber (220) including the impeller (54) (Figure 7 and 8; Column 7 lines 46-67); and

a thermal exchange chamber (204) formed below the pump chamber and vertically spaced apart from the pump chamber (Figures 7 and 8 illustrate the two chambers are vertically aligned),

the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled together by one or more passages (Column 7 lines 33-38 & 59-67);

a heat-exchanging interface (202) removably coupled to the reservoir (Figure 7 illustrates that the components are removably coupled together), the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component (Column 7 lines 23-36);

a heat radiator (210, 212 combine to form the radiator, 28 are fins of the radiator and 30 is a fan) adapted to pass the cooling liquid therethrough (Figure 7; Column 7 line 23 - Column 8 line 12; Cooling liquid will pass through 210 and be dissipated by 212.), the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component (Figure 7; Column 7 line 23 - Column 8 line 12), the heat radiator being configured to dissipate heat from the cooling liquid (Figure 7; Column 7 line 23 - Column 8 line 12);

a fan (30) configured to direct air through the heat radiator (Figure 7).

Batchelder fails to specifically teach the fan being driven by a motor separate from the motor of the pump; and a control system configured to independently control a speed of the pump and a speed of the fan. However, Lenehan teaches a fan (140) that is attached to a radiator (130) which is spaced apart from the heat generating device (125), wherein the fan is driven by a motor separate from the motor of the pump; and a control system (150) configured to independently control a speed of the pump and a speed of the fan (Figures 1&3; Column 1 lines 45-57; Column 2 lines 36-62; Column 5 lines 30-60; Column 6 lines 11-24).

Therefore, in view of Lenehan's teaching, it would have been obvious to one of ordinary skill in the art at the time of invention to make the fan and the pump of Betchelder have separate motors, as this would allow for the individual operation of the fan and the pump. Lenehan teaches that this is advantageous in order to independently regulate the airflow and the liquid flow so as to achieve an optimal efficiency of the system while reducing noise (Lenehan Column 6 lines 11-24 and 50-59). Further, in view of Lenehan's teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a control system in Batchelder in order to better regulate the temperature of the heat generating component.

Re Claim 2. Batchelder discloses the chassis shields the stator from the cooling liquid in the reservoir (Figure 7; Column 7 lines 46-67).

Re Claim 3. Batchelder discloses the heat-exchanging interface (202) includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact (14) with the surface of the heat-generating component on the second side (Figure 7; Column 7 lines 23-36).

Re Claim 4. Batchelder discloses the first side of the heat- exchanging interface includes features (52 are fins) that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber (Figure 7; Column 7 lines 33-36 & 51-54; Fins are known to increase heat transfer).

Re Claim 5. Batchelder discloses the features include at least one of pins or fins (52; Figure 7).

Re Claim 6. Batchelder discloses the impeller is positioned in the pump chamber (Figure 7).

Re Claim 7. Batchelder discloses the impeller includes a plurality of curved blades (Figure 9 illustrates curved blades of the impeller).

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRAVIS RUBY whose telephone number is (571)270-5760. The examiner can normally be reached on Monday-Friday 9:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Allana Lewin can be reached on 571-272-5560. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
				Art Unit	3744
				Examiner Name	Judy J. Swann
Sheet	1	of	1	Attorney Docket Number	10494.0003-03000

U.S. PATENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-6,408,937	06-25-2002	Roy	
		US-6,470,289	10-22-2002	Peters	

U.S. PUBLISHED PATENT APPLICATIONS

Examiner Initials*	Cite No.[3]	Document Number Number-Kind Code[4] (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

Note: Submission of copies of U.S. Patents and published U.S. Patent Applications is not required.

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[5] Number[6] Kind Code[7] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[8]
		EP 0105667	04-18-1984	Bingler		
		JP 3452059	09-29-2003	Matsushita Electric Ind. Co. Ltd.		Yes

NONPATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[8]
		Notice of Allowability with Examiner's Reason for Allowance mailed on May 23, 2012 in U.S. Patent Application No. 13/269,334 (8 pages).	
		Office Action mailed on December 20, 2011 in U.S. Patent Application No. 13/269,234 (9 pages).	
		Office Action mailed on March 13, 2012 in U.S. Patent Application No. 13/269,234 (11 pages).	
		Office Action mailed on March 27, 2012 in U.S. Patent Application No. 11/919,974 (16 pages).	
		Order re: Claim Construction for U.S. Patent Nos. 8,240,362 and 8,245,764 in U.S. District Court, Northern District of California, Case Nos. C-12-4498 EMC and C-13-0457 JST, filed December 3, 2013 (18 pages).	
		Third Party Observation for European Application No. EP20080100686 submitted on August 15, 2014 (8 pages).	
		Third Party Observation for European Application No. EP20080100686 submitted on August 18, 2014 (7 pages).	

Examiner Signature	/TRAVIS C RUBY/	Date Considered	10/01/2016

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.C.R/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
				Art Unit	3744
				Examiner Name	Travis C. Ruby
Sheet	1	of	1	Attorney Docket Number	10494.0003-03000

U.S. PATENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

U.S. PUBLISHED PATENT APPLICATIONS

Examiner Initials*	Cite No.[3]	Document Number Number-Kind Code[4] (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

Note: Submission of copies of U.S. Patents and published U.S. Patent Applications is not required.

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[5] Number[6] Kind Code[7] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[8]
	1.	CN M24451	09-21-2004	3R System Co., LTD		Yes
	2.	JP 2002-151638 A	05-24-2002	HITACHI LTD		Yes
	3.	TW M256682 U	02-01-2005	SONICEDGE INDUSTRIES CORPORATION TW		Yes

NONPATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]

Examiner Signature	/TRAVIS C RUBY/	Date Considered	10/01/2016

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.C.R/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	27	(("ERIKSEN") near3 ("Andre")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2016/10/01 20:57
L2	136	(165/244).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	OFF	2016/10/01 20:57
L3	27	((ANDRE) near2 (ERIKSEN)).INV.	US-PGPUB; USPAT	OR	ON	2016/10/01 20:57
L4	65	("20020117291" | "20030010050" | "20030039097" | "20030056939" | "20030151895" | "20040042176" | "20040052048" | "20040052049" | "20040105232" | "20040141275" | "20050052847" | "20050061482" | "20050083656" | "20060113066" | "20060169440" | "3810509" | "4520298" | "4563620" | "4777578" | "4898579" | "5001548" | "5006924" | "5142214" | "5316077" | "5441102" | "5708564" | "5731954" | "5763951" | "5784257" | "5825622" | "5890880" | "5901037" | "6019165" | "6021844" | "6114827" | "6166907" | "6170563" | "6263957" | "6305463" | "6343478" | "6408937" | "6415860" | "6447270" | "6551734" | "6580610" | "6668911" | "6702002" | "6725682" | "6749012" | "6892802" | "6945315" | "6952345" | "6967841" | "6972954" | "6992887" | "7055581" | "7215546" | "7298617" | "7325588" | "7359197").PN. OR ("7971632").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/10/01 20:57
L5	3	(("6019165") or ("20050061482") or ("20050069432")).PN.	US-PGPUB; USPAT	OR	OFF	2016/10/01 20:57
L6	1841	(165/80.2).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L7	3076	(165/80.4).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L8	3017	(165/104.21).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L9	1188	(165/104.31).CCLS.	US-	OR	OFF	2016/10/01

Cooler Master Co., Ltd. Exhibit 1006, Page 266 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

			PGPUB; USPAT; FPRS; EPO; JPO; DERWENT			20:57
L10	5386	(165/104.33).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L11	3443	(361/699).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L12	1181	(361/702).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L13	1998	(361/720).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L14	1257	(417/423.1).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L15	170	(165/244).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L16	541	(165/272).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L17	1512	(165/67).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L18	744	(165/80.5).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L19	264	(165/104.22).CCLS.	US-PGPUB;	OR	OFF	2016/10/01 20:57

Cooler Master Co., Ltd. Exhibit 1006, Page 267 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

			USPAT; FPRS; EPO; JPO; DERWENT			
L20	2771	(165/133).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	OFF	2016/10/01 20:57
L21	171	("1819528" | "3654528" | "4519447" | "4780062" | "5001548" | "5183104" | "5203399" | "5316077" | "5394936" | "5731954" | "5763951").PN. OR ("6019165").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/10/01 20:57
L22	1	(10/290610).APP.	USPAT; USOCR	OR	ON	2016/10/01 20:57
L23	35	("6019165" | "6021844" | "6029742" | "6166907" | "6175495" | "6377458" | "6408937" | "6422304").PN. OR ("6894899").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/10/01 20:57
L24	14	("20050077028" | "20060185830" | "6894899" | "7114551" | "7219714" | "7222661" | "7249625" | "7251137" | "7262967" | "7325591" | "7379301").PN. OR ("7537048").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/10/01 20:57
L25	39	("20030072656" | "20030151130" | "20030214786" | "20040052663" | "20040070942" | "20040105232" | "20040240179" | "20050069432" | "20050168079" | "20060018775" | "20060171801" | "20060185829" | "20060185830" | "20070000648" | "20070029069" | "20070103869" | "20070193720" | "20080053641" | "6327145" | "6748758" | "6832646" | "6839234" | "6894899" | "6999316" | "7016195" | "7055581" | "7117931" | "7209355" | "7249625" | "7255154" | "7274566" | "7312986" | "7371056" | "7379301" | "7539016" | "7544049").PN. OR ("7688589").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/10/01 20:57
L26	14	("20040000157" | "20040240179" | "20050168079" | "20050241312" | "20050243520" | "20060191667" | "6894899" | "6935411" | "7013959" | "7249625" | "7274566").PN. OR ("7694721").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/10/01 20:57
L27	41	(US-20020117291-$ or US-20030056939-$ or US-20040042176-$ or US-20040052049-$ or US-20040052048-$ or US-20040105232-$ or US-20040141275-$ or US-20050052847-$ or US-20050061482-$ or US-20050083656-$ or US-20060169440-$ or US-20050069432-$ or US-20050168079-$ or US-20030151130-$).did. or (US-4563620-$ or US-4898579-$ or US-5001548-$ or US-5316077-$ or US-5441102-$ or US-5708564-$ or US-5731954-$ or US-5763951-$ or US-5890880-$ or US-6019165-$ or US-6021844-$ or US-6166907-$ or US-6170563-$ or US-6263957-$ or US-6343478-$ or US-6408937-$ or US-6447270-$ or US-6702002-$ or US-6725682-$ or US-6749012-$ or US-7055581-$ or US-7215546-$ or US-6029742-$ or US-7688589-$ or US-7694721-$ or US-6839234-$).did. or (US-6894899-$).did.	US-PGPUB; USPAT	OR	ON	2016/10/01 20:57
L28	8	L27 and flexible	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2016/10/01 20:57
L29	27	((ANDRE) near2 (ERIKSEN)).INV.	US-	OR	ON	2016/10/01

Cooler Master Co., Ltd. Exhibit 1006, Page 268 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

			PGPUB; USPAT			20:57
L30	17574	((165/80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133) or (361/699,702,720) or (417/423.1)).CCLS.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	OFF	2016/10/01 20:57
L31	3065	L30 and (@pd>"20120314" or @ad>"20120314")	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2016/10/01 20:57
L32	23	("4328682" | "5230223" | "5269146" | "5291941" | "5471850" | "5823005" | "6166907" | "6196003" | "6205803" | "6213194").PN. OR ("6343478").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/10/01 20:57
L33	65	("20020117291" | "20030010050" | "20030039097" | "20030056939" | "20030151895" | "20040042176" | "20040052048" | "20040052049" | "20040105232" | "20040141275" | "20050052847" | "20050061482" | "20050083656" | "20060113066" | "20060169440" | "3810509" | "4520298" | "4563620" | "4777578" | "4898579" | "5001548" | "5006924" | "5142214" | "5316077" | "5441102" | "5708564" | "5731954" | "5763951" | "5784257" | "5825622" | "5890880" | "5901037" | "6019165" | "6021844" | "6114827" | "6166907" | "6170563" | "6263957" | "6305463" | "6343478" | "6408937" | "6415860" | "6447270" | "6551734" | "6580610" | "6668911" | "6702002" | "6725682" | "6749012" | "6892802" | "6945315" | "6952345" | "6967841" | "6972954" | "6992887" | "7055581" | "7215546" | "7298617" | "7325588" | "7359197").PN. OR ("7971632").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/10/01 20:57
L34	48	US-4109707-$.DID. OR US-4520298-$.DID. OR US-4777578-$.DID. OR US-5001548-$.DID. OR US-5006924-$.DID. OR US-5070936-$.DID. OR US-5142214-$.DID. OR US-5316077-$.DID. OR US-5441102-$.DID. OR US-5566745-$.DID. OR US-5731954-$.DID. OR US-5763951-$.DID. OR US-6021844-$.DID. OR US-6114827-$.DID. OR US-6170563-$.DID. OR US-6408937-$.DID. OR US-6529376-$.DID. OR US-6580610-$.DID. OR US-6668911-$.DID. OR US-6702002-$.DID. OR US-6725682-$.DID. OR US-6728107-$.DID. OR US-6796370-$.DID. OR US-6945315-$.DID. OR US-6952345-$.DID. OR US-6992887-$.DID. OR US-7055581-$.DID. OR US-7100389-$.DID. OR US-7325591-$.DID. OR US-7455103-$.DID. OR US-7544049-$.DID. OR US-7591302-$.DID. OR US-7971632-$.DID. OR US-20030056939-$.DID. OR US-20040042176-$.DID. OR US-20040052048-$.DID. OR US-20040052663-$.DID. OR US-20040141275-$.DID. OR US-20050052847-$.DID. OR US-20050069432-$.DID. OR US-20050183848-$.DID. OR US-20060157230-$.DID. OR US-20060161311-$.DID. OR US-20060169440-$.DID. OR US-20020117291-$.DID. OR US-20030039097-$.DID. OR DE-19534423-$.DID. OR EP-0400455-$.DID. OR WO-2006119761-$.DID.	US-PGPUB; USPAT; EPO	OR	ON	2016/10/01 20:57
L35	15	L34 and noise	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2016/10/01 20:57
L36	49	(US-20020117291-$ or US-20030056939-$ or US-20040042176-$ or US-20040052049-$ or US-20040052048-	US-PGPUB;	OR	ON	2016/10/01 20:57

Cooler Master Co., Ltd. Exhibit 1006, Page 269 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

		$ or US-20040105232-$ or US-20040141275-$ or US-20050052847-$ or US-20050061482-$ or US-20050083656-$ or US-20060169440-$ or US-20050069432-$ or US-20050168079-$ or US-20030151130-$ or US-20060157230-$ or US-20060161311-$).did. or (US-4563620-$ or US-4898579-$ or US-5001548-$ or US-5316077-$ or US-5441102-$ or US-5708564-$ or US-5731954-$ or US-5763951-$ or US-5890880-$ or US-6019165-$ or US-6021844-$ or US-6166907-$ or US-6170563-$ or US-6263957-$ or US-6343478-$ or US-6408937-$ or US-6447270-$ or US-6702002-$ or US-6725682-$ or US-6749012-$ or US-7055581-$ or US-7215546-$ or US-6029742-$ or US-7688589-$ or US-7694721-$ or US-6839234-$).did. or (US-6894899-$ or US-5230223-$ or US-5269146-$ or US-7151667-$ or US-6668911-$ or US-7971632-$ or US-7591302-$).did.	USPAT			
L37	12	L36 and noise	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2016/10/01 20:57
L38	7193	(G06F1/206).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2016/10/01 21:10
L39	11802	(G06F1/20).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2016/10/01 21:10
L40	2622	(F04D15/0066).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2016/10/01 21:10
L41	10698	(H01L23/473).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2016/10/01 21:11
L42	2487	(G06F2200/201).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2016/10/01 21:11
L45	31093	(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2016/10/01 21:13
L46	2	("6408937" | "6470289" | "US-6408937" | "US-6.470289").PN.	US-PGPUB; USPAT	OR	ON	2016/10/01 21:36
L47	80	("20020117291" | "20030010050" | "20030039097" | "20030056939" | "20030151895" | "20040042176" | "20040052048" | "20040052049" | "20040052663" | "20040105232" | "20040141275" | "20050052847" | "20050061482" | "20050069432" | "20050083656" | "20050126750" | "20050183848" | "20050243518" | "20060113066" | "20060157230" | "20060161311" |	US-PGPUB; USPAT	OR	ON	2016/10/01 21:37

Cooler Master Co., Ltd. Exhibit 1006, Page 270 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

		"20060169440" | "20070000268" | "3810509" | "4109707" | "4520298" | "4563620" | "4777578" | "4898579" | "5001548" | "5006924" | "5070936" | "5142214" | "5316077" | "5441102" | "5566745" | "5708564" | "5731954" | "5763951" | "5784257" | "5825622" | "5890880" | "5901037" | "6019165" | "6021844" | "6114827" | "6166907" | "6170563" | "6263957" | "6305463" | "6343478" | "6408937" | "6415860" | "6447270" | "6529376" | "6551734" | "6580610" | "6668911" | "6702002" | "6725682" | "6728107" | "6749012" | "6796370" | "6892802" | "6945315" | "6952345" | "6967841" | "6972954" | "6992887" | "7055581" | "7100389" | "7215546" | "7298617" | "7325588" | "7325591" | "7359197" | "7455103" | "7544049" | "7591302" | "7971632").PN.				

EAST Search History (Interference)

< This search history is empty>

10/ 1/ 2016 9:44:04 PM
C:\ Users\ truby\ Documents\ EAST\ Workspaces\ 13-861593.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	Art Unit
	TRAVIS RUBY	3744

CPC- SEARCHED		
Symbol	Date	Examiner
(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc.	10/1/2016	/TR/

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
165	80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133	10/1/2016	/TR/
361	699,702,720	10/1/2016	/TR/
417	423.1	10/1/2016	/TR/

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Name Search	10/1/2016	/TR/
See EAST Search History	10/1/2016	/TR/

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/TRAVIS RUBY/ Primary Examiner.Art Unit 3744

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 3473

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/861,593	04/12/2013 RULE	165	3744	10494.0003-03000

APPLICANTS
ASETEK A/S, Bronderslev, DENMARK;

INVENTORS
André Sloth Eriksen, Morgan Hill, CA;

**** CONTINUING DATA ***************************
This application is a CON of 11/919,974 01/06/2009 ABN
which is a 371 of PCT/DK2005/000310 05/06/2005

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
05/17/2013

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ Yes ☑ No	☐ Yes ☑ No	/TRAVIS C RUBY/ Examiner's Signature	☐ Initials	CA	17	18	2

ADDRESS

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413
UNITED STATES

TITLE

COOLING SYSTEM FOR A COMPUTER SYSTEM

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
1740	No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
				Art Unit	Not available
				Examiner Name	Not available
Sheet	1	of	4	Attorney Docket Number	10494.0003-03000

U.S. PATENTS

Examiner Initials[3]	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	US-3,810,509	05/14/1974	Kun	
	2	US-4,109,707	08-29-1978	Wilson et al.	
	3	US-4,520,298	05-28-1985	Abbondanti	
	4	US-4,563,620	01/07/1986	Komatsu	
	5	US-4,777,578	10-11-1988	Jahns	
	6	US-4,898,579 A	02-06-1990	Groshong et al.	
	7	US-5,001,548	03-19-1991	Iversen	
	8	US-5,006,924	04-09-1991	Frankeny et al.	
	9	US-5,070,936	12-10-1991	Carroll et al.	
	10	US-5,142,214	08-25-1992	Purson et al.	
	11	US-5,316,077	05-31-1994	Reichard	
	12	US-5,441,102	08-15-1995	Burward-Hoy	
	13	US-5,566,745	10-22-1996	Hill et al.	
	14	US-5,708,564	01/13/1998	Lin	
	15	US-5,731,954	03/24/1998	Cheon	
	16	US-5,763,951	06-09-1998	Hamilton et al.	
	17	US-5,784,257	07/21/1998	Tata	
	18	US-5,825,622	10/20/1998	Rife et al.	
	19	US-5,890,880	04/06/1999	Lustwerk	
	20	US-5,901,037	05/04/1999	Hamilton et al.	
	21	US-6,019,165	02/01/2000	Batchelder	
	22	US-6,021,844	02-08-2000	Batchelder	
	23	US-6,114,827	09-05-2000	Alvaro	
	24	US-6,166,907	12/26/2000	Chien	
	25	US-6,170,563	01-09-2001	Hsieh	
	26	US-6,263,957 B1	07/24/2001	Chen et al.	
	27	US-6,305,463 B1	10/23/2001	Salmonson	
	28	US-6,343,478 B1	02/05/2002	Chang	
	29	US-6,408,937	06-25-2002	Roy	
	30	US-6,415,860 B1	07/09/2002	Kelly et al.	
	31	US-6,447,270 B1	09/10/2002	Schmidt et al.	
	32	US-6,529,376	03-04-2003	Hamman	
	33	US-6,551,734 B1	04/22/2003	Simpkins et al.	
	34	US-6,580,610	06-17-2003	Morris et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.C.R/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
				Art Unit	Not available
				Examiner Name	Not available
Sheet	2	of	4	Attorney Docket Number	10494.0003-03000

U.S. PATENTS

	35	US-6,668,911 A	12-30-2003	Bingler	
	36	US-6,702,002	03-09-2004	Wang	
	37	US-6,725,682 B2	04-27-2004	Scott	
	38	US-6,728,107	04-27-2004	Tseng et al.	
	39	US-6,749,012 B2	06-15-2004	Gwin et al.	
	40	US-6,796,370	09-28-2004	Doll	
	41	US-6,892,802 B2	05/17/2005	Kelly et al.	
	42	US-6,945,315	09-20-2005	Gektin et al.	
	43	US-6,952,345	10-04-2005	Weber et al.	
	44	US-6,967,841 B1	11/22/2005	Chu et al.	
	45	US-6,972,954 B2	12/06/2005	Minamitani et al.	
	46	US-6,992,887	01-31-2006	Jairazbhoy et al.	
	47	US-7,055,581	06-06-2006	Roy	
	48	US-7,100,389	09-05-2006	Wayburn	
	49	US-7,215,546 B2	05/08/2007	Hata et al.	
	50	US-7,298,617 B2	11/20/2007	Campbell et al.	
	51	US-7,325,588 B2	02/05/2008	Malone et al.	
	52	US-7,325,591	02-05-2008	Duan et al.	
	53	US-7,359,197 B2	04/15/2008	Stefanoski et al.	
	54	US-7,455,103	11-25-2008	Sato et al.	
	55	US-7,544,049	06-09-2009	Koga	
	56	US-7,591,302	09-22-2009	Lenehan et al.	
	57	US-7,971,632	07-05-2011	Eriksen	

U.S. PUBLISHED PATENT APPLICATIONS

Examiner Initials*	Cite No.[3]	Document Number Number-Kind Code[4] (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	58	US-2002/0117291	08-29-2002	Cheon	
	59	US-2003/0010050 A1	01/16/2003	Scott	
	60	US-2003/0039097	02-27-2003	Igarashi	
	61	US-2003/0056939	03-27-2003	Chu et al.	
	62	US-2003/151895 A1	08-14-2003	Zuo	
	63	US-2004/0042176	03-04-2004	Niwatsukino et al.	
	64	US-2004/0052048	03-18-2004	Wu et al.	
	65	US-2004/0052049 A1	03/18/2004	Wu et al.	
	66	US-2004/0052663	03-18-2004	Laing et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.C.R/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
				Art Unit	Not available
				Examiner Name	Not available
Sheet	3	of	4	Attorney Docket Number	10494.0003-03000

U.S. PUBLISHED PATENT APPLICATIONS

	67	US-2004/0105232 A1	06-03-2004	Ito et al.	
	68	US-2004/0141275	07-22-2004	Athari	
	69	US-2005/0052847	03-10-2005	Hamman	
	70	US-2005/0061482 A1	03/24/2005	Lee et al.	
	71	US-2005/0069432	03-31-2005	Tomioka	
	72	US-2005/0083656 A1	04/21/2005	Hamman	
	73	US-2005/0183848	08-25-2005	Cheng et al.	
	74	US-2005/0126750	06-16-2005	Yokozawa et al.	
	75	US-2005/0243518 A1	11-03-2005	Hata et al.	
	76	US-2006/0113066 A1	06/01/2006	Mongia et al.	
	77	US-2006/0157230	07-20-2006	Kawahara et al.	
	78	US-2006/0161311	07-20-2006	Vinson et al.	
	79	US-2006/0169440	08-03-2006	Chou et al.	
	80	US-2007/0000268	01-04-2007	Crocker et al.	

Note: Submission of copies of U.S. Patents and published U.S. Patent Applications is not required.

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[5] Number[6] Kind Code[7] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[8]
	81	DE 19534423 A1	03-20-1997	Kunz		
	82	EP 0400455 A1	05-22-1990	Gfroeer		
	83	EP 0574823 A2	12/22/1993	Marioni et al.		
	84	EP 0610826 A2	08/17/1994	Marioni et al.		
	85	WO 01/25581 A	04-12-2001	Asetek A/S		
	86	WO 2005/017468 A2	02-24-2005	Culbert et al.		
	87	WO 2005/045654 A2	05/19/2005	Eriksen André Sloth.		
	88	WO 2006/119761	11-16-2006	Asetek A/S		

NONPATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[8]
	89	Office Action mailed on 08/22/2007 in U.S. Patent Application No. 10/578,578 (9 pages)	
	90	Office Action mailed on 04/25/2008 in U.S. Patent Application No. 10/578,578 (11 pages)	
	91	Office Action mailed on 08/18/2008 in U.S. Patent Application No. 10/578,578 (12 pages)	
	92	Office Action mailed on 03/20/2009 in U.S. Patent Application No. 10/578,578 (14 pages)	
	93	Office Action mailed on 07/15/2009 in U.S. Patent Application No. 10/578,578 (14 pages)	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.C.R/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known	
				Application Number	13/861,593
				Filing Date	April 12, 2013
				First Named Inventor	André Sloth Eriksen
				Art Unit	Not available
				Examiner Name	Not available
Sheet	4	of	4	Attorney Docket Number	10494.0003-03000

NONPATENT LITERATURE DOCUMENTS			
	94	Office Action mailed on 04/13/2010 in U.S. Patent Application No. 10/578,578 (14 pages)	
	95	Office Action mailed on 11/24/2010 in U.S. Patent Application No. 10/578,578 (11 pages)	
	96	Office Action mailed on 11/23/2011 in U.S. Patent Application No. 12/826,802 (11 pages)	
	97	Office Action mailed on 12/05/2011 in U.S. Patent Application No. 12/826,768 (14 pages)	
	98	Office Action mailed on 09/12/2012 in U.S. Patent Application No. 13/547,240 (15 pages)	
	99	Office Action mailed on 01/16/2013 in U.S. Patent Application No. 13/547,240 (9 pages)	
	100	Notice of Allowability with Examiner's Reason for Allowance mailed on 04/08/11 in U.S. Patent Application No. 10/578,578 (5 pages)	
	101	Notice of Allowability with Examiner's Reason for Allowance mailed on 05/17/12 in U.S. Patent Application No. 12/826,768 (4 pages)	

Examiner Signature	/TRAVIS C RUBY/	Date Considered	10/01/2016

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.C.R/

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	06/27/2016	10/01/2016							
	1	÷	✓							
	2	÷	✓							
	3	÷	✓							
	4	÷	✓							
	5	÷	✓							
	6	÷	✓							
	7	÷	✓							
	8	÷	N							
	9	÷	N							
	10	÷	N							
	11	÷	N							
	12	÷	N							
	13	÷	N							
	14	÷	N							
	15	÷	N							
	16	÷	N							
	17	÷	N							
	18	÷	N							

Cooler Master Co., Ltd. Exhibit 1006, Page 278 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
André Sloth Eriksen	)	Group Art Unit: 3744
	)	
Application No.: 13/861,593	)	Examiner: Travis C. Ruby
	)	
Filed: April 12, 2013	)	Confirmation No.: 3473
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	***VIA EFS-WEB***
	)	

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

RESPONSE TO OFFICE ACTION

In response to the Non-Final Office Action mailed October 6, 2016, the period for response to which extends through January 6, 2017, Applicant respectfully request reconsideration of the above-identified application based on the following remarks:

Listing of the Claims are reflected in the listing of claims in this paper.

Remarks follow the amendments section of this paper.

LISTING OF THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Original) A liquid cooling system for cooling a heat-generating component of a computer, comprising:

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor with a stator and an impeller, the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:

a pump chamber including the impeller; and

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled together by one or more passages;

a heat-exchanging interface removably coupled to the reservoir, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component;

a heat radiator adapted to pass the cooling liquid therethrough, the heat radiator being fluidly coupled to the reservoir and positioned at a location

Cooler Master Co., Ltd. Exhibit 1006, Page 280 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

horizontally spaced apart from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;

a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump; and

a control system configured to independently control a speed of the pump and a speed of the fan.

2. (Original) The cooling system of claim 2, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3. (Original) The cooling system of claim 1, wherein the heat exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. (Original) The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

5. (Original) The cooling system of claim 4, wherein the features include at least one of pins or fins.

Cooler Master Co., Ltd. Exhibit 1006, Page 281 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

6. (Original) The cooling system of claim 1, wherein the impeller is positioned in the pump chamber.

7. (Original) The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

8. (Withdrawn) A cooling system for a computer system, comprising:

a centrifugal pump adapted to circulate a cooling liquid, the pump including:

a curved impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:

a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;

a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber;

a heat radiator fluidly coupled to the reservoir and positioned at a location spaced apart from the heat-generating component;

a fan attached to the heat radiator, wherein a speed of the fan is configured to be varied independent of a speed of the pump; and

Cooler Master Co., Ltd. Exhibit 1006, Page 282 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

a control system configured to independently adjust a speed of the pump and a speed of the fan to provide a desired cooling capacity.

9. (Withdrawn) The cooling system of claim 8, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component

10. (Withdrawn) The cooling system of claim 8, wherein the control system is configured to independently control the speed of the pump and the speed of the fan to minimize noise while providing the desired cooling capacity.

11. (Withdrawn) The cooling system of claim 10, wherein, if the fan generates more noise than the pump, the control system reduces the speed of the fan before the speed of the pump to reduce noise, and if the pump generates more noise than the fan, the control system reduces the speed of the pump before the speed of the fan to reduce noise.

12. (Withdrawn) The cooling system of claim 8, wherein the control system is configured to determine the desired cooling capacity based on a performance parameter of the heat generating component

Cooler Master Co., Ltd. Exhibit 1006, Page 283 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

13. (Withdrawn) The cooling system of claim 12, wherein the performance parameter is one of an operating load or an operating temperature of the heat-generating component.

14. (Withdrawn) The cooling system of claim 8, wherein the control system configured to determine the desired cooling capacity based on at least one of an operating load or an operating temperature of the heat-generating component.

15. (Withdrawn) The cooling system of claim 8, wherein the control system is configured to determine the desired cooling capacity based on a type of computer processing taking place in the heat-generating component.

16. (Withdrawn) The cooling system of claim 8, wherein the control system is configured to reduce the speed of the fan before the speed of the pump to reduce noise if the fan generates more noise than the pump, and reduce the speed of the pump before the speed of the fan to reduce noise if the pump generates more noise than the fan.

17. (Withdrawn) The cooling system of claim 8, wherein the control system is configured to select a rotational direction of the impeller.

18. (Withdrawn) The cooling system of claim 8, wherein the control system is configured to determine an angular position of the rotor.

Cooler Master Co., Ltd. Exhibit 1006, Page 284 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

REMARKS

I. Status and Disposition of the Claims

Claims 1-20 are pending, of which claims 1-7 are under examination and claims 8-20 are withdrawn. In the Non-Final Office Action dated October 6, 2016 ("*Office Action*") [1], the Office:

a) rejected claims 1-7 under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 6,019,165 to Batchelder ("*Batchelder*") in view of U.S. Patent No. 7,591,302 to Lenehan et al. ("*Lenehan*").

With this response Applicant makes no amendments to the claims. Accordingly, no new matter has been introduced. Claims 8-20 are withdrawn, and claims 1-7 are presently pending and under examination.

II. Rejection under 35 U.S.C. § 103

Applicant respectfully traverses the rejection of claims 1-7 under 35 U.S.C. §103 as being unpatentable over *Batchelder* in view of *Lenehan*. A *prima facie* case of obviousness has not been established.

The Office acknowledges that *Batchelder* fails to teach "the fan being driven by a motor separate from the motor of the pump; and a control system configured to independently control a speed of the pump and a speed of the fan," as recited in claim 1. Office Action at p. 4. In addition to these elements of claim 1, *Batchelder* also fails to teach or suggest other elements of claim 1, including for example, "the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component." The heat

1 The Office Action contains statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicant declines to automatically subscribe to any statement or characterization in the Office Action.

Cooler Master Co., Ltd. Exhibit 1006, Page 285 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

absorbing device 28 (i.e., heat radiator) of *Batchelder* is not horizontally spaced apart from the heat sink 2 (i.e., heat-generating component). Instead, the heat absorbing device 28 is stacked vertically above the heat sink, as illustrated in Fig. 7.

In an attempt to cure the deficiencies of *Batchelder*, the Office relies on *Lenehan*, and alleges it would be obvious to modify *Batchelder* to incorporate the teachings of *Lenehan*. Applicant respectfully disagrees because (a) *Batchelder* teaches away from the above-identified elements of claim 1 and (b) combining *Batchelder* and *Lenehan* as proposed by the Office is improper because it would render *Batchelder* unsatisfactory for its intended purpose and would change the principle of operation of *Batchelder*.

a. Batchelder teaches away

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley,* 27 F.3d 551, 553 (Fed. Cir. 1994); *see KSR,* 127 S.Ct. at 1739–40 (explaining that when the prior art teaches away from a combination, that combination is more likely to be nonobvious). In the present case, *Batchelder* not only fails to teach or suggest "the fan being driven by a motor separate from the motor of the pump," but further teaches away from the use thereof. For instance, *Batchelder* explicitly states an "objective of the invention is to provide a heat sink design for electronic components that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid." *See Batchelder* at Col. 2, ll. 52-55. Therefore, *Batchelder* explicitly teaches away from "the fan being driven by a motor separate from the motor of the pump," as claimed.

Cooler Master Co., Ltd. Exhibit 1006, Page 286 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

b. Combining Batchelder* and *Lenehan is improper

MPEP § 2145(III) states "the claimed combination cannot change the principle of operation of the primary reference or render the reference inoperable for its intended purpose. See MPEP §2143.01." Applicant submits the Office's proposed modifications both change the principal of operation of *Batchelder* and render *Batchelder* inoperable for its intended purpose, making the proposed modification nonobvious, as explained in detail below.

Moreover, MPEP § 2143.01(V) states "[i]f [a] proposed modification would render the prior art invention being modified *unsatisfactory for its intended purpose*, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)." (Emphasis added). "If the proposed modification or combination of the prior art *would change the principle of operation* of the prior art invention being modified, then the teachings of the references are *not sufficient* to render the claims prima facie obvious." (Emphasis added). *See* MPEP § 2143.01(VI), citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959), which held claims nonobvious where the "suggested combination of references would require a *substantial reconstruction and redesign of the elements* shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." *Id.* at 813 (Emphasis added).

In the present case, *Batchelder* clearly states in the summary of the invention section that the intended purpose or objective of the invention is to provide a low cost high reliability heat exchange apparatus "that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid" and "to provide an active spreader plate without hoses or fluid couplings." *See Batchelder* at Col. 2, ll. 40-57. To provide the single motor, *Batchelder* teaches using a magnet 56 rotated with the fan blades 34, which causes the rotatable impeller 54 to rotate

due to the moving magnetic fields emanating from the magnet 56." *Id.* at Col. 5, ll. 11-26. To eliminate the need for hoses and fluid couplings as intended, *Batchelder* teaches an integrated heat exchange apparatus, for example as shown in Fig. 7, that houses everything including the active spreader plate, heat absorbing device 28, fan housing 30, magnet 56, etc. *Id.* at Col. 7, ln. 23 to Col. 8, ln. 12.

Modifying *Batchelder* so the fan and the pump have separate motors and to have a control system configured to independently control a speed of the pump and a speed of the fan, as suggested by the Office, would frustrate the intended purpose of *Batchelder*. First, incorporating a second motor to make the fan and the pump have separate motors would completely negate the objective of *Batchelder* to use "a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid." *Id.* at Col. 2, ll. 52-55. Second, modifying *Batchelder* based on *Lenehan* so the heat absorbing device 28 and fan housing 30 are positioned at a location horizontally spaced apart from the heat sink 2, would require hoses or fluid couplings, which would negate the objective of *Batchelder* to go "without houses or fluid couplings." *Id.* at Col. 2, ll. 56-57. Third, separating the heat absorbing device and heat sink of *Batchelder* and incorporating a second motor and the control system of *Lenehan* into *Batchelder* would significantly increases the complexity and cost of the *Batchelder* apparatus, thereby frustrating the objective to provide "a low cost high reliability heat exchange apparatus." *Id.* at Col. 2, ll. 40-45. Furthermore, any potential modifications to *Batchelder* in order to separate the heat absorbing device and heat sink and incorporate a second motor would require a substantial reconstruction and redesign including a change in the basic principle under which *Batchelder* was designed to operate.

Accordingly, the modifications to *Batchelder* based on *Lenehan* proposed by the Office are precisely the kinds of modifications that the courts in *In re Gordon* and *In re Ratti* found nonobvious because there is no suggestion or motivation to make and the modifications would require a substantial reconstruction and redesign of the elements. Therefore, a *prima facie* case of obviousness has not been established and thus Applicant respectfully requests that the rejection of independent claim 1 and dependent claims 2-7 be withdrawn.

III. Conclusion

In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: January 3, 2017

By: /David R. Lefebvre/
David R. Lefebvre
Reg. No. 72,868
(617) 646-1652

Cooler Master Co., Ltd. Exhibit 1006, Page 289 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Electronic Acknowledgement Receipt

EFS ID:	27948638
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	David Lefebvre/Julie Giordano
Filer Authorized By:	David Lefebvre
Attorney Docket Number:	10494.0003-03000
Receipt Date:	03-JAN-2017
Filing Date:	12-APR-2013
Time Stamp:	10:40:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10494_0003_03_Response.pdf	169384 0adf3248e6e26ee5c08c37f7072a4e2a03019587	yes	11

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	11
Warnings:			
Information:			
	Total Files Size (in bytes):	169384	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/861,593	Filing Date 04/12/2013	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	01/03/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**0**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
SHAREILL COLES

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

22852 7590 02/03/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RUBY, TRAVIS C	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
02/03/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

regional-desk@finnegan.com

Office Action Summary	Application No. 13/861,593	Applicant(s) ERIKSEN, ANDRÉ SLOTH	
	Examiner TRAVIS RUBY	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *1/3/2017*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-18* is/are pending in the application.

5a) Of the above claim(s) *8-18* is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-7* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Status of Claims

2. The status of the claims as filed in the reply dated 1/3/2017 are as follows:

Claims 1-18 are pending;

Claims 8-18 are withdrawn from consideration as being drawn to a non-elected invention without traverse;

Claims 1-7 are being examined.

Claim Rejections - 35 USC § 103

3. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

4. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1-7 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Batchelder (US6019165, as cited by applicant in the IDS) in view of Lenehan (US7591302B1, as cited by applicant in the IDS)

Re Claim 1. Batchelder teaches a liquid cooling system for cooling a heat-generating component (2) of a computer, comprising:

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor with a stator (56) and an impeller (54), the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid (Figure 7 illustrates the impeller located on the inside of a chassis with the stator located on the outside; Column 7 lines 46-63);

a reservoir (208) adapted to pass the cooling liquid therethrough (Figure 7 and 8), the reservoir including:

a pump chamber (220) including the impeller (54) (Figure 7 and 8; Column 7 lines 46-67); and

a thermal exchange chamber (204) formed below the pump chamber and vertically spaced apart from the pump chamber (Figures 7 and 8 illustrate the two chambers are vertically aligned),

the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled together by one or more passages (Column 7 lines 33-38 & 59-67);

a heat-exchanging interface (202) removably coupled to the reservoir (Figure 7 illustrates that the components are removably coupled together), the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component (Column 7 lines 23-36);

a heat radiator (210, 212 combine to form the radiator, 28 are fins of the radiator and 30 is a fan) adapted to pass the cooling liquid therethrough (Figure 7; Column 7 line 23 - Column 8 line 12; Cooling liquid will pass through 210 and be dissipated by 212.), the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component (Figure 7; Column 7 line 23 - Column 8 line 12), the heat radiator being configured to dissipate heat from the cooling liquid (Figure 7; Column 7 line 23 - Column 8 line 12);

a fan (30) configured to direct air through the heat radiator (Figure 7).

Batchelder fails to specifically teach the fan being driven by a motor separate from the motor of the pump; and a control system configured to independently control a speed of the pump and a speed of the fan. However, Lenehan teaches a fan (140) that is attached to a radiator (130) which is spaced apart from the heat generating device (125), wherein the fan is driven by a motor separate from the motor of the pump; and a control system (150) configured to

independently control a speed of the pump and a speed of the fan (Figures 1&3; Column 1 lines 45-57; Column 2 lines 36-62; Column 5 lines 30-60; Column 6 lines 11-24).

Therefore, in view of Lenehan's teaching, it would have been obvious to one of ordinary skill in the art at the time of invention to make the fan and the pump of Batchelder have separate motors, as this would allow for the individual operation of the fan and the pump. Lenehan teaches that this is advantageous in order to independently regulate the airflow and the liquid flow so as to achieve an optimal efficiency of the system while reducing noise (Lenehan Column 6 lines 11-24 and 50-59). Further, in view of Lenehan's teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a control system in Batchelder in order to better regulate the temperature of the heat generating component.

Re Claim 2. Batchelder discloses the chassis shields the stator from the cooling liquid in the reservoir (Figure 7; Column 7 lines 46-67).

Re Claim 3. Batchelder discloses the heat-exchanging interface (202) includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact (14) with the surface of the heat-generating component on the second side (Figure 7; Column 7 lines 23-36).

Re Claim 4. Batchelder discloses the first side of the heat- exchanging interface includes features (52 are fins) that are adapted to increase heat transfer from the heat-exchanging interface

to the cooling liquid in the thermal exchange chamber (Figure 7; Column 7 lines 33-36 & 51-54; Fins are known to increase heat transfer).

Re Claim 5. Batchelder discloses the features include at least one of pins or fins (52; Figure 7).

Re Claim 6. Batchelder discloses the impeller is positioned in the pump chamber (Figure 7).

Re Claim 7. Batchelder discloses the impeller includes a plurality of curved blades (Figure 9 illustrates curved blades of the impeller).

Response to Arguments

7. Applicant's arguments filed 1/3/2017 have been fully considered but they are not persuasive.

Applicant argues that Batchelder teaches away from the claimed invention. Applicant cites Column 2 lines 52-55 as providing support for their argument. Column 2 lines 52-55 of Batchelder recites "*A further objective of this invention is to provide a heat sink design for electronic components that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid*". However, that is but one preferred embodiment of the invention of Batchelder and not the only embodiment allowed. Column 13 lines 13-15 of Batchelder recites "*It should be understood that this description has been made by way of*

preferred example, and that the invention is defined by the scope of the following claims", wherein Claim 1 of Batchelder only requires an electrically conductive rotatable fluid impeller. Thus, it is clear that the embodiment of Batchelder having only one motor is but a preferred example of the invention and not a single defining characteristic of the invention. Thus, to modify Batchelder to have independent motors to actuate the fan and impeller would still allow Batchelder to provide cooling to the heat generating device. Therefore, when Batchelder is considered as a whole, Batchelder does not teach away from the claimed invention.

Applicant argues that combining Batchelder with Lenehan is improper because it would render Batchelder unsatisfactory for its intended purpose and would change the principle of operation of Batchelder. Batchelder is concerned with moving cooling fluid through an interior cooling circuit and moving air around an exterior heat exchanger. Lenehan teaches independent control of an exterior fan and interior pump of a heat exchange assembly. When Batchelder is combined with Lenehan, the resulting combination is a heat exchange assembly that has an interior pump motor that is independently controlled from an exterior fan motor. Once combined, Batchelder would still be able to dissipate heat from the heat generating component through internal cooling pumping and exterior air cooling. Thus, the combination of Batchelder with Lenehan would not render Batchelder unsatisfactory for its intended purpose and would not change the principle of operation of Batchelder.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRAVIS RUBY whose telephone number is (571)270-5760. The examiner can normally be reached on Monday-Friday 9:30-5:00.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jianying Atkisson can be reached on 571-270-7740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	06/27/2016	10/01/2016	01/31/2017						
	1	÷	✓	✓						
	2	÷	✓	✓						
	3	÷	✓	✓						
	4	÷	✓	✓						
	5	÷	✓	✓						
	6	÷	✓	✓						
	7	÷	✓	✓						
	8	÷	N	N						
	9	÷	N	N						
	10	÷	N	N						
	11	÷	N	N						
	12	÷	N	N						
	13	÷	N	N						
	14	÷	N	N						
	15	÷	N	N						
	16	÷	N	N						
	17	÷	N	N						
	18	÷	N	N						

Cooler Master Co., Ltd. Exhibit 1006, Page 303 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	Art Unit
	TRAVIS RUBY	3744

CPC- SEARCHED		
Symbol	Date	Examiner
(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc.	10/1/2016	/TR/

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
165	80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133	10/1/2016	/TR/
361	699,702,720	10/1/2016	/TR/
417	423.1	10/1/2016	/TR/

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Name Search	1/31/2017	/TR/
See EAST Search History	1/31/2017	/TR/

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/TRAVIS RUBY/ Primary Examiner.Art Unit 3744

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S47	27	((ANDRE) near2 (ERIKSEN)).INV.	US-PGPUB; USPAT	OR	ON	2017/01/31 10:58
S48	46938	(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc. (165/80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133).ccls. (361/699,702,720).ccls. (417/423.1).ccls.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/01/31 10:59
S49	484	S48 and @PD>"20161006"	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/01/31 10:59

EAST Search History (Interference)

< This search history is empty>

1/31/2017 2:28:18 PM
C:\Users\truby\Documents\EAST\Workspaces\13-861593.wsp

Cooler Master Co., Ltd. Exhibit 1006, Page 305 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

PATENT
Attorney Docket No.: 10494.0003-03000

RESPONSE UNDER 37 C.F.R. § 1.116
EXPEDITED PROCEDURE REQUESTED
EXAMINING GROUP 3744

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
André Sloth Eriksen	)	Group Art Unit: 3744
	)	
Application No.: 13/861,593	)	Examiner: Travis C. Ruby
	)	
Filed: April 12, 2013	)	Confirmation No.: 3473
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	***VIA EFS-WEB***

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

AMENDMENT AFTER FINAL

In response to the Final Office Action mailed February 3, 2017, the period for response to which extends through May 3, 2017, and pursuant to 37 C.F.R. § 1.116, Applicant proposes that this application be amended as follows:

Amendments to the Claims are reflected in the listing of claims in this paper.

Remarks follow the amendments section of this paper.

Electronic Acknowledgement Receipt

EFS ID:	28813104
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	David Lefebvre/Julie Giordano
Filer Authorized By:	David Lefebvre
Attorney Docket Number:	10494.0003-03000
Receipt Date:	03-APR-2017
Filing Date:	12-APR-2013
Time Stamp:	13:31:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		10494_0003_03_Amendment.pdf	206727 07c8787f9729c4569e10ef845353b7c863d87720	yes	15

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	5	15
	Claims	2	4
	Response After Final Action	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	206727	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS

I. Status and Disposition of the Claims

In the Final Office Action dated February 3, 2017 ("Office Action") [1], the Office:

a) rejected claims 1-7 under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,019,165 to John Samuel Batchelder ("*Batchelder*") in view of U.S. Patent No. 7,591,302 B1 to Daniel J. Lenehan et al. ("*Lenehan*").

With this response, Applicant cancels claims 8-18 without prejudice or disclaimer of their subject matter. Accordingly, no new matter has been introduced. Claims 1-7 are presently pending and under examination.

II. Rejection under 35 U.S.C. § 103(a)

The Office rejects claims 1-7 under 35 U.S.C. § 103(a) as being unpatentable over *Batchelder* in view of *Lenehan*. Office Action at pp. 3-7. A *prima facie* case of obviousness has not been established for the reasons discussed herein.

The Office acknowledges that *Batchelder* fails to teach "the fan being driven by a motor separate from the motor of the pump; and a control system configured to independently control a speed of the pump and a speed of the fan," as recited in claim 1. Office Action at p. 4. In addition to these elements of claim 1, *Batchelder* also fails to teach or suggest other elements of claim 1, including for example, "the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component." The heat absorbing device 28 (i.e., heat radiator) of *Batchelder* is not horizontally spaced apart from the heat sink 2 (i.e., heat-generating component). Instead, the heat absorbing device 28 is stacked vertically above the heat sink, as illustrated in Fig. 7.

[1] The Office Action contains statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicant declines to automatically subscribe to any statement or characterization in the Office Action.

Cooler Master Co., Ltd. Exhibit 1006, Page 309 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

In an attempt to cure the deficiencies of *Batchelder*, the Office relies on *Lenehan*, and alleges it would be obvious to modify *Batchelder* to incorporate the teachings of *Lenehan*. Applicant respectfully disagrees because (a) *Batchelder* teaches away from the above-identified elements of claim 1 and (b) combining *Batchelder* and *Lenehan* as proposed by the Office is improper because it would render *Batchelder* unsatisfactory for its intended purpose and would change the principle of operation of *Batchelder*.

a. Batchelder teaches away

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley,* 27 F.3d 551, 553 (Fed. Cir. 1994); *see KSR,* 127 S.Ct. at 1739–40 (explaining that when the prior art teaches away from a combination, that combination is more likely to be nonobvious). Further, the MPEP § 2143.03(VI) states that "[a] prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." Accordingly, where cited art teaches away from a claimed feature, the cited art is not available for the purposes of an obviousness rejection.

In the present case, *Batchelder* not only fails to teach or suggest "the fan being driven by a motor separate from the motor of the pump," but further teaches away from the use thereof. For instance, *Batchelder* explicitly states an "objective of the invention is to provide a heat sink design for electronic components that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid." *See Batchelder* at Col. 2, ll. 52-55. Therefore, *Batchelder* explicitly teaches away from "the fan being driven by a motor separate from the motor of the pump," as claimed.

Cooler Master Co., Ltd. Exhibit 1006, Page 310 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

The Office attempts to address this fatal flaw of *Batchelder* by asserting that *Batchelder* does not teach away, but instead contends this "is but one preferred embodiment of the invention and not the only embodiment allowed." Office Action at p. 6. In an attempt to support its contention that *Batchelder* does not teach away, the Office points to stock language at the end of the specification, which recites "[i]t should be understood that this description has been made by way of preferred example, and that the invention is defined by the scope of the following claims." *Batchelder*, Col. 13:13-15. The Office then points to claim 1 of *Batchelder* and contends it only requires an electrically conductive rotatable fluid impeller and "[t]hus, it is clear that the embodiment of Batchelder having only one motor is but a preferred example of the invention and not a single defining characteristic of the invention." Office Action at p. 6. This conclusion is improper because the specification provides no support for an embodiment with one motor, and does nothing to refute the overwhelming evidence that *Batchelder* teaches away from two separate motors as claimed, when *Batchelder* is considered as a whole.

First, claim 1 of *Batchelder* does not recite two separate motors (i.e., one to drive the electrically conductive rotatable fluid impeller and another to drive the fan), and trying to infer that it does would be improper because claims 16 and 17 of *Batchelder*, which are intended to depend from claim 1[2], recite that a single motor generates both the electrically conductive rotatable fluid impeller and the second impeller. See Col. 14:54-64.

Second, the Office relies on stock language and strained logic to argue that *Batchelder* does not teach away, but the evidence that it does is overwhelming. For example, starting with the background section, *Batchelder* explicitly criticizes using separate motors and the increased cost associated with separate motors. *Batchelder* criticizes the prior art by stating "[m]ost of

[2] Applicant acknowledges that claim 16 appears to have an error. Applicant has assumed the patentee intended that claim 16 depend on claim 1, and since claim 17 depends from claim 16, claim 17 would indirectly depend from claim 1.

these [prior art devices] incur the cost disadvantage of requiring separate motors to impel the heat transfer fluid and to impel the atmosphere." Col. 1:66 to 2:1. Sticking with the background section, *Batchelder* also discredits the prior art by stating:

> [n]one of these existing heat transfer systems simultaneously use a single motor to drive an impeller for the heat transfer fluid and an impeller for the atmosphere, use moving external magnetic fluids to eliminate a rotary seal, and use monolithic assembly without hoses or fittings. Col. 2:6-10.

Moving next to the summary of invention section, *Batchelder* explicitly states that:

> "[t]he primary object of this invention is to provide a low cost high reliability heat exchange apparatus . . . [and a] further objective of this invention is to provide a heat sink design for electronic components that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid. Col. 2:40-55.

Thus modifying *Batchelder* to include separate motors as proposed by the Office would undermine the *primary objective* of *Batchelder*—to provide a low cost apparatus—by adding unnecessary components and negate the objection of *Batchelder*—to use a single motor.

The drawings, specification, and claims of *Batchelder* provide further support that *Batchelder* teaches away from using separate motors. The Office has not pointed to any drawings or anywhere in the specification where *Batchelder* discloses or suggests anything other than using a single motor to impel atmospheric motion and the motion of the heat transfer fluid. Further, independent claims 32, 33, 34, and 35 all recite a single motor to impel atmospheric motion and the motion of the heat transfer fluid. 16:52-63; 17:20-31; 18:1-26; and 18:51-64. The Office trying to infer that claim 1 somehow discloses an embodiment not having a single motor is unreasonable because such an embodiment is neither supported or enabled by the specification as required by 35 U.S.C. § 112.

Thus, in summary, every embodiment disclosed in the drawings and specification of *Batchelder* utilizes a single motor to impel atmospheric motion and the motion of the heat transfer fluid, the majority of the independent claims explicitly recite a single motor, *Batchelder* specifically identifies its object is to use a single motor and limit the cost of the apparatus, and *Batchelder* specifically discredits using two motors and criticizes the increased cost associated with two motors. Applicant acknowledges that, "prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed…." In re Fulton, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004). But, in the present case, *Batchelder* does not disclose an alternative to a single motor, as discussed above, and *Batchelder* extensively criticizes, discredits, and otherwise discourages the solution claimed (i.e., separate motors).

For the foregoing reasons, when *Batchelder* is considered *as a whole*, it is unreasonable for the Office to conclude *Batchelder* does not teach away from the claimed invention.

b. Combining Batchelder and Lenehan is improper

MPEP § 2145(III) states "the claimed combination cannot change the principle of operation of the primary reference or render the reference inoperable for its intended purpose. See MPEP §2143.01." Applicant submits the Office's proposed modifications both change the principal of operation of *Batchelder* and render *Batchelder* inoperable for its intended purpose, making the proposed modification nonobvious, as explained in detail below.

MPEP § 2143.01(V) states "[i]f [a] proposed modification would render the prior art invention being modified *unsatisfactory for its intended purpose*, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)." (Emphasis added). "If the proposed modification or combination of the prior

art *would change the principle of operation* of the prior art invention being modified, then the teachings of the references are *not sufficient* to render the claims prima facie obvious." (Emphasis added). *See* MPEP § 2143.01(VI), citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959), which held claims nonobvious where the "suggested combination of references would require a *substantial reconstruction and redesign of the elements* shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." *Id.* at 813 (Emphasis added).

i. The proposed modification would render *Batchelder* unsatisfactory for its intended purpose

In the present case, *Batchelder* clearly states that the intended purpose or objective of the invention is to provide *a low cost* high reliability heat exchange apparatus "that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid" and "to provide an active spreader plate without hoses or fluid couplings." *See Batchelder* at Col. 2, ll. 40-57. To provide the single motor, *Batchelder* teaches using a magnet 56 rotated with the fan blades 34, which causes the rotatable impeller 54 to rotate due to the moving magnetic fields emanating from the magnet 56." *Id.* at Col. 5, ll. 11-26. To eliminate the need for hoses and fluid couplings as intended, *Batchelder* teaches an integrated heat exchange apparatus, for example as shown in Fig. 7, that houses everything including the active spreader plate, heat absorbing device 28, fan housing 30, magnet 56, etc. *Id.* at Col. 7, ln. 23 to Col. 8, ln. 12.

Modifying *Batchelder* so the fan and the pump have separate motors and to have a control system configured to independently control a speed of the pump and a speed of the fan, as suggested by the Office, would frustrate the intended purpose of *Batchelder*. First, incorporating a second motor to make the fan and the pump have separate motors would completely negate the objective of *Batchelder* to use "a single motor to impel atmospheric

motion and the motion of an additional heat transfer fluid." *Id.* at Col. 2, ll. 52-55. Second, modifying *Batchelder* based on *Lenehan* so the heat absorbing device 28 and fan housing 30 are positioned at a location horizontally spaced apart from the heat sink 2, would require hoses or fluid couplings, which would negate the objective of *Batchelder* to go "without houses or fluid couplings." *Id.* at Col. 2, ll. 56-57. Third, separating the heat absorbing device and heat sink of *Batchelder* and incorporating a second motor and the control system of *Lenehan* into *Batchelder* would significantly increase the complexity and cost of the *Batchelder* apparatus, thereby frustrating the objective to provide "a low cost high reliability heat exchange apparatus." *Id.* at Col. 2, ll. 40-45.

The Office attempts to address this fatal flaw in the combination of *Batchelder* and *Lenehan* by generalizing *Batchelder to be concerned with* "moving cooling fluid through an interior cooling circuit and moving air around an exterior heat exchanger." Office Action at p. 7. This is an improper mischaracterization and over-generalization because *Batchelder* unambiguously defines its intended purpose is to provide *a low cost* high reliability heat exchange apparatus "that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid" and "to provide an active spreader plate without hoses or fluid couplings." *See Batchelder* at Col. 2, ll. 40-57. It is improper for the Office to ignore the disclosure of *Batchelder* and unilaterally redefine the object or purpose of the invention.[3] According to the Federal Circuit, when considering the intended purpose of a reference, a court must look at the specific purpose disclosed by the reference, not redefine a generalized purpose. For example, as stated by MPEP § 2143.01(V), in *In re Gordon,* the Court found the prior art device (i.e., a liquid strainer for removing dirt and water from gasoline) would be inoperable for

[3]If an examiner or court could unilaterally over generalize the intended purpose of the reference to such an extent as done here by the Office, the precedent set by *In re Gordon* would be rendered irrelevant.

Cooler Master Co., Ltd. Exhibit 1006, Page 315 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

its intended purpose if simply turned upside down because the gasoline to be filtered would be trapped at the top, the water and heavier oils sought to be separated would flow out of the outlet instead of the purified gasoline, and the screen would become clogged. In other words, the Court looked at the specific purpose of the reference not some generalized purpose (e.g., filtering) when considering whether a combination renders the prior art reference unsatisfactory for its intended purpose.

Therefore, contrary to the Office's assertion, the modification of *Batchelder* proposed by the Office would render *Batchelder* unsatisfactory for its intended purpose. As a result, and following *In re Gordon*, the combination of *Batchelder* and *Lenehan* is improper and therefore fails to establish a *prima facie* case of obviousness.

ii. The proposed modification would change the principle of operation of *Batchelder*

In the present case, *Batchelder* clearly states that the principle of operation of the invention is to "use a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid." *See Batchelder* at Col. 2, ll. 53-55. Further, the modifications to *Batchelder* based on *Lenehan* proposed by the Office are precisely the kinds of modifications that the court in *In re Ratti* found nonobvious because there is no suggestion or motivation to make them in the references themselves, and the modifications would require a substantial reconstruction and redesign of the elements. Therefore, a *prima facie* case of obviousness has not been established.

The Office attempts to address this fatal flaw in the combination of *Batchelder* and *Lenehan* by generalizing *Batchelder to be concerned with* "moving cooling fluid through an interior cooling circuit and moving air around an exterior heat exchanger." Office Action at p. 7. But, again, this is an improper mischaracterization and over-generalization because *Batchelder* unambiguously discloses that a principle of operation is to use "a single motor to impel

atmospheric motion and the motion of an additional heat transfer fluid." *See Batchelder* at Col. 2, ll. 40-57. The Office tries to rationalize this by stating "[w]hen Batchelder is combined with Lenehan, the resulting combination is a heat exchange assembly that has an interior pump motor that is independently controlled from an exterior fan motor. Once combined *Batchelder* would still be able to dissipate heat from the heat generating component through internal cooling pumping and exterior air cooling." Office Action at p. 7. But, this is nonetheless improper. The Office's proposed combination comprises separate motors to motivate fluid and air flow while use of a single motor to motivate fluid and air flow is a fundamental principle of *Batchelder*. Such a modification would be a change in the basic principle of *Batchelder*, as explained below.

When considering the principle of operation of a reference, Federal Circuit precedent advises courts to look at the *details* of the principle of operation disclosed by the reference. For example, as noted in MPEP § 2143.01(VI), the claims in *In re Ratti* were directed to an oil seal comprising a bore engaging portion with outwardly biased resilient spring fingers inserted in a resilient sealing member. The primary reference relied upon in a rejection based on a combination of references disclosed an oil seal wherein the bore engaging portion was reinforced by a cylindrical sheet metal casing. MPEP § 2143.01(VI). The primary reference taught a device that required rigidity for operation, whereas the claimed invention required resiliency. *Id.* The Federal Circuit found this slight modification to be a change in the principle of operation and therefore reversed the rejection, noting that the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." *Id.*

Similarly, it is unreasonable for the Office to conclude that modifying *Batchelder* to include separate motors to motivate fluid and air flow is not a change in the principle of operation, when *Batchelder* explicitly teaches using a single motor to motivate fluid and air flow, and specifically criticizes using two or more motors. Therefore, contrary to the Office's assertion, the modification of *Batchelder* proposed by the Office would have been a change in the principle of operation of *Batchelder*. As a result, the combination of *Batchelder* and *Lenehan* is improper and therefore fails to establish a *prima facie* case of obviousness.

In summary, the modifications to *Batchelder* based on *Lenehan* proposed by the Office are precisely the kinds of modifications that the courts in *In re Gordon* and *In re Ratti* found nonobvious because there is no suggestion or motivation to make and the modifications would require a substantial reconstruction and redesign of the elements. Therefore, a *prima facie* case of obviousness has not been established and thus Applicant respectfully requests that the rejection of independent claim 1 and dependent claims 2-7 be withdrawn.

III. Conclusion

Applicant respectfully requests that this Amendment under 37 C.F.R. § 1.116 be entered by the Examiner, placing claims 1-7 in condition for allowance. Applicant submits that the proposed canceling of claims and arguments presented do not raise new issues or necessitate the undertaking of any additional search of the art by the Examiner. Therefore, this Amendment should allow for immediate action by the Examiner.

Finally, Applicant submits that the entry of the Amendment would place the application in better form for appeal, should the Examiner dispute the patentability of the pending claims.

Cooler Master Co., Ltd. Exhibit 1006, Page 318 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Please grant any extensions of time required to enter this response and charge any additional required fees to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: April 3, 2017

By: /David R. Lefebvre/
David R. Lefebvre
Reg. No. 72,868
(617) 646-1652

Cooler Master Co., Ltd. Exhibit 1006, Page 319 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Original) A liquid cooling system for cooling a heat-generating component of a computer, comprising:

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor with a stator and an impeller, the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:

a pump chamber including the impeller; and

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled together by one or more passages;

a heat-exchanging interface removably coupled to the reservoir, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component;

Cooler Master Co., Ltd. Exhibit 1006, Page 320 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

a heat radiator adapted to pass the cooling liquid therethrough, the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;

a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump; and

a control system configured to independently control a speed of the pump and a speed of the fan.

2. (Original) The cooling system of claim 2, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3. (Original) The cooling system of claim 1, wherein the heat exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. (Original) The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

Cooler Master Co., Ltd. Exhibit 1006, Page 321 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

5. (Original) The cooling system of claim 4, wherein the features include at least one of pins or fins.

6. (Original) The cooling system of claim 1, wherein the impeller is positioned in the pump chamber.

7. (Original) The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

8-18. (Canceled).

Cooler Master Co., Ltd. Exhibit 1006, Page 322 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

22852 7590 04/12/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RUBY, TRAVIS C	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
04/12/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

regional-desk@finnegan.com

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 13/861,593	**Applicant(s)** ERIKSEN, ANDRÉ SLOTH	
	Examiner TRAVIS RUBY	**Art Unit** 3744	**AIA (First Inventor to File) Status** No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 03 April 2017 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☐ The period for reply expires _____months from the mailing date of the final rejection.
   b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.
   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☐ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☐ will not be entered, or (b) ☒ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.
13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
14. ☒ Other: See Continuation Sheet.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
    Claim(s) allowed: .
    Claim(s) objected to: .
    Claim(s) rejected: 1-7.
    Claim(s) withdrawn from consideration: .

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

Continuation of 12. does NOT place the application in condition for allowance because: Applicant argues that Batchelder teaches away from the claimed invention. Applicant cites Column 2 lines 52-55 as providing support for their argument. Column 2 lines 52-55 of Batchelder recites "A further objective of this invention is to provide a heat sink design for electronic components that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid". However, that is but one preferred embodiment of the invention of Batchelder and not the only embodiment allowed. Column 13 lines 13-15 of Batchelder recites "It should be understood that this description has been made by way of preferred example, and that the invention is defined by the scope of the following claims", wherein Claim 1 of Batchelder only requires an electrically conductive rotatable fluid impeller. Thus, it is clear that the embodiment of Batchelder having only one motor is but a preferred example of the invention and not a single defining characteristic of the invention. Thus, to modify Batchelder to have independent motors to actuate the fan and impeller would still allow Batchelder to provide cooling to the heat generating device. Therefore, when Batchelder is considered as a whole, Batchelder does not teach away from the claimed invention. Applicant argues that combining Batchelder with Lenehan is improper because it would render Batchelder unsatisfactory for its intended purpose and would change the principle of operation of Batchelder. Batchelder is concerned with moving cooling fluid through an interior cooling circuit and moving air around an exterior heat exchanger. Lenehan teaches independent control of an exterior fan and interior pump of a heat exchange assembly. When Batchelder is combined with Lenehan, the resulting combination is a heat exchange assembly that has an interior pump motor that is independently controlled from an exterior fan motor. Once combined, Batchelder would still be able to dissipate heat from the heat generating component through internal cooling pumping and exterior air cooling. Thus, the combination of Batchelder with Lenehan would not render Batchelder unsatisfactory for its intended purpose and would not change the principle of operation of Batchelder.

Continuation of 14. Other: No claim amendments were filed, thus the claims would be rejected in the same manner as outlined in the Final Office Action.

Cooler Master Co., Ltd. Exhibit 1006, Page 325 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

OK TO ENTER: /T.C.R/

RESPONSE UNDER 37 C.F.R. § 1.116
EXPEDITED PROCEDURE REQUESTED
EXAMINING GROUP 3744

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
André Sloth Eriksen	)	Group Art Unit: 3744
	)	
Application No.: 13/861,593	)	Examiner: Travis C. Ruby
	)	
Filed: April 12, 2013	)	Confirmation No.: 3473
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	***VIA EFS-WEB***

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

AMENDMENT AFTER FINAL

In response to the Final Office Action mailed February 3, 2017, the period for response to which extends through May 3, 2017, and pursuant to 37 C.F.R. § 1.116, Applicant proposes that this application be amended as follows:

Amendments to the Claims are reflected in the listing of claims in this paper.

Remarks follow the amendments section of this paper.

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-14)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	13/861,593	Filing Date	2013-04-12	Docket Number (if applicable)	10494.0003-03000	Art Unit	3744
First Named Inventor	André Sloth Eriksen			Examiner Name	Travis C. Ruby		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, to any international application that does not comply with the requirements of 35 U.S.C. 371, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV.

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☒ Enclosed

☒ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 060916

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

EFS - Web 2.1.15

PTO/SB/30EFS (07-14)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/David R. Lefebvre/	Date (YYYY-MM-DD)	2017-04-25
Name	David R. Lefebvre	Registration Number	72868

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Cooler Master Co., Ltd. Exhibit 1006, Page 329 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
André Sloth Eriksen	)	Group Art Unit: 3744
	)	
Application No.: 13/861,593	)	Examiner: Travis C. Ruby
	)	
Filed: April 12, 2013	)	Confirmation No.: 3473
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	***VIA EFS-WEB***

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

AMENDMENT WITH REQUEST FOR CONTINUED EXAMINATION

This Amendment accompanies a Request for Continued Examination, fulfills the requirement for a submission under 37 C.F.R. § 1.114, and responds to the Final Office Action mailed February 3, 2017, and the Advisory Action mailed April 12, 2017, the period for response to which extends through May 3, 2017. Applicant proposes that this application be amended as follows:

Amendments to the Claims are reflected in the listing of claims in this paper.

Remarks follow the amendments section of this paper.

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A liquid cooling system for cooling a heat-generating component of a computer, comprising:

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor with a stator and an impeller, the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:

a pump chamber including the impeller; and

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled ~~together by one or more passages~~;

a heat-exchanging interface removably coupled to the reservoir, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component;

a heat radiator adapted to pass the cooling liquid therethrough, the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;

Cooler Master Co., Ltd. Exhibit 1006, Page 331 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump; and

a control system configured to independently control a speed of the pump and a speed of the fan;

wherein the pump chamber includes:

an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber;

an outlet that fluidly couples the pump chamber to the thermal exchange chamber via a first passage, the outlet is positioned along an outer circumference of the pump chamber and is configured to direct the cooling liquid driven by the impeller through the first passage to the thermal exchange chamber;

wherein the first passage directs the cooling liquid into the thermal exchange chamber between a first end and a second end of the thermal exchange chamber;

wherein the thermal exchange chamber includes at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber.

2. (Original) The cooling system of claim 2, wherein the chassis shields the stator from the cooling liquid in the reservoir.

Cooler Master Co., Ltd. Exhibit 1006, Page 332 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

3. (Original) The cooling system of claim 1, wherein the heat exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. (Original) The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

5. (Original) The cooling system of claim 4, wherein the features include at least one of pins or fins.

6. (Original) The cooling system of claim 1, wherein the impeller is positioned in the pump chamber.

7. (Original) The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

8-18. (Canceled).

Cooler Master Co., Ltd. Exhibit 1006, Page 333 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

19. (New) A liquid cooling system for cooling a heat-generating component of a computer, comprising:

a pump chamber housing an impeller, the pump chamber being defined by an intermediate member and a double-sided chassis housing, the impeller being part of a pump that includes a motor, a rotor, and a stator configured to circulate a cooling liquid, the impeller being positioned on one side of the double-sided chassis housing and the stator being positioned on an opposite side of the double-sided chassis housing and isolated from the cooling liquid;

a thermal exchange chamber disposed between the pump chamber and the heat-generating component when the system is installed on the heat-generating component;

a heat-exchanging interface coupled to the intermediate member, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, the heat-exchanging interface has a plane outer surface configured to be placed in thermal contact with a surface of the heat-generating component and an inner surface that defines a network of channels that direct the flow of the cooling liquid within the thermal exchange chamber;

a heat radiator adapted to pass the cooling liquid therethrough, the heat radiator being fluidly coupled to the pump chamber and the thermal exchange chamber via fluid conduits and positioned at a location remote from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;

wherein the pump chamber includes:

an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber;

an outlet that fluidly couples the pump chamber to the thermal exchange chamber via a first passage defined by the intermediate member, the outlet is positioned along an outer circumference of the pump chamber and is configured to direct the cooling liquid driven by the impeller through the first passage to the thermal exchange chamber;

wherein the first passage directs the cooling liquid into the thermal exchange chamber and into the network of channels between a first end and a second end of the thermal exchange chamber;

wherein the intermediate member defines at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber.

20. (New) The liquid cooling system of claim 19, wherein the heat-exchanging interface is formed of copper.

21. (New) The liquid cooling system of claim 19, further comprising a clip having legs configured to secure the double-sided chassis housing, intermediate member, and the heat-exchanging interface to the heat-generating component.

22. (New) The liquid cooling system of claim 19, wherein the double-sided chassis housing defines a recess configured to house the stator.

Cooler Master Co., Ltd. Exhibit 1006, Page 335 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

23. (New) The liquid cooling system of claim 19, further comprising a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump.

24. (New) The liquid cooling system of claim 19, wherein the pump chamber is configured to function as a reservoir for the cooling liquid.

25. (New) The liquid cooling system of claim 19, wherein the network of channels is defined by a plurality of fins.

26. (New) The liquid cooling system of claim 19, wherein the first passage directs the cooling liquid into a middle of the thermal exchange chamber.

27. (New) The liquid cooling system of claim 19, wherein the heat-exchanging interface is removably coupled to the intermediate member

Cooler Master Co., Ltd. Exhibit 1006, Page 336 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

REMARKS

I. Status and Disposition of the Claims

In the Final Office Action dated February 3, 2017 ("Office Action") [1], the Office:

a) rejected claims 1-7 under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,019,165 to John Samuel Batchelder ("*Batchelder*") in view of U.S. Patent No. 7,591,302 B1 to Daniel J. Lenehan et al. ("*Lenehan*").

In the Advisory Action dated April 12, 2017 ("Advisory Action") [2] the Office maintained the same rejection.

With this response, Applicant amends claim 1, adds new claims 19-27, and cancels claims 8-18 without prejudice or disclaimer of their subject matter. Support for these amendments can be found in the original application at, for example, paragraphs [0120] to [0135] and Figs. 17 and 20. Accordingly, no new matter has been introduced. Claims 1-7 and 19-27 are presently pending and under examination.

II. Rejection under 35 U.S.C. § 103(a)

The Office rejects claims 1-7 under 35 U.S.C. § 103(a) as being unpatentable over *Batchelder* in view of *Lenehan*. Office Action at pp. 3-7. A *prima facie* case of obviousness has not been established for the reasons discussed herein.

The Office acknowledges that *Batchelder* fails to teach "the fan being driven by a motor separate from the motor of the pump; and a control system configured to independently control a speed of the pump and a speed of the fan," as recited in claim 1. Office Action at p. 4. In addition to these elements of claim 1, *Batchelder* also fails to teach or suggest other elements of claim 1, including for example, "the heat radiator being fluidly coupled to the reservoir and positioned at

[1, 2] The Office Action and Advisory Action contain statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicant declines to automatically subscribe to any statement or characterization in the Office Action or Advisory Action.

Cooler Master Co., Ltd. Exhibit 1006, Page 337 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

a location horizontally spaced apart from the heat-generating component." The heat absorbing device 28 (i.e., heat radiator) of *Batchelder* is not horizontally spaced apart from the heat sink 2 (i.e., heat-generating component). Instead, the heat absorbing device 28 is stacked vertically above the heat sink, as illustrated in Fig. 7.

In an attempt to cure the deficiencies of *Batchelder*, the Office relies on *Lenehan*, and alleges it would be obvious to modify *Batchelder* to incorporate the teachings of *Lenehan*. Applicant respectfully disagrees because (a) *Batchelder* teaches away from the above-identified elements of claim 1 and (b) combining *Batchelder* and *Lenehan* as proposed by the Office is improper because it would render *Batchelder* unsatisfactory for its intended purpose and would change the principle of operation of *Batchelder*.

a. Batchelder teaches away

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley,* 27 F.3d 551, 553 (Fed. Cir. 1994); *see KSR,* 127 S.Ct. at 1739–40 (explaining that when the prior art teaches away from a combination, that combination is more likely to be nonobvious). Further, the MPEP § 2143.03(VI) states that "[a] prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." Accordingly, where cited art teaches away from a claimed feature, the cited art is not available for the purposes of an obviousness rejection.

In the present case, *Batchelder* not only fails to teach or suggest "the fan being driven by a motor separate from the motor of the pump," but further teaches away from the use thereof. For instance, *Batchelder* explicitly states an "objective of the invention is to provide a heat sink design for electronic components that uses a single motor to impel atmospheric motion and the

motion of an additional heat transfer fluid." *See Batchelder* at Col. 2, ll. 52-55. Therefore, *Batchelder* explicitly teaches away from "the fan being driven by a motor separate from the motor of the pump," as claimed.

The Office attempts to address this fatal flaw of *Batchelder* by asserting that *Batchelder* does not teach away, but instead contends this "is but one preferred embodiment of the invention and not the only embodiment allowed." Office Action at p. 6; Advisory Action at p. 2. In an attempt to support its contention that *Batchelder* does not teach away, the Office points to stock language at the end of the specification, which recites "[i]t should be understood that this description has been made by way of preferred example, and that the invention is defined by the scope of the following claims." *Batchelder*, Col. 13:13-15. The Office then points to claim 1 of *Batchelder* and contends it only requires an electrically conductive rotatable fluid impeller and "[t]hus, it is clear that the embodiment of Batchelder having only one motor is but a preferred example of the invention and not a single defining characteristic of the invention." Office Action at p. 6; Advisory Action at p. 2. This conclusion is improper because *Batchelder* provides no support for an embodiment with more than one motor, and *Batchelder* teaches away from two separate motors as claimed, when *Batchelder* is considered as a whole.

First, claim 1 of *Batchelder* does not recite two separate motors (i.e., one to drive the electrically conductive rotatable fluid impeller and another to drive the fan), and trying to infer that it does would be improper because *Batchelder* has no support for such an embodiment and claims 16 and 17 of *Batchelder*, which are intended to depend from claim 1[3], recite that a single motor generates both the electrically conductive rotatable fluid impeller and the second impeller. See Col. 14:54-64.

[3] Applicant acknowledges that claim 16 appears to have an error. Applicant has assumed the patentee intended that claim 16 depend on claim 1, and since claim 17 depends from claim 16, claim 17 would indirectly depend from claim 1.

Second, the Office relies on stock language to argue that *Batchelder* does not teach away, but the evidence that it does is overwhelming. For example, starting with the background section, *Batchelder* explicitly criticizes using separate motors and the increased cost associated with separate motors. *Batchelder* criticizes the prior art by stating "[m]ost of these [prior art devices] incur the cost disadvantage of requiring separate motors to impel the heat transfer fluid and to impel the atmosphere." Col. 1:66 to 2:1. Sticking with the background section, *Batchelder* also discredits the prior art by stating:

> [n]one of these existing heat transfer systems simultaneously use a single motor to drive an impeller for the heat transfer fluid and an impeller for the atmosphere, use moving external magnetic fluids to eliminate a rotary seal, and use monolithic assembly without hoses or fittings. Col. 2:6-10.

Moving next to the summary of invention section, *Batchelder* explicitly states that:

> "[t]he primary object of this invention is to provide a low cost high reliability heat exchange apparatus . . . [and a] further objective of this invention is to provide a heat sink design for electronic components that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid. Col. 2:40-55.

Thus modifying *Batchelder* to include separate motors as proposed by the Office would undermine the *primary objective* of *Batchelder*—to provide a low cost apparatus—by adding unnecessary components and negate the objection of *Batchelder*—to use a single motor.

The drawings, specification, and claims of *Batchelder* provide further support that *Batchelder* teaches away from using separate motors. The Office has not pointed to any drawings or anywhere in the specification where *Batchelder* discloses or suggests anything other than using a single motor to impel atmospheric motion and the motion of the heat transfer fluid. Further, independent claims 32, 33, 34, and 35 all recite a single motor to impel atmospheric motion and the motion of the heat transfer fluid. 16:52-63; 17:20-31; 18:1-26; and 18:51-64. The

Cooler Master Co., Ltd. Exhibit 1006, Page 340 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Office trying to infer that claim 1 somehow discloses an embodiment not having a single motor is unreasonable because such an embodiment is neither supported or enabled by the specification as required by 35 U.S.C. § 112.

Thus, in summary, every embodiment disclosed in the drawings and specification of *Batchelder* utilizes a single motor to impel atmospheric motion and the motion of the heat transfer fluid, the majority of the independent claims explicitly recite a single motor, *Batchelder* specifically identifies its object is to use a single motor and limit the cost of the apparatus, and *Batchelder* specifically discredits using two motors and criticizes the increased cost associated with two motors. Applicant acknowledges that, "prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed…." In re Fulton, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004). But, in the present case, *Batchelder* does not disclose an alternative to a single motor, as discussed above, and *Batchelder* extensively criticizes, discredits, and otherwise discourages the solution claimed (i.e., separate motors).

For the foregoing reasons, when *Batchelder* is considered *as a whole*, it is unreasonable for the Office to conclude *Batchelder* does not teach away from the claimed invention.

b. Combining Batchelder and Lenehan is improper

MPEP § 2145(III) states "the claimed combination cannot change the principle of operation of the primary reference or render the reference inoperable for its intended purpose. See MPEP §2143.01." Applicant submits the Office's proposed modifications both change the principal of operation of *Batchelder* and render *Batchelder* inoperable for its intended purpose, making the proposed modification nonobvious, as explained in detail below.

Cooler Master Co., Ltd. Exhibit 1006, Page 341 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

MPEP § 2143.01(V) states "[i]f [a] proposed modification would render the prior art invention being modified *unsatisfactory for its intended purpose*, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)." (Emphasis added). "If the proposed modification or combination of the prior art *would change the principle of operation* of the prior art invention being modified, then the teachings of the references are *not sufficient* to render the claims prima facie obvious." (Emphasis added). *See* MPEP § 2143.01(VI), citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959), which held claims nonobvious where the "suggested combination of references would require a *substantial reconstruction and redesign of the elements* shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." *Id.* at 813 (Emphasis added).

i. The proposed modification would render *Batchelder* unsatisfactory for its intended purpose

In the present case, *Batchelder* clearly states that the intended purpose or objective of the invention is to provide *a low cost* high reliability heat exchange apparatus "that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid" and "to provide an active spreader plate without hoses or fluid couplings." *See Batchelder* at Col. 2, ll. 40-57. To provide the single motor, *Batchelder* teaches using a magnet 56 rotated with the fan blades 34, which causes the rotatable impeller 54 to rotate due to the moving magnetic fields emanating from the magnet 56." *Id.* at Col. 5, ll. 11-26. To eliminate the need for hoses and fluid couplings as intended, *Batchelder* teaches an integrated heat exchange apparatus, for example as shown in Fig. 7, that houses everything including the active spreader plate, heat absorbing device 28, fan housing 30, magnet 56, etc. *Id.* at Col. 7, ln. 23 to Col. 8, ln. 12.

Cooler Master Co., Ltd. Exhibit 1006, Page 342 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Modifying *Batchelder* so the fan and the pump have separate motors and to have a control system configured to independently control a speed of the pump and a speed of the fan, as suggested by the Office, would frustrate the intended purpose of *Batchelder*. First, incorporating a second motor to make the fan and the pump have separate motors would completely negate the objective of *Batchelder* to use "a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid." *Id.* at Col. 2, ll. 52-55. Second, modifying *Batchelder* based on *Lenehan* so the heat absorbing device 28 and fan housing 30 are positioned at a location horizontally spaced apart from the heat sink 2, would require hoses or fluid couplings, which would negate the objective of *Batchelder* to go "without houses or fluid couplings." *Id.* at Col. 2, ll. 56-57. Third, separating the heat absorbing device and heat sink of *Batchelder* and incorporating a second motor and the control system of *Lenehan* into *Batchelder* would significantly increase the complexity and cost of the *Batchelder* apparatus, thereby frustrating the objective to provide "a low cost high reliability heat exchange apparatus." *Id.* at Col. 2, ll. 40-45.

The Office attempts to address this fatal flaw in the combination of *Batchelder* and *Lenehan* by generalizing *Batchelder to be concerned with* "moving cooling fluid through an interior cooling circuit and moving air around an exterior heat exchanger." Office Action at p. 7; Advisory Action at p. 2. This is an improper mischaracterization and over-generalization because *Batchelder* unambiguously defines its intended purpose is to provide *a low cost* high reliability heat exchange apparatus "that uses a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid" and "to provide an active spreader plate without hoses or fluid couplings." *See Batchelder* at Col. 2, ll. 40-57. It is improper for the Office to ignore the

disclosure of *Batchelder* and unilaterally redefine the object or purpose of the invention.[4] According to the Federal Circuit, when considering the intended purpose of a reference, a court must look at the specific purpose disclosed by the reference, not redefine a generalized purpose. For example, as stated by MPEP § 2143.01(V), in *In re Gordon,* the Court found the prior art device (i.e., a liquid strainer for removing dirt and water from gasoline) would be inoperable for its intended purpose if simply turned upside down because the gasoline to be filtered would be trapped at the top, the water and heavier oils sought to be separated would flow out of the outlet instead of the purified gasoline, and the screen would become clogged. In other words, the Court looked at the specific purpose of the reference not some generalized purpose (e.g., filtering) when considering whether a combination renders the prior art reference unsatisfactory for its intended purpose.

Therefore, contrary to the Office's assertion, the modification of *Batchelder* proposed by the Office would render *Batchelder* unsatisfactory for its intended purpose. As a result, and following *In re Gordon*, the combination of *Batchelder* and *Lenehan* is improper and therefore fails to establish a *prima facie* case of obviousness.

ii. The proposed modification would change the principle of operation of *Batchelder*

In the present case, *Batchelder* clearly states that the principle of operation of the invention is to "use a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid." *See Batchelder* at Col. 2, ll. 53-55. Further, the modifications to *Batchelder* based on *Lenehan* proposed by the Office are precisely the kinds of modifications that the court

[3] If an examiner or court could unilaterally over generalize the intended purpose of the reference to such an extent as done here by the Office, the precedent set by *In re Gordon* would be rendered irrelevant.

in *In re Ratti* found nonobvious because there is no suggestion or motivation to make them in the references themselves, and the modifications would require a substantial reconstruction and redesign of the elements. Therefore, a *prima facie* case of obviousness has not been established.

The Office attempts to address this fatal flaw in the combination of *Batchelder* and *Lenehan* by generalizing *Batchelder to be concerned with* "moving cooling fluid through an interior cooling circuit and moving air around an exterior heat exchanger." Office Action at p. 7; Advisory Action at p. 2. But, again, this is an improper mischaracterization and over-generalization because *Batchelder* unambiguously discloses that a principle of operation is to use "a single motor to impel atmospheric motion and the motion of an additional heat transfer fluid." *See Batchelder* at Col. 2, ll. 40-57. The Office tries to rationalize this by stating "[w]hen Batchelder is combined with Lenehan, the resulting combination is a heat exchange assembly that has an interior pump motor that is independently controlled from an exterior fan motor. Once combined *Batchelder* would still be able to dissipate heat from the heat generating component through internal cooling pumping and exterior air cooling." Office Action at p. 7. But, this is nonetheless improper. The Office's proposed combination comprises separate motors to motivate fluid and air flow while use of a single motor to motivate fluid and air flow is a fundamental principle of *Batchelder*. Such a modification would be a change in the basic principle of *Batchelder*, as explained below.

When considering the principle of operation of a reference, Federal Circuit precedent advises courts to look at the *details* of the principle of operation disclosed by the reference. For example, as noted in MPEP § 2143.01(VI), the claims in *In re Ratti* were directed to an oil seal comprising a bore engaging portion with outwardly biased resilient spring fingers inserted in a resilient sealing member. The primary reference relied upon in a rejection based on a combination of references disclosed an oil seal wherein the bore engaging portion was reinforced

Cooler Master Co., Ltd. Exhibit 1006, Page 345 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

by a cylindrical sheet metal casing. MPEP § 2143.01(VI). The primary reference taught a device that required rigidity for operation, whereas the claimed invention required resiliency. *Id.* The Federal Circuit found this slight modification to be a change in the principle of operation and therefore reversed the rejection, noting that the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." *Id.*

Similarly, it is unreasonable for the Office to conclude that modifying *Batchelder* to include separate motors to motivate fluid and air flow is not a change in the principle of operation, when *Batchelder* explicitly teaches using a single motor to motivate fluid and air flow, and specifically criticizes using two or more motors. Therefore, contrary to the Office's assertion, the modification of *Batchelder* proposed by the Office would have been a change in the principle of operation of *Batchelder*. As a result, the combination of *Batchelder* and *Lenehan* is improper and therefore fails to establish a *prima facie* case of obviousness.

In summary, the modifications to *Batchelder* based on *Lenehan* proposed by the Office are precisely the kinds of modifications that the courts in *In re Gordon* and *In re Ratti* found nonobvious because there is no suggestion or motivation to make and the modifications would require a substantial reconstruction and redesign of the elements. Therefore, a *prima facie* case of obviousness has not been established and thus Applicant respectfully requests that the rejection of independent claim 1 and dependent claims 2-7 be withdrawn.

Cooler Master Co., Ltd. Exhibit 1006, Page 346 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Applicant presented these arguments in the prior Amendment After Final filed on April 3, 2017, but this prior Amendment After Final was neither entered nor considered by the Office. Instead, the Advisory Action simply repeated the same arguments from the Office Action that are flawed, improper, and fail to establish a *prima facie* case of obviousness, as previously explained in the Amendment After Final and explained again herein.

c. Amended Independent Claim 1

Despite the Office's failure to establish a prima facie case of obviousness, as explained above, in the interest of advancing prosecution, Applicant has amended independent claim 1 to further distinguish over the prior art references.

Independent claim 1 has been amended, in relevant part, to recite:

> wherein the pump chamber includes:
>
> an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber;
>
> an outlet that fluidly couples the pump chamber to the thermal exchange chamber via a first passage, the outlet is positioned along an outer circumference of the pump chamber and is configured to direct the cooling liquid driven by the impeller through the first passage to the thermal exchange chamber;
>
> wherein the first passage directs the cooling liquid into the thermal exchange chamber between a first end and a second end of the thermal exchange chamber;
>
> wherein the thermal exchange chamber includes at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber.

(Emphasis Added). These elements of amended independent claim 1 as well as the other elements of claim 1 discussed herein are not taught or suggested by *Batchelder* and *Lenehan* alone or in combination.

Cooler Master Co., Ltd. Exhibit 1006, Page 347 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

The MPEP states that a rejection under pre-AIA 35 U.S.C. § 103 requires "a finding that the prior art included each element claimed . . . with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference." MPEP 2143(A) (emphasis added). That is, in order to support a § 103 rejection based on a combination of references, the Examiner must first article that each claim element is present in at least one of the individual references for that element to be present in the combination or references. If a claim element is not present in any one of the individual references, as demonstrated by Applicant herein, then that claim element cannot be present in the combination of references. For example, *Batchelder* does not teach or suggest a first passage that "directs the cooling liquid into the thermal exchanger chamber *between a first end and a second end of the thermal exchanger chamber*," as claimed. (Emphasis added). Instead, *Batchelder* discloses, as shown in Fig. 8, the heat transfer fluid enters pocket 230 at either end of the pocket and flow inward through the fins 52. In another example, *Batchelder* does not teach or suggest "the thermal exchange chamber includes at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, *the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber*," as claimed. (Emphasis added). Instead, *Batchelder* discloses, as shown in Fig. 8, the exit slots 232 are positioned in the center of the fins 52 and pocket 230. And *Lenehan* does not cure these deficiencies of *Batchelder*.

For at least the foregoing reasons, Applicant respectfully requests the rejection of independent claim 1 and dependent claims 2-7 be withdrawn.

Cooler Master Co., Ltd. Exhibit 1006, Page 348 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

III. New Claims 19-27 are Patentable over *Batchelder* and *Lenehan*

New independent claim 19, although different in scope than independent claim 1, includes elements similar to that *Batchelder* and *Lenehan* fail to teach or suggest as explained above. Therefore, new independent claim 19 and dependent claims 20-27 are patentable over *Batchelder* and *Lenehan* for at least the same reasons as claims 1-7, as explained above.

IV. Conclusion

In view of the foregoing remarks, Applicant submits that this claimed invention, as amended, is neither anticipated nor rendered obvious in view of the prior art references cited against this application. Applicant therefore requests the entry of this Amendment, the Examiner's reconsideration of the application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: April 25, 2017

By: /David R. Lefebvre/
David R. Lefebvre
Reg. No. 72,868
(617) 646-1652

Cooler Master Co., Ltd. Exhibit 1006, Page 349 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Electronic Patent Application Fee Transmittal

Application Number:	13861593
Filing Date:	12-Apr-2013
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Filer:	David Lefebvre/Julie Giordano
Attorney Docket Number:	10494.0003-03000

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1st Request	1801	1	1200	1200
		Total in USD ($)		**1200**

Electronic Acknowledgement Receipt	
EFS ID:	29015743
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	David Lefebvre/Julie Giordano
Filer Authorized By:	David Lefebvre
Attorney Docket Number:	10494.0003-03000
Receipt Date:	25-APR-2017
Filing Date:	12-APR-2013
Time Stamp:	09:19:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1200
RAM confirmation Number	042517INTEFSW09204500
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	10494_0003_03_RCE.pdf	1350078 cd3b570c92caa63d7bd2cfcb566767f9aa16b2ba	no	3
Warnings:					
Information:					
2		10494_0003_03_Amendment.pdf	221333 18afe4b9a5ca1115ac421fdef0eb24398444d8f9	yes	20

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment Submitted/Entered with Filing of CPA/RCE	1	1
Claims	2	7
Applicant Arguments/Remarks Made in an Amendment	8	20

Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30636 e499cce3a7a3c9209ca937a28461d350a69021f9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1602047		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/861,593	Filing Date 04/12/2013	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	04/25/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 16	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
TAMARA DARKO

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

22852 7590 06/07/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RUBY, TRAVIS C	
ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 06/07/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

TITLE OF INVENTION: COOLING SYSTEM FOR A COMPUTER SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	09/07/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

Cooler Master Co., Ltd. Exhibit 1006, Page 356 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22852 7590 06/07/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

TITLE OF INVENTION: COOLING SYSTEM FOR A COMPUTER SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	09/07/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
RUBY, TRAVIS C	3744	165-080400

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Cooler Master Co., Ltd. Exhibit 1006, Page 357 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

22852 7590 06/07/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RUBY, TRAVIS C	
ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 06/07/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Cooler Master Co., Ltd. Exhibit 1006, Page 358 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/861,593	Applicant(s) ERIKSEN, ANDRÉ SLOTH	
	Examiner TRAVIS RUBY	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *4/25/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-7 and 19-27*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/25/2017 has been entered.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

In claim 2 line 1 replace "of claim 2" with --of claim 1-- for proper claim dependency.

REASONS FOR ALLOWANCE

3. The following is an examiner's statement of reasons for allowance:

The prior art does not anticipate nor render obvious the combination set forth in the independent claims, and specifically does not show the specifics of the pump chamber as outlined in Claims 1 and 19.

The closest prior art of record Batchelder (as previously cited) teaches a pump chamber but fails to teach the recited first and second passages. There would be no motivation to modify the pump chamber of Batchelder. The prior art fails to neither anticipate nor render obvious the applicants' invention. Thus the applicants' invention is novel and non-obvious in view of the prior art.

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRAVIS RUBY whose telephone number is (571)270-5760. The examiner can normally be reached on Monday-Friday 9:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jianying Atkisson can be reached on 571-270-7740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	Art Unit
	TRAVIS RUBY	3744

CPC- SEARCHED		
Symbol	Date	Examiner
(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc.	10/1/2016	/TR/

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
165	80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133	10/1/2016	/TR/
361	699,702,720	10/1/2016	/TR/
417	423.1	10/1/2016	/TR/

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Name Search	5/30/2017	/TR/
See EAST Search History	5/30/2017	/TR/

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc.	5/30/2017	/TR/

	/TRAVIS RUBY/ Primary Examiner.Art Unit 3744

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

CPC							
Symbol						**Type**	**Version**
G06F		1	/	206		F	2013-01-01
G06F		1	/	20		I	2013-01-01
G06F		2200	/	201		A	2013-01-01
H01L		23	/	473		I	2013-01-01
F04D		15	/	0066		I	2013-01-01
H01L		2924	/	0002		A	2013-01-01
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
H01L		2924	/	0002	A	1	1	2013-01-01
H01L		2924	/	00	A	1	2	2013-01-01

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	16	
/TRAVIS RUBY/ Primary Examiner.Art Unit 3744	05/30/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	20

Cooler Master Co., Ltd. Exhibit 1006, Page 365 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
165	80.4	F	2	8	F	7 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	16	
/TRAVIS RUBY/ Primary Examiner.Art Unit 3744	05/30/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	20

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1														
2	2														
3	3														
4	4														
5	5														
6	6														
7	7														
8	19														
9	20														
10	21														
11	22														
12	23														
13	24														
14	25														
15	26														
16	27														

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	16	
/TRAVIS RUBY/ Primary Examiner.Art Unit 3744	05/30/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	20

Cooler Master Co., Ltd. Exhibit 1006, Page 367 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	28	(("ERIKSEN") near3 ("Andre")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/05/30 13:24
L2	49710	(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc. (165/80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133).ccls. (361/699,702,720).ccls. (417/423.1).ccls.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/30 13:24
L3	629	L2 and @PD>"20170203"	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/30 13:24
L6	1	L3 and (pump and stator and reservoir and radiator)	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/30 13:30
L7	38	L2 and (pump and stator and reservoir and radiator)	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/30 13:30

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L4	27109	(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc. (165/80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133).ccls. (361/699,702,720).ccls. (417/423.1).ccls.	US-PGPUB; USPAT	OR	ON	2017/05/30 13:24
L5	11	L4 and (pump and stator and reservoir and radiator).clm.	US-PGPUB; USPAT	OR	ON	2017/05/30 13:29

5/30/2017 1:34:22 PM
C:\Users\truby\Documents\EAST\Workspaces\13-861593.wsp

Cooler Master Co., Ltd. Exhibit 1006, Page 368 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	06/27/2016	10/01/2016	01/31/2017	05/30/2017					
1	1	÷	✓	✓	=					
2	2	÷	✓	✓	=					
3	3	÷	✓	✓	=					
4	4	÷	✓	✓	=					
5	5	÷	✓	✓	=					
6	6	÷	✓	✓	=					
7	7	÷	✓	✓	=					
	8	÷	N	N	-					
	9	÷	N	N	-					
	10	÷	N	N	-					
	11	÷	N	N	-					
	12	÷	N	N	-					
	13	÷	N	N	-					
	14	÷	N	N	-					
	15	÷	N	N	-					
	16	÷	N	N	-					
	17	÷	N	N	-					
	18	÷	N	N	-					
8	19				=					
9	20				=					
10	21				=					
11	22				=					
12	23				=					
13	24				=					
14	25				=					
15	26				=					
16	27				=					

Cooler Master Co., Ltd. Exhibit 1006, Page 369 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

22852 7590 06/07/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER
RUBY, TRAVIS C

ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 06/07/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

TITLE OF INVENTION: COOLING SYSTEM FOR A COMPUTER SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	09/07/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 02/11)

Cooler Master Co., Ltd. Exhibit 1006, Page 370 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22852 7590 06/07/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

TITLE OF INVENTION: COOLING SYSTEM FOR A COMPUTER SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	09/07/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
RUBY, TRAVIS C	3744	165-080400

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Cooler Master Co., Ltd. Exhibit 1006, Page 371 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

22852 7590 06/07/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RUBY, TRAVIS C	
ART UNIT	PAPER NUMBER
3744	

DATE MAILED: 06/07/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Cooler Master Co., Ltd. Exhibit 1006, Page 372 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/861,593	Applicant(s) ERIKSEN, ANDRÉ SLOTH	
	Examiner TRAVIS RUBY	Art Unit 3744	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *4/25/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-7 and 19-27*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   Certified copies:
   a) ☐ All b) ☐ Some *c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/25/2017 has been entered.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

In claim 2 line 1 replace "of claim 2" with --of claim 1-- for proper claim dependency.

REASONS FOR ALLOWANCE

3. The following is an examiner's statement of reasons for allowance:

The prior art does not anticipate nor render obvious the combination set forth in the independent claims, and specifically does not show the specifics of the pump chamber as outlined in Claims 1 and 19.

The closest prior art of record Batchelder (as previously cited) teaches a pump chamber but fails to teach the recited first and second passages. There would be no motivation to modify the pump chamber of Batchelder. The prior art fails to neither anticipate nor render obvious the applicants' invention. Thus the applicants' invention is novel and non-obvious in view of the prior art.

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRAVIS RUBY whose telephone number is (571)270-5760. The examiner can normally be reached on Monday-Friday 9:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jianying Atkisson can be reached on 571-270-7740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	Art Unit
	TRAVIS RUBY	3744

CPC- SEARCHED		
Symbol	Date	Examiner
(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc.	10/1/2016	/TR/

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
165	80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133	10/1/2016	/TR/
361	699,702,720	10/1/2016	/TR/
417	423.1	10/1/2016	/TR/

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Name Search	5/30/2017	/TR/
See EAST Search History	5/30/2017	/TR/

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc.	5/30/2017	/TR/

	/TRAVIS RUBY/ Primary Examiner.Art Unit 3744

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

CPC							
Symbol						**Type**	**Version**
G06F		1	/	206		F	2013-01-01
G06F		1	/	20		I	2013-01-01
G06F		2200	/	201		A	2013-01-01
H01L		23	/	473		I	2013-01-01
F04D		15	/	0066		I	2013-01-01
H01L		2924	/	0002		A	2013-01-01
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
H01L		2924	/	0002	A	1	1	2013-01-01
H01L		2924	/	00	A	1	2	2013-01-01

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	16	
/TRAVIS RUBY/ Primary Examiner.Art Unit 3744	05/30/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	20

Cooler Master Co., Ltd. Exhibit 1006, Page 379 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
165	80.4	F	2	8	F	7 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	16	
/TRAVIS RUBY/ Primary Examiner.Art Unit 3744	05/30/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	20

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1														
2	2														
3	3														
4	4														
5	5														
6	6														
7	7														
8	19														
9	20														
10	21														
11	22														
12	23														
13	24														
14	25														
15	26														
16	27														

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	16	
/TRAVIS RUBY/ Primary Examiner.Art Unit 3744	05/30/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	20

Cooler Master Co., Ltd. Exhibit 1006, Page 381 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	28	(("ERIKSEN") near3 ("Andre")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/05/30 13:24
L2	49710	(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc. (165/80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133).ccls. (361/699,702,720).ccls. (417/423.1).ccls.	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/30 13:24
L3	629	L2 and @PD>"20170203"	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/30 13:24
L6	1	L3 and (pump and stator and reservoir and radiator)	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/30 13:30
L7	38	L2 and (pump and stator and reservoir and radiator)	US-PGPUB; USPAT; FPRS; EPO; JPO	OR	ON	2017/05/30 13:30

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L4	27109	(G06F1/206,20).cpc. (G06F2200/201).cpc. (F04D15/0066).cpc. (H01L23/473).cpc. (165/80.2,80.4,104.21,104.33,244,272,67,80.5,104.22,133).ccls. (361/699,702,720).ccls. (417/423.1).ccls.	US-PGPUB; USPAT	OR	ON	2017/05/30 13:24
L5	11	L4 and (pump and stator and reservoir and radiator).clm.	US-PGPUB; USPAT	OR	ON	2017/05/30 13:29

5/30/2017 1:34:22 PM
C:\Users\truby\Documents\EAST\Workspaces\13-861593.wsp

Cooler Master Co., Ltd. Exhibit 1006, Page 382 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13861593	ERIKSEN, ANDRÉ SLOTH
	Examiner	**Art Unit**
	TRAVIS RUBY	3744

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	06/27/2016	10/01/2016	01/31/2017	05/30/2017					
1	1	÷	✓	✓	=					
2	2	÷	✓	✓	=					
3	3	÷	✓	✓	=					
4	4	÷	✓	✓	=					
5	5	÷	✓	✓	=					
6	6	÷	✓	✓	=					
7	7	÷	✓	✓	=					
	8	÷	N	N	-					
	9	÷	N	N	-					
	10	÷	N	N	-					
	11	÷	N	N	-					
	12	÷	N	N	-					
	13	÷	N	N	-					
	14	÷	N	N	-					
	15	÷	N	N	-					
	16	÷	N	N	-					
	17	÷	N	N	-					
	18	÷	N	N	-					
8	19				=					
9	20				=					
10	21				=					
11	22				=					
12	23				=					
13	24				=					
14	25				=					
15	26				=					
16	27				=					

Cooler Master Co., Ltd. Exhibit 1006, Page 383 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22852 7590 06/07/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

TITLE OF INVENTION: COOLING SYSTEM FOR A COMPUTER SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	09/07/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
RUBY, TRAVIS C	3744	165-080400

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☒ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 FINNEGAN, HENDERSON, FARABOW,
2 GARRETT & DUNNER LLP
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: ASETEK DANMARK A/S

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Aalborg East, Denmark

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

☐ A check is enclosed.

☒ Payment by credit card. Form PTO-2038 is attached.

☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 06-0916 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /David R. Lefebvre/ Date June 19, 2017

Typed or printed name David R. Lefebvre Registration No. 72,868

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Cooler Master Co., Ltd. Exhibit 1006, Page 384 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: André Sloth Eriksen	)	
	)	Group Art Unit: 3744
Application No.: 13/861,593	)	
	)	Examiner: Travis C. Ruby
Filed: April 12, 2013	)	
	)	Confirmation No.: 3473
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	
	)	***VIA EFS-WEB***

Mail Stop M Correspondence
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

FEE ADDRESS FOR MAINTENANCE FEE PURPOSES IN ACCORDANCE WITH 37 C.F.R. 1.363

In accordance with the provisions of 37 C.F.R. 1.363, the fee address set forth below is being supplied for purposes of receiving notices, receipts, and other correspondence relating to the payment of maintenance fees:

CPA Global Limited (CPA)
12th Floor
2318 Mill Road
Alexandria, VA 22314
Payor No.: 00197

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.

Dated: June 19, 2017

By: /David R. Lefebvre/
David R. Lefebvre
Reg. No. 72,868
(617) 646-1652

Electronic Patent Application Fee Transmittal

Application Number:	13861593
Filing Date:	12-Apr-2013
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Filer:	David Lefebvre/Julie Giordano
Attorney Docket Number:	10494.0003-03000

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**960**

Electronic Acknowledgement Receipt	
EFS ID:	29538319
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	David Lefebvre/Julie Giordano
Filer Authorized By:	David Lefebvre
Attorney Docket Number:	10494.0003-03000
Receipt Date:	19-JUN-2017
Filing Date:	12-APR-2013
Time Stamp:	15:32:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$960
RAM confirmation Number	062017INTEFSW15332800
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	10494_0003_03_Issue_Trans.pdf	1634439 520593939e81f0a264ed085e165120e376d76a4a	no	1
Warnings:					
Information:					
2	Maintenance Fee Address Change	10494_0003_03_FeeAddress.pdf	107065 af8b66bd64720d86b72dee31ca59634d2d6164db	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30734 381f074652233383c5aef585d25ec41604a1ececc	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1772238		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	04/12/2013	André Sloth Eriksen	10494.0003-03000	3473

22852 7590 07/06/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
RUBY, TRAVIS C	

ART UNIT	PAPER NUMBER
3744	

NOTIFICATION DATE	DELIVERY MODE
07/06/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

regional-desk@finnegan.com

UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address : COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/861,593	12 April, 2013	ERIKSEN, ANDRÉ SLOTH	10494.0003-03000

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
TRAVIS RUBY	
ART UNIT	PAPER
3744	20170628

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

Original Claim 27 contains a grammatical error and does not have a period at the end. The examiner has done an examiners amendment to add a period after the word "member" in Original Claim 27.

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

PTO-90C (Rev.04-03)

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Original Claim 27, replace "member" with --member.--

Conclusion

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRAVIS RUBY whose telephone number is (571)270-5760. The examiner can normally be reached on Monday-Friday 9:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jianying Atkisson can be reached on 571-270-7740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TRAVIS RUBY/
Primary Examiner, Art Unit 3744

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/861,593	08/15/2017	9733681	10494.0003-03000	3473

22852 7590 07/26/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 1116 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

ASETEK A/S, Bronderslev, DENMARK;
André Sloth Eriksen, Morgan Hill, CA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PATENT
Customer No. 22,852
Attorney Docket No.: 10494.0003-03000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent No.: 9,733,681	) Group Art Unit:	3744
	)	
Inventor: André Sloth Eriksen	) Examiner:	Travis C. Ruby
	)	
Issued: August 15, 2017	) Confirmation No.:	3473
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	) ***VIA EFS-WEB***	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

COMBINED DESIGNATION OF DOMESTIC REPRESENTATIVE AND STATEMENT UNDER 37 C.F.R. § 3.73(b)

Pursuant to 35 U.S.C. § 293 and in accordance with 37 C.F.R. § 3.61 and M.P.E.P. § 302.04, the assignee of the above-identified patent, who does not reside in the United States, hereby designates:

Corporation Service Company
2720 Gateway Oaks Drive
Suite 150N
Sacramento, CA 95833
Phone: (916) 641-5100

as the domestic representative on whom process or notice of proceedings affecting the patent may be served.

Asetek Danmark A/S, a corporation of Denmark, is the assignee of the entire right, title, and interest in the patent identified above by virtue of an assignment from inventor André Sloth Eriksen to Asetek A/S, recorded in the United States Patent and Trademark Office (USPTO) at Reel 042952, Frame 0177 on June 22, 2017, and a change of name from Asetek A/S to Asetek

Danmark A/S, recorded in the USPTO at Reel 033748, Frame 0097 on September 16, 2014. Thus, in accordance with 37 C.F.R. § 3.73(b), the undersigned (whose title is supplied below) is empowered to sign this designation on behalf of the assignee.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Asetek Danmark A/S

Dated: July 27, 2017

By: /André Sloth Eriksen/
André Sloth ERIKSEN
Chief Executive Officer

Dated: July 27, 2017

By: /Peter Dam Madsen/
Peter Dam MADSEN
Chairman of the Board

Electronic Acknowledgement Receipt

EFS ID:	29915958
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	David Lefebvre/Julie Giordano
Filer Authorized By:	David Lefebvre
Attorney Docket Number:	10494.0003-03000
Receipt Date:	28-JUL-2017
Filing Date:	12-APR-2013
Time Stamp:	08:38:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	10494_0003_03_CDDR.pdf	117849 f17804c12d3d4dccbb91afe133afc7086ff26397	no	2
Warnings:					

Information:	
Total Files Size (in bytes):	117849

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Trials@uspto.gov
571.272.7822

Paper No. 9
Entered: August 24, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COOLIT SYSTEMS, INC.,
Petitioner,

v.

ASETEK DANMARK A/S,
Patent Owner.

IPR2020-00524
Patent 9,733,681 B2

Before MICHAEL P. TIERNEY, *Vice Chief Administrative Patent Judge*, KEVIN W. CHERRY, and JASON W. MELVIN, *Administrative Patent Judges*.

CHERRY, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

CoolIT Systems, Inc. ("Petitioner") filed a Petition (Paper 2, "Pet.") requesting institution of *inter partes* review of claims 1, 4, 8, 11, 15, and 16 of U.S. Patent No. 9,733,681 B2 (Ex. 1001, "the '681 patent"). Asetek Danemark A/S ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). We authorized Petitioner to file a Reply ("Reply," Paper 8). Paper 7 (Order Authorizing Reply).

Pursuant to 35 U.S.C. § 314(a), an *inter partes* review may be instituted only if "the information presented in the petition . . . and any [preliminary] response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

For the reasons given below, on this record Petitioner has established a reasonable likelihood that it would prevail in showing the unpatentability of claims 1, 4, 8, 11, 15, and 16 of the '681 patent. Accordingly, we institute an *inter partes* review of the '681 patent.

II. BACKGROUND

A. Real Parties in Interest

The Petition identifies CoolIT Systems, Inc. as the real party-in-interest for Petitioner. Pet. 1. Patent Owner identifies Asetek Danmark A/S, Asetek USA, Inc., Asetek A/S, and Asetek Holdings, Inc. as the real parties-in-interest for Patent Owner. Paper 4, 1 (Patent Owner's Mandatory Notices).

B. Related Proceedings

The parties identify *Asetek Danmark A/S v. CoolIT Systems, Inc.*, Case No. 3:19-cv-00410-EMC (N.D. Cal.) (served on February 7, 2019, currently

Cooler Master Co., Ltd. Exhibit 1006, Page 400 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

pending) as the related co-pending district court litigation. Pet. 1; Paper 4, 1; Prelim. Resp. 2. The parties also identify the following pending petitions for *inter partes* review involving patents that are related to the '681 patent: IPR2020-00522, Petition for *Inter Partes* Review of U.S. Patent No. 10,078,355 B2, filed on February 7, 2020; IPR2020-00523, Petition for *Inter Partes* Review of U.S. Patent No. 10,078,354 B2, filed on February 7, 2020. Pet. 1; Paper 4, 1.

C. The '681 Patent

The '681 patent is titled "Cooling System for a Computer System." Ex. 1001, Code [54]. The '681 patent issued from Application Serial No. 13/861,593, filed April 12, 2013. *Id.* at Codes [21], [22]. The '593 application is a continuation of Application Serial No. 11/919,974, filed on January 6, 2009, which is a U.S. national phase application of PCT/DK2005/00310, filed May 6, 2005. *Id.* at Code [63].

The '681 patent relates to a liquid-cooling system for a computer system. *Id.* at Code [57]. The specification explains, at the time of the invention, air cooling arrangements were the most-used cooling system for cooling central processing units (CPUs) in computer systems. *Id.* at 1:17–33. An alternative design known at the time of the invention was to use a cooling liquid circulating inside a closed system by means of a pumping unit with a heat exchanger past which the cooling liquid circulates. *Id.* at 1:34–38. The specification contends that liquid cooling is generally more efficient and quieter than air cooling, but that a liquid cooling design consists of "many components," which increases the total installation time, size, and risk of leakage of the cooling liquid from the system. *Id.* at 1:39–49. Thus, it is one object of the invention to provide a small and compact liquid-

Cooler Master Co., Ltd. Exhibit 1006, Page 401 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

cooling solution, which is more efficient than existing air-cooling arrangements and which can be produced at low cost enabling high production volumes, be easy-to-use and implement, can be used with existing CPU types and computer systems, and requires a low level of maintenance or no maintenance at all. *Id.* at 1:53–63.

An illustrative embodiment of such a device is depicted in Figures 7 and 8, reproduced below.

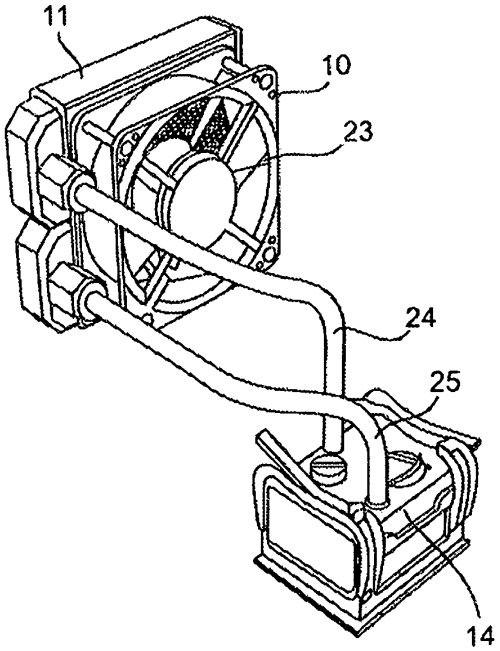


FIG. 7

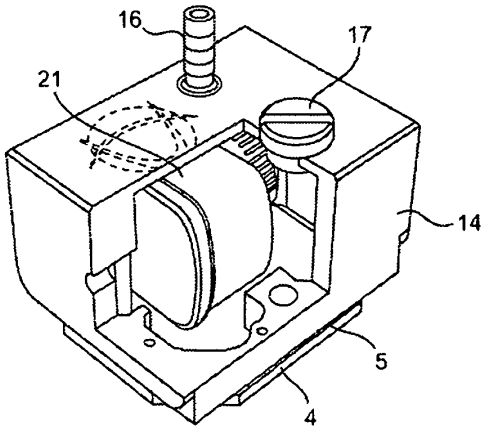


FIG. 8

Figure 7[1] is a perspective view of the cooling system showing reservoir housing 14 with the heat exchanging surface 5 (shown in Figure 8)

[1] We agree with Petitioner that it appears that the specification transposes the description of Figure 7 with that of Figure 8. Pet. 5 n.1. We refer to the

Cooler Master Co., Ltd. Exhibit 1006, Page 402 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

and the pump 21 (shown in Figure 8) inside the reservoir. *Id.* at 16:16–19. Figure 8 is a cut-out view into reservoir housing 14, when the reservoir, pump 21, and heat exchanging surface 4 are situated inside the reservoir. *Id.* at 15:49–51. The reservoir has a tube inlet connection (not shown in Figure 8) through which the cooling liquid enters the reservoir. *Id.* at 15:51–53. From the tube inlet connection, the cooling liquid flows through the reservoir passing heat exchanging surface 4 and enters the inlet of the pump. *Id.* at 15:54–56. After the cooling liquid flows through the pump, the cooling liquid passes out of the outlet of the pump and further out through tube outlet connection 16. *Id.* at 15:56–58. As shown in Figure 7, tube inlet connection and tube outlet connection 16 are connected to heat radiator 11 by means of connecting tubes 24 and 25. *Id.* at 16:19–21. Cooling liquid flows into and out of the reservoir and the heat radiator through connecting tubes 24 and 25, respectively. *Id.* at 16:21–23. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir to prevent the cooling liquid passing the reservoir too quickly to take up a sufficient amount of heat from the heat exchanging surface. *Id.* at 16:51–62.

Within heat radiator 11 (shown in Figure 7), the cooling liquid passes a number of channels for radiating the heat carried in the cooling fluid from heat exchanging surface 4 (shown in Figure 8). *Id.* at 16:23–26. Air fan 10 (with propeller 23) of Figure 7 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid

---

description of "Figure 8" in the specification in our discussion of Figure 7, and we refer to the specification's discussion of "Figure 7" in our discussion of Figure 8.

Cooler Master Co., Ltd. Exhibit 1006, Page 403 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

flowing inside the channels through the heat radiator and back into the reservoir. *Id.* at 16:26–30.

Figures 17 and 20 show the internal structures of a preferred embodiment of the reservoir according to the invention and are reproduced below. *Id.* at 21:48–50.

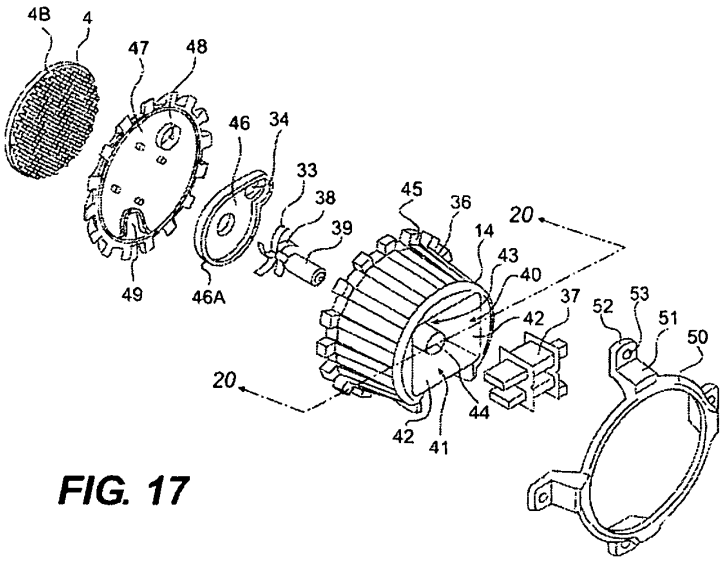


FIG. 17

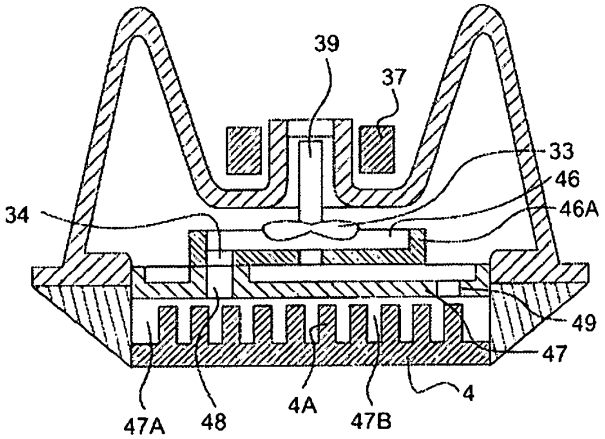


FIG. 20

Cooler Master Co., Ltd. Exhibit 1006, Page 404 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Figure 17 is an exploded perspective view of a preferred embodiment of a reservoir and a pump and the heat exchanging surface. *Id.* at 10:7–9. Figure 20 is a simplified schematic showing a cross-sectional view of the reservoir along plane 20-20 of Figure 17. *Id.* at 10:16–17. Reservoir housing 14 as shown in Figures 17 and 20 is in the form of a double-sided chassis having a substantially conical, circular configuration with stiffening ribs 36 extending axially along the exterior of the reservoir housing and configured to mount an electrical motor. *Id.* at 21:49–57. Reservoir housing 14 has recess 40 intended for accommodating stator 37 of an electrical motor driving impellor 33 of the pump, which is attached to shaft 38 of rotor 39 of the electric motor. *Id.* at 21:58–22:1. The specification explains that "a liquid-proof division" is made between rotor 39 of the motor, which is submerged in the cooling liquid, and the stator 37 of the pump. *Id.* at 22:1–22:6.

The enclosed space between impeller 33 and heating exchanging interface 4 is divided into two separate chambers by impeller cover 46A and intermediate member 47, as shown in Figure 20. The chamber formed by impeller 33 and impeller cover 46A is described as "pump chamber 46" and has outlet 34. *Id.* at 22:64–67. A second chamber termed the "thermal exchange chamber 47A" is formed by intermediate member 47 and heat exchanging interface 4. *Id.* at 23:5–11. Intermediate member 47 has two passages through it—first passage 48 and second passage 49. *Id.* at 23:7–15. First passage 48 connects to outlet 34 and provides a passage for the cooling liquid to flow from pump chamber 46 to thermal exchange chamber 47A. *Id.* Second passage 49 leads cooling liquid from thermal exchange chamber

Cooler Master Co., Ltd. Exhibit 1006, Page 405 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

47A to the interior of reservoir housing 14 allowing for the circulation of the liquid out of reservoir housing 14 to heat radiator 11. *Id.* at 23:11–19.

D. Illustrative Claims

Of the challenged claims, claims 1 and 8 are independent. Claims 4, 11, 15, and 16 depend directly or indirectly from either claims 1 or 8. Claims 1 and 8, reproduced below, are illustrative:

> 1. A liquid cooling system for cooling a heat-generating component of a computer, comprising:
>
> a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor with a stator and an impeller, the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid;
>
> a reservoir adapted to pass the cooling liquid there-through, the reservoir including:
>
> a pump chamber including the impeller; and
>
> a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled;
>
> a heat-exchanging interface removably coupled to the reservoir, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component;
>
> a heat radiator adapted to pass the cooling liquid therethrough, the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;

Cooler Master Co., Ltd. Exhibit 1006, Page 406 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump; and

a control system configured to independently control a speed of the pump and a speed of the fan;

wherein the pump chamber includes:

an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber;

an outlet that fluidly couples the pump chamber to the thermal exchange chamber via a first passage, the outlet is positioned along an outer circumference of the pump chamber and is configured to direct the cooling liquid driven by the impeller through the first passage to the thermal exchange chamber;

wherein the first passage directs the cooling liquid into the thermal exchange chamber between a first end and a second end of the thermal exchange chamber;

wherein the thermal exchange chamber includes at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber.

Ex. 1001, 28:18–67.

Cooler Master Co., Ltd. Exhibit 1006, Page 407 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

8. A liquid cooling system for cooling a heat-generating component of a computer, comprising:

a pump chamber housing an impeller, the pump chamber being defined by an intermediate member and a double-sided chassis housing, the impeller being part of a pump that includes a motor, a rotor, and a stator configured to circulate a cooling liquid, the impeller being positioned on one side of the double-sided chassis housing and the stator being positioned on an opposite side of the double-sided chassis housing and isolated from the cooling liquid;

a thermal exchange chamber disposed between the pump chamber and the heat-generating component when the system is installed on the heat-generating component;

a heat-exchanging interface coupled to the intermediate member, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, the heat-exchanging interface has a plane outer surface configured to be placed in thermal contact with a surface of the heat-generating component and an inner surface that defines a network of channels that direct the flow of the cooling liquid within the thermal exchange chamber;

a heat radiator adapted to pass the cooling liquid therethrough, the heat radiator being fluidly coupled to the pump chamber and the thermal exchange chamber via fluid conduits and positioned at a location remote from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;

wherein the pump chamber includes:

an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber;

an outlet that fluidly couples the pump chamber to the thermal exchange chamber via a first passage defined by the intermediate member, the outlet is positioned along an outer circumference of the pump chamber and is configured to direct the cooling liquid driven by the

Cooler Master Co., Ltd. Exhibit 1006, Page 408 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

impeller through the first passage to the thermal exchange chamber;

wherein the first passage directs the cooling liquid into the thermal exchange chamber and into the network of channels between a first end and a second end of the thermal exchange chamber;

wherein the intermediate member defines at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber.

Id. at 29:21–30:22.

E. The Asserted Grounds of Unpatentability

Petitioner challenges the patentability of claims 1, 4, 8, 11, 15, and 16 of the '681 patent on the following grounds:

Reference(s)	Basis	Claims challenged
Duan,[2] Shin,[3] Cheon[4]	§ 103(a)[5]	1, 4
Duan	§ 102	8, 11, 15, 16
Duan	§ 103(a)	8, 11, 15, 16

Petitioner supports its Petition with a Declaration by Marc Hodes, Ph.D., dated February 7, 2020. Ex. 1003.

---

[2] U.S. Patent Application Publication No. 2006/0185830, filed Feb. 18, 2005, published Aug. 24, 2006 (Ex. 1005, "Duan").

[3] Japanese Published Patent Application 2002-151638, published May 24, 2002 (Ex. 1006, "Shin"). The record includes a certified English translation of Shin. All citations will be to the certified English translation.

[4] U.S. Patent No. 5,731,954, issued Mar. 24, 1998 (Ex. 1007, "Cheon").

[5] Because the claims at issue have an effective filing date prior to March 16, 2013, the effective date of the applicable provisions of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), we apply the pre-AIA versions of 35 U.S.C. §§ 102 and 103 in this Decision.

Cooler Master Co., Ltd. Exhibit 1006, Page 409 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

F. Level of Ordinary Skill

> Petitioner proposes that a person of ordinary skill
>
> would have been knowledgeable regarding liquid cooling systems for computer systems, would have earned at least a bachelor's degree, such as an B.S. (bachelor of science), or equivalent thereof, in electrical or mechanical engineering or a closely-related field, and would have possessed at least two or three years of experience in liquid cooling systems for computer systems, or in similar systems.

Pet. 4 (citing Ex. 1003 ¶¶ 25–30). Patent Owner does not dispute this definition of a person of ordinary skill. *See generally* Prelim. Resp. For purposes of this Decision, we adopt Petitioner's proposed level of ordinary skill as it appears to be consistent with the level of skill reflected by the specification and in the asserted prior art references. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself can reflect the appropriate level of ordinary skill in the art).

G. Claim Construction

We interpret claims in the same manner used in a civil action under 35 U.S.C. § 282(b) "including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R. § 42.100(b) (2019).[6] Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the

[6] On October 11, 2018, the USPTO revised its rules to harmonize the Board's claim construction standard with that used in federal district court. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (to be codified at 37 C.F.R. pt. 42). This rule change applies to the instant Petition because it was filed after November 13, 2018. *See id.*

Cooler Master Co., Ltd. Exhibit 1006, Page 410 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

Petitioner argues that identifies "reservoir," "chamber," "impeller," "stator," "heat radiator," "an inlet positioned below the center of the impeller," and "intermediate member" as needing construction. Pet. 14–20. Petitioner submits that the other terms do not require construction. Pet. 20. Patent Owner agrees with Petitioner's proposed constructions for "reservoir," "chamber," "impeller," and "heat radiator." Prelim. Resp. 21. Patent Owner disagrees with Petitioner's constructions of "stator," "intermediate member," "an inlet positioned below the center of the impeller," "double-sided chassis," and "a first end or a second end of the thermal exchange chamber." *Id.* at 21. In addition, Patent Owner proposes a construction for "the pump chamber defined by an intermediate and double-sided chassis housing." *Id.* Patent Owner submits that, although it disputes Petitioner's constructions of "stator," "intermediate member," "double-sided chassis," and "a first end or a second end of the thermal exchange chamber," no construction of these terms is necessary. *Id.* Patent Owner submits that resolving the party's conflicting constructions of the terms "an inlet positioned below the center of the impeller" and "the pump chamber defined by an intermediate member and a double-sided chassis housing" would aid our institution decision. *Id.*

We agree with Patent Owner that no construction is necessary of "reservoir," "chamber," "impeller," "heat radiator," "stator," "intermediate member," "double-sided chassis," and "a first end or a second end of the thermal exchange chamber" for our determination of whether to institute *inter partes* review. We also agree with the parties that resolving the

Cooler Master Co., Ltd. Exhibit 1006, Page 411 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

constructions of "an inlet positioned below the center of the impeller" requires construction and "the pump chamber defined by an intermediate member and a double-sided chassis housing" would be helpful for this Decision.

1. "an inlet positioned below the center of the impeller"

Petitioner submits that the phrase "an inlet positioned below the center of the impeller" should be construed as including an "opening for fluid near the center of the impeller along the axis around which the impeller rotates." Pet. 16. Patent Owner argues that the phrase is "easily understood" and should be given its plain and ordinary meaning. Prelim. Resp. 35. We agree with Patent Owner that this phrase should receive its plain and ordinary meaning.

We note, however, that Patent Owner additionally contends that this limitation requires "a particular positional/directional frame of reference, i.e., the position of the 'inlet' into the pump chamber' must be understood or defined in relation to the positions of the recited 'impeller' and 'heat exchanging interface.'" *Id.* at 36. We disagree. The contrast between the specific language of the two independent claims demonstrates that this single phrase by itself does not impute a certain "positional/directional frame of reference" for other structures of the device. Claim 1 recites that the "thermal exchange chamber" is "formed below the pump chamber and vertically spaced apart from the pump chamber" and that the "heat radiator" is "positioned at a location horizontally spaced apart from the heat generating component." Unlike claim 1, claim 8 does not contain any "vertical" or "horizontal" references or a requirement that the "thermal exchange chamber" be "below" the "pump chamber." Instead, claim 8

Cooler Master Co., Ltd. Exhibit 1006, Page 412 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

merely requires that the "thermal exchange chamber" be "disposed between the pump chamber and the pump chamber and the heat-generating component when the system is installed on the heat-generating component." Claim 8, in contrast to claim 1, does not impose any specific particular positional/directional frame of reference on the entire claimed cooling device. Patent Owner points to the limitation "the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, the heat-exchanging interface has a plane outer surface configured to be placed in thermal contact with a surface of the heat-generating component" of claim 8 as imposing particular directional/positional frame of reference. We disagree. The "boundary wall" limitation merely requires that a boundary of the thermal exchange chamber be in contact with the heat-generating component; it does not impose a particular positional/directional framework as Patent Owner contends. Thus, the claim language does not support incorporating such a particular positional/directional frame of reference into claim 8 based on the disputed claim limitation alone. *See Intellectual Ventures I LLC v. T-Mobile USA, Inc.*, 902 F.3d 1372, 1379 (Fed. Cir. 2018) ("This shows that the patentee knew how to restrict the resource allocator to using information obtained from layer 7. If the patentee had intended to similarly restrict the resource allocator in claim 1, it could have done so using the language of claim 19, but did not.").

As for Patent Owner's reliance on Figures 17 and 20 and the supporting discussion, we see nothing in the specification that would suggest limiting the claims to a particular positional/directional frame of reference based on these figures alone—especially given the express limitation of the positional/directional frame in claim 1. *See Acumed LLC*, 483 F.3d at 805

Cooler Master Co., Ltd. Exhibit 1006, Page 413 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

("[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments." (quoting *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc))).

Accordingly, we determine that "an inlet positioned below the center of the impeller" should be given its plain and ordinary meaning, which does not impose—by itself—a particular positional/directional frame of reference.

2. "the pump chamber defined by an intermediate member and a double-sided chassis housing"

Patent Owner proposes construing the term "defined by" in the limitation "the pump chamber defined by an intermediate member and a double-sided chassis housing" as "formed between." Prelim. Resp. 31–32. Patent Owner relies on an annotated version of Figure 20 to support its contentions. *Id.* at 32. A version of Figure 20, annotated by Patent Owner, is reproduced below.

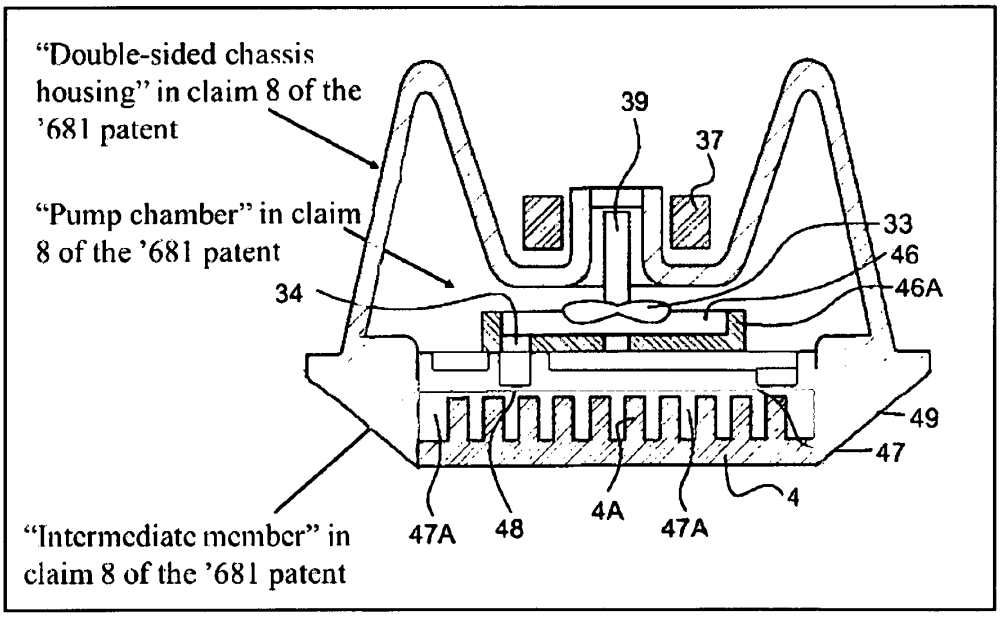


Figure 20, as annotated by Patent Owner, shows the double-sided chassis in green, intermediate member in blue, and the pump chamber in sky blue. *Id.* Patent Owner contends that this annotated figure shows the "pump chamber" is formed between the "double-sided chassis" at the top and the "intermediate member" at the bottom. *Id.*

We disagree with Patent Owner's proposed construction and determine that no construction is necessary. Beginning with the claim language, we note that claim 1 recites that the "thermal exchange chamber [is] formed below the pump chamber." Thus, the patent could have used the term "formed," but chose a distinct term, "defined" for claim 8 instead. *See Intellectual Ventures II*, 902 F.3d at 1379. The specification further supports this point that the patentee chose "defined" instead of "formed." For example, in discussing an alternative embodiment, the specification describes that "pump chamber 46 [is] formed by impeller cover 46A." Ex. 1001, 22:65–66.

In addition, we disagree with Patent Owner that Figure 20 supports its construction. When describing the pump chamber in Figure 20, the specification explains that "impeller cover 46A interfaces with the recess on the underside of the reservoir 14 to define the pump chamber 46 which houses the impeller 33, while the intermediate member 47 and the heat exchange surface 4 together define the thermal exchange chamber 47A." Ex. 1001, 23:21–24. In Figure 20, it is the impeller cover combined with the doubled-sided chassis and intermediate member that defines the pump chamber, not just the double-sided chassis and intermediate member, as Patent Owner contends. Moreover, the claims of the '681 patent do not recite an impeller cover. Instead, the claims of the '681 patent appear to be

Cooler Master Co., Ltd. Exhibit 1006, Page 415 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

broader. Thus, we are not persuaded that we should limit the claims of the '681 patent to the embodiment shown in Figure 20.

Other than as explained above, we see no reason, at this time, to construe the phrase "the pump chamber defined by an intermediate member and a double-sided chassis housing."

III. DISCUSSION

A. § 315(b) Bar

Pursuant to 35 U.S.C. § 315(b), "[a]n inter partes review may not be instituted if the petition requesting the proceeding is filed more than 1 year after the date on which the petitioner, real party in interest, or privy of the petitioner is served with a complaint alleging infringement of the patent." In addition, 35 U.S.C. § 312(a)(5) provides a petition for inter partes review may be considered only if "the petitioner provides copies of any of the documents required under paragraphs (2), (3), and (4) to the patent owner or, if applicable, the designated representative of the patent owner." 35 U.S.C. § 312(a)(5). Our rules expand on this service requirement stating that the "petition and supporting evidence must be served on the patent owner at the correspondence address of record for the subject patent. The petitioner may additionally serve the petition and supporting evidence on the patent owner at any other address known to the petitioner as likely to effect service." 37 C.F.R. § 42.105(a). Moreover, 37 C.F.R. § 42.106(a)(2) provides that the petition will not be accorded a filing date until the petition satisfies the requirement of effecting "service of the petition on the correspondence address of record as provided in 37 C.F.R. § 42.105(a)."

The essential facts are not in dispute. Petitioner was served with the complaint on February 7, 2019, and thus, the one-year deadline under

Cooler Master Co., Ltd. Exhibit 1006, Page 416 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

§ 315(b) was February 7, 2020. *See* Prelim. Resp. 3–4; Reply 1. Petitioner filed the Petition and exhibits on Friday, February 7, 2020, before the one-year deadline.[7] *Id.* at 4. The Petition and supporting exhibits were deposited with a FedEx facility in Palo Alto, CA at 9:57 PM Pacific Time on Friday, February 7, 2020. *See* Prelim. Resp. 4; Reply 1; Ex. 2005 (FedEx receipt sent to Patent Owner's counsel by Petitioner's IPR counsel). The package was not picked up from the shipment location until 4:05 PM Pacific Time on Saturday, February 8, 2020, and arrived at Patent Owner's counsel's office on Monday, February 10, 2020—the next business day after the Petition was filed. Prelim. Resp. 5 (citing Ex. 2010 ¶¶ 5, 6; Ex. 2008); Reply 1.

Patent Owner contends that Petitioner failed to timely serve the Petition before the 1-year bar date, so the Petition is not entitled to a February 7, 2020 filing date and should be denied as barred by § 315(b). Prelim. Resp. 13–20. Patent Owner contends that "very similar facts were presented in *Plaid Techs. Inc. v. Yodlee, Inc.*, IPR2016-00275, Paper 15 at 4–6 (PTAB June 9, 2016)." *Id.* at 13. Patent Owner also identifies *Teva Pharms. USA, Inc. v. Monosol RX, LLC*, IPR2016-00281, Paper 21 (PTAB May 23, 2016), as a similar case, which Patent Owner contends declined to excuse late service. *Id.* at 15.

Petitioner responds that Patent Owner provides no support for its contention that we should apply Eastern Time to find that Petitioner's service in California that occurred before the deadline in the Pacific Time Zone untimely. Reply 1. Petitioner argues that its service was "complete

[7] Timeliness of filings in AIA proceedings is determined as of receipt in the USPTO headquarters in Alexandria, VA. *See* PTAB Operational FAQs (May 29, 2020), FAQ 11, available at https://go.usa.gov/xfzRx.

upon deposit of the petition papers with FedEx on Friday, February 7, 2020, local time." *Id.* Petitioner submits that we should follow the "mailbox rule" and find the papers served upon their submission to the courier's office. *Id.* at 1–2.

We determine, on the facts of this case, that the Petition was timely served. Patent Owner's arguments would have read a particular time-zone requirement into 37 C.F.R. § 42.105(b). We decline to do that. Patent Owner's cited cases—*Plaid* and *Teva*—do not compel a different result. Both of those cases involve an untimely filing and service that was untimely in the time zone in which it was made. Here, there is no dispute that the filings were timely and the service was before the bar date *in time zone where the service was made*. Thus, *Plaid* and *Teva* are non-analogous situations to this case.

Considering the parties filings and based on the particular facts of this case, we are satisfied that Petitioner's use of FedEx on a Friday evening Pacific Time followed by delivery on a Monday—the next business day—is sufficiently akin to Priority Mail Express to satisfy the service requirement § 42.105(b). *See Varian Med. Sys., Inc. v. Best Med. Int'l, Inc.*, IPR2020-00071, Paper 14, at 33–34. Further, to the extent necessary, we waive regulatory requirements related to the timing of Petitioner's service based on the particular facts of this case. *See* 37 C.F.R. § 42.5(b). In particular, Patent Owner has not established any actual prejudice or harm arising from Petitioner's next-business-day service based on a filing on Friday evening Pacific Time. Finally, we do not agree with Patent Owner's implication that the timing of service in a particular time zone in the United States is a

Cooler Master Co., Ltd. Exhibit 1006, Page 418 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

statutory requirement under 35 U.S.C. § 312(a); the plain language of that statute does not address service deadlines.

B. Overview of the Prior Art

1. Overview of Duan

Duan is entitled "Cooling Plate Module." Ex. 1005, [54]. Duan discloses a cooling plate module for cooling a CPU. *Id.* ¶ 2. Duan's system includes a cooling plate module with a cooling plate integrally formed with a liquid driving module such that the layout of the cooling plate module can be minimized to reduce space. *Id.* ¶ 7. Figure 6, reproduced below, is a view of the liquid cooling cyclic mechanism of Duan. *Id.* ¶ 17.

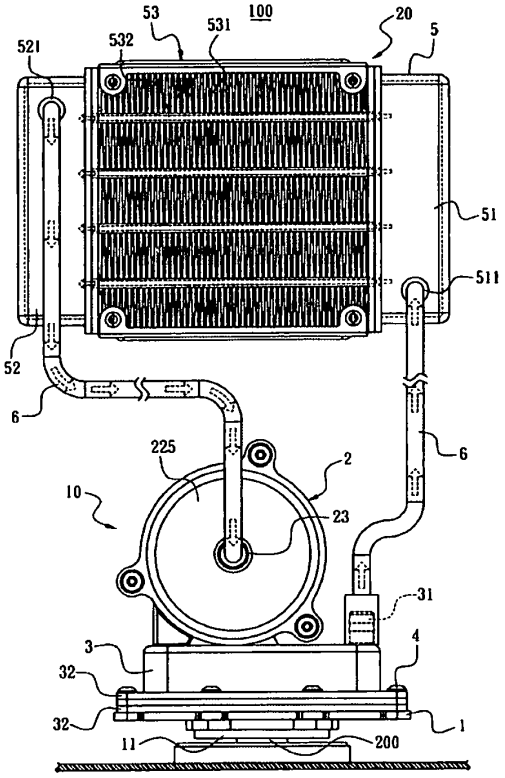


FIG. 6

Cooler Master Co., Ltd. Exhibit 1006, Page 419 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Figure 6, reproduced above, shows liquid cooling cyclic mechanism 100 for cooling CPU 200. *Id.* ¶ 22. Liquid cooling cyclic mechanism 100 consists of cooling module 10 and water tank module 20, which is connected with cooling plate module 10 through ducts. *Id.* Cooling plate module 10 includes cooling plate 1, liquid driving module 2, and heat absorbing interface 11. *Id.* Heat absorbing face 11 is in contact with CPU 200 for dissipating heat generated by CPU 200. *Id.* ¶ 26.

Water tank 20 includes box 5, with liquid entrance region 51 and liquid exit region 52 on either side of box 5 and cooling stage 53, in the center of box 5. *Id.* ¶ 25. Cool stage 53 has a plurality of heat-dissipating fins 531 arranged in rows with runners 532 defined between rows of heat dissipating fins 531. *Id.* When hot liquid in liquid entrance region 51 flows to liquid exit region 52, heat from the hot liquid dissipates through heat-dissipating fins 531 and the resulting cool liquid flows to liquid exit region 52. *Id.*

Liquid inlet 23 of cooling plate module 10 is connected to liquid outlet 521 of liquid exit region 52 of water tank 20 through duct 6. *Id.* Second liquid outlet 31 of cooling plate module 10 is connected to liquid inlet 511 of liquid entrance region 51 of water tank 20 through duct 6, which allows hot liquid from cooling plate module 10 to be cooled and cycled back to cooling plate module 10. *Id.*

Figure 2, reproduced below, is an exploded view of cooling plate module 10 of Duan. *Id.* ¶ 17.

Cooler Master Co., Ltd. Exhibit 1006, Page 420 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

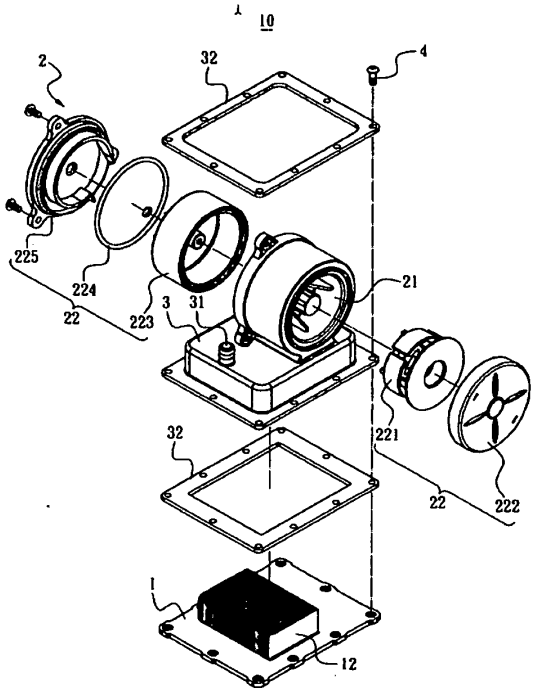


FIG. 2

Figure 2, reproduced above, shows a detailed exploded view of cooling plate module 10. Liquid driving module 2 of cooling plate module 10 includes accommodation chamber 21 and liquid driving unit 22 located in the accommodation chamber 21 to drive the cool liquid. *Id.* ¶ 23. Liquid driving unit 22 includes coil stage 221, upper cover 222, an impeller stage 223, sealing washer 224 and lower cover 225. *Id.* Lower cover 225 includes liquid inlet 23 connected with accommodation chamber 21. *Id.* First liquid outlet 24 connects to the bottom of accommodation chamber 21 and is enclosed by cap 3. *Id.* Cap 3 includes second liquid outlet 31 and cooling plate 1 is assembled with cap 3 to define a closed space therein and first liquid outlet 24 is corresponding to heat-dissipating plates 12. *Id.* Duan explains that liquid driving module 2 can be reciprocating pump, centrifugal pump or axial-flow pump. *Id.*

Figure 7 of Duan, reproduced below, is a sectional view of the cooling plate module.

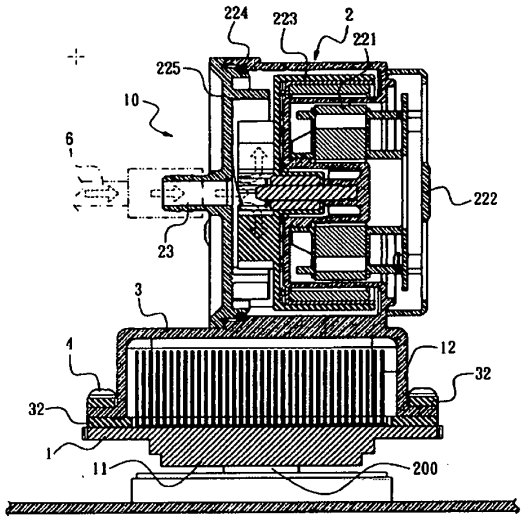


FIG. 7

Figure 7, reproduced above, is a sectional view of the cooling plate module of Duan. As shown in Figure 7, the cool liquid in water tank 20 flows to accommodation chamber 21 through duct 6 and liquid inlet 23 of cooling plate module 10 and is driven by liquid driving unit 22. *Id.* ¶ 27. The cool liquid then flows to cap 3 through first liquid outlet 24 for heat dissipating heat-dissipating plates 12 in cap 3. *Id.* The cool liquid is then heat exchanged with the heat-dissipating plates 12 into hot liquid. *Id.* The hot liquid then flows to liquid entrance region 51 of water tank 20 through second liquid outlet 31 of cooling plate module 10 and another duct 6.

2. Overview of Shin

Shin is entitled "Cooling device for electronic equipment." Ex. 1006, [54]. Shin discloses "a cooling structure for liquid cooling of heat generating electronic circuit components such as LSI chips installed on a

Cooler Master Co., Ltd. Exhibit 1006, Page 422 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

wiring board, relating in particular to a cooling structure for compactly mounting a liquid cooled heat sink and pump." *Id.* ¶ 1. Shin teaches: "Using a DC motor allows the motor speed to be easily changed by changing the DC voltage, thus enabling control of cooling power. Moreover, making the motor into a DC brushless motor makes it possible to implement a pump of low noise and long service life." *Id.* ¶ 19. Shin also teaches

> Besides the heat generating element 1, heat generating elements 22a, 22b, 22c, such as memory LSI and driver LSI chips, which can be cooled by air cooling, as well as an IO card, memory card, hard disk or other card mounting board 23 are also installed on the wiring board 2. The wiring board 2 is housed inside case 24, which is an electronic equipment case. An air cooling fan 34 is installed in the case 24, and the aforementioned multiple air cooled components are air-cooled by cooling air 25.

Id. ¶¶ 23, 24.

3. Overview of Cheon

Cheon is entitled "Cooling System for Computer." Ex. 1007, at [54]. Cheon discloses a cooling system for a computer having a heat transfer device contacting a computer component and communicating with a liquid coolant reservoir via first and second conduits, a radiator mounted on the outside of the computer housing and in heat exchanging contact with the reservoir, and a pump and brushless motor therefor mounted on the reservoir casing. *Id.* at 1:5–12. Specifically, Cheon discloses such a cooling system that has a control circuit that controls circulation of coolant based on feedback from one or more sensors indicating the temperatures of the components to which the heat transfer device are attached. *Id.* at 5:66–6:16.

C. Anticipation and Obviousness of Claims 8, 11, 15, and 16 over Duan

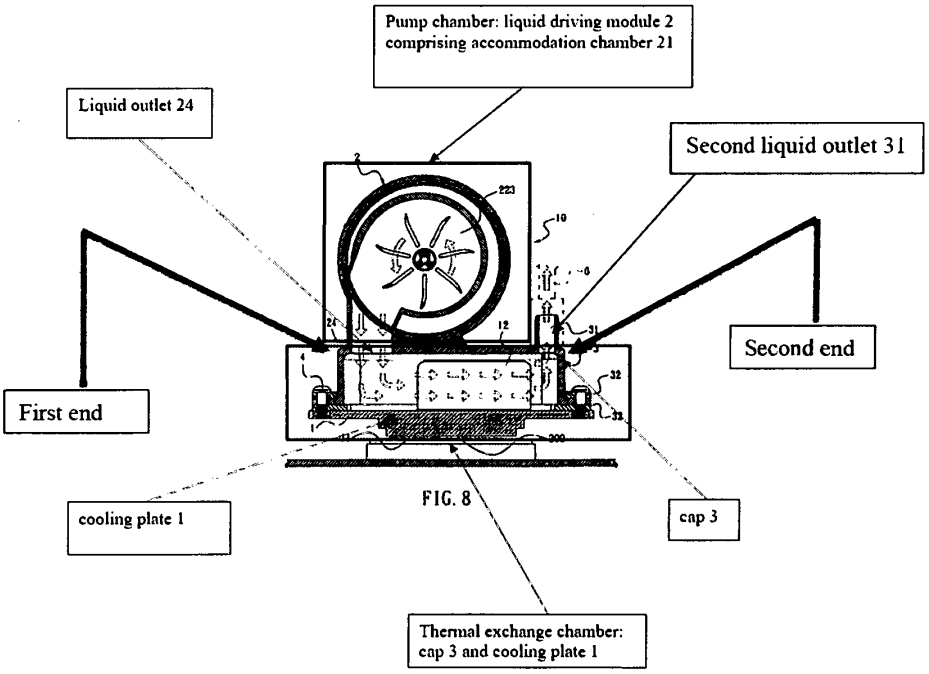
Petitioner challenges claims 8, 11, 15, and 16 of the '681 patent under 35 U.S.C. §§ 102 and 103 as unpatentable over Duan. Pet. 68–90. Patent

Cooler Master Co., Ltd. Exhibit 1006, Page 423 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Owner opposes. Prelim. Resp. 36–43. We have reviewed Petitioner's and Patent Owner's assertions, as well as the evidence of record, and, for the reasons discussed below, we conclude that Petitioner has demonstrated a reasonable likelihood of prevailing in showing that claims 8, 11, 15, and 16 of the '681 patent are anticipated by or would have been obvious over Duan.

1. Independent Claim 8

Petitioner maps the language of independent claim 8 to Duan's disclosures. Pet. 68–83. Patent Owner challenges Petitioner's showing regarding the limitation requiring "a first passage defined by the intermediate member . . . wherein the first passage directs the cooling liquid in the thermal exchange chamber between a first end and a second end of the thermal exchange chamber." PO Resp. 36–39. Petitioner asserts that Duan's outlet 24 constitutes the claimed first passage. Pet. 79–81. Petitioner's annotated version of Duan's Figure 8 is reproduced below:



Pet. 80 (annotating Ex. 1005, Fig. 8). Figure 8 depicts a sectional view of Duan's cooling-plate module; Petitioner's annotations identify liquid outlet 24 and second liquid outlet 31 carrying fluid into and out of, respectively, a chamber formed by cap 3 and cooling plate 1. Ex. 1005 ¶ 27, Fig. 8; Pet. 80.

According to Patent Owner, Duan's outlet 24 "is at a first end of the alleged thermal exchange chamber" rather than "between the first and second ends of the thermal exchange chamber" as claimed and as shown in Figure 9 of the '681 patent. Prelim. Resp. 37. We do not agree. Patent Owner appears to misread the claim language such that "between a first end and a second end of the thermal exchange chamber" applies to the location of the first fluid passage. *See id.* The more natural reading instructs that the first passage must *direct the cooling liquid* between two ends of the thermal exchange chamber. The structure of the claim language first defines that the first passage "fluidly coupl[es] the pump chamber and the thermal exchange chamber" and then further restricts the function of the passage such that it "directs the cooling liquid . . . between a first end and a second end of the thermal exchanger chamber." Ex. 1001, 30:14–17. Patent Owner's argument regarding Duan's outlet 24 would require a contorted reading of the claim language.[8]

Patent Owner's argument is premised on an understanding that Duan's "outlet 24 is located at the 'first end,' and not in between the first and second ends." Prelim. Resp. 38. Because the claim language does not

[8] We note further that the Specification appears to use the verb form of "direct" consistently with our understanding, to refer to the direction of a fluid flow. *See* Ex. 1001, 17:64–18:2 ("[T]he flow of air of the air fan may also be directed along outer surfaces of the reservoir.").

Cooler Master Co., Ltd. Exhibit 1006, Page 425 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

require the first fluid passage be located between the first and second ends of the thermal exchange chamber, Patent Owner's argument is not persuasive.

Patent Owner next argues that Duan does not describe an "inlet positioned below the center of the impeller," as recited in claim 8. Prelim. Resp. 39–41. This argument rests on Patent Owner's contention that this claim phrase requires a particular positional/directional frame of reference. *Id.* at 39–40. In other words, Patent Owner asserts that "[a]ny structure in Duan can only be 'below the center of the impeller' if it is positioned between the 'impeller' and the 'heat exchanging interface,' which forms the base of Duan's cooling system." We did not adopt, however, Patent Owner's claim construction. Instead, we explained that this claim limitation does not impose a particular positional/directional frame of reference. Moreover, we explained that although claim 1 does have other limitations that do impose a particular positional/directional frame of reference, claim 8 does not have such limitations.

On this record, Petitioner has shown sufficiently that Duan describes this limitation. As Petitioner sufficiently shows, when mounted to a vertical motherboard, the inlet is below the center of the impeller, as required by the plain meaning of the limitation. Pet. 52, 71. Moreover, Dr. Hodges, Petitioner's declarant, explains that such mountings are common in tower computer cases where the motherboard is vertical as opposed to horizontal. Ex. 1003 ¶ 28. Accordingly, on this record, Petitioner has shown a reasonable likelihood that Duan discloses this limitation.

Patent Owner also argues that Duan's "'pump chamber' is <u>not</u> 'defined by an intermediate member and a double-sided chassis housing." Prelim. Resp. 41. Patent Owner's argument, however, appears to be based

Cooler Master Co., Ltd. Exhibit 1006, Page 426 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

on its proposed construction that the "pump chamber" must be "formed" from the intermediate member and the double-sided chassis housing. On this record, we did not adopt Patent Owner's construction. On this record, we determine that Petitioner has shown sufficiently that Duan's "pump chamber" is defined by an intermediate member and a double-sided chassis housing, as shown below Figure 7 of Duan, as annotated by Petitioner.

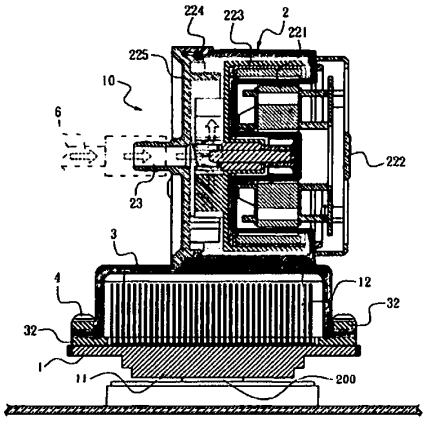


FIG. 7

Figure 7 of Duan, as annotated by Petitioner is shown above. Pet. 70. Petitioner has shown Duan's "pump chamber" in light green, Duan's "intermediate member" in teal, and Duan's double-sided chassis housing in red. *Id.* at 70–71. On this record, we agree Petitioner has shown a reasonable likelihood Duan accounts for this limitation. Ex. 1003 ¶¶ 174–175.

We have reviewed Petitioner's remaining contentions regarding claim 8 and determine that they show Petitioner is likely to prevail with respect to Petitioner's contention that Duan anticipates, or renders obvious claim 8.

Cooler Master Co., Ltd. Exhibit 1006, Page 427 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

2. Claims 11, 15, and 16

Claims 11, 15, and 16 all depend from directly from claim 8. We have reviewed Petitioner's cited evidence and explanation regarding why Duan anticipates, or renders obvious claims 11, 15, and 16 and find it sufficient at this stage. At this stage, Patent Owner raises no other arguments regarding these claims other than those considered above with respect to claim 8. On this record, we determine that Petitioner has shown a reasonable likelihood of success that Duan anticipates, or renders obvious, claims 11, 15, and 16.

D. Obviousness of Claims 1 and 4 Over Duan, Shin, and Cheon

Petitioner challenges claims 1 and 4 of the '681 patent under 35 U.S.C. § 103(a) as unpatentable over Duan, Shin, and Cheon. Pet. 26–68. In addition to the frame of reference limitations discussed above in our claim construction, claim 1 differs from claim 8 primarily in that it includes a "a fan" attached to the "heat radiator" and a control system to control the pump and the fan. Petitioner relies primarily on Duan for most of the limitations of claim 1, and cites Shin for the fan and Shin and Cheon for the control system. *See id.* Patent Owner argues that Duan fails to account for the claimed "first passage" and the "inlet." We agree with Patent Owner that Duan fails to account for the "inlet" as claimed in claim 1. We explained above in our claim construction discussion that the phrase "an inlet positioned below the center of impeller" does not impose a specific positional/directional frame of reference. However, we explained that claim 1 does contain limitations—not found in claim 8—that do impose a positional/directional frame of reference. On the record before us, we determine that Petitioner has not shown sufficiently that Duan teaches or

Cooler Master Co., Ltd. Exhibit 1006, Page 428 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

suggests a device where both the claimed "inlet" is "positioned below the center of the impellor" and the "thermal exchange chamber" is "formed below the pump chamber and vertically spaced apart from the pump chamber." Nor has Petitioner made any argument that a device so configured would be obvious in view of Duan, either alone or in combination with the other references. Thus, we determine that Petitioner has not shown a reasonable likelihood of prevailing in showing that claim 1 would have obvious over Duan, Shin, and Cheon.

Claim 4 depends from claim 1, and for the reasons above with respect to claim 1, we also determine that Petitioner has not shown a reasonable likelihood of prevailing with respect to its contention that claim 4 is obvious over the combination of Duan, Shin, and Cheon.

IV. CONCLUSION

For the reasons discussed above, we conclude Petitioner has shown a reasonable likelihood of prevailing with respect to at least one claim. We have evaluated all of the parties' submissions and determine that the record supports institution. We note that although Petitioner's assertions against claims 1 and 4 do not support institution, its assertions against claims 8, 11, 15, and 16 do support institution. The Board does not apply a fixed threshold for determining when to institute in such cases. *See* SAS Q&A's, Part D, Effect of SAS on Future Challenges that Could Be Denied for Statutory Reasons (June 5, 2018), available at https://go.usa.gov/xfvmA. We are cognizant that, in some cases, the Board has exercised its discretion not to institute when a petitioner's showing for institution demonstrated a reasonable likelihood of prevailing with respect to only a small number of

Cooler Master Co., Ltd. Exhibit 1006, Page 429 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

challenged claims. *See Deeper, UAB v. Vexilar, Inc.*, IPR2018-01310, Paper 7 (Jan. 24, 2019) (informative); *Chevron Oronite Co. LLC v. Infineum USA L.P.*, IPR2018-00923, Paper 9 (Nov. 7, 2018) (informative). This case, however, presents a much more balanced analysis at the institution stage. Additionally, the challenges that support institution appear to be strong on the current record, which further supports institution. We conclude that instituting review in this proceeding is in the interest of efficient administration of the Office and the integrity of the patent system. *See* 35 U.S.C. § 316(b). Accordingly, we institute an *inter partes* review of all challenged claims under all grounds set forth in the Petition.

Our determination at this stage of the proceeding is based on the evidentiary record currently before us. This decision to institute trial is not a final decision as to patentability of any claim for which *inter partes* review has been instituted. Our final decision will be based on the full record developed during trial.

V. ORDER

For the reasons given, it is:

ORDERED that an *inter partes* review is instituted on all challenged claims under all challenged grounds; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '681 patent is hereby instituted commencing on the entry date of this Decision, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

Cooler Master Co., Ltd. Exhibit 1006, Page 430 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

For PETITIONER:

Vivek Ganti
GREENBERG TRAURIG, LLP
gantiv@gtlaw.com

For PATENT OWNER:

Eric Raciti
Arpita Bhattacharyya
FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER LLP
Eric.raciti@finnegan.com
Arpita.bhattacharyya@finnegan.com

Cooler Master Co., Ltd. Exhibit 1006, Page 431 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

PATENT
Customer No. 22,852
Attorney Docket No.: 10494.0003-03000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent No.: 9,733,681	) Group Art Unit:	3744
	)	
Inventor: André Sloth Eriksen	) Examiner:	Travis C. Ruby
	)	
Issued: August 15, 2017	) Confirmation No.:	3473
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	) ***VIA EFS-WEB***	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

COMBINED DESIGNATION OF DOMESTIC REPRESENTATIVE AND STATEMENT UNDER 37 C.F.R. § 3.73(b)

Pursuant to 35 U.S.C. § 293 and in accordance with 37 C.F.R. § 3.61 and M.P.E.P. § 302.04, the assignee of the above-identified patent, who does not reside in the United States, hereby designates:

Bend Law Group, PC
2181 Greenwich Street
San Francisco, CA 94123
Phone: (415) 633-6841

as the domestic representative on whom process or notice of proceedings affecting the patent may be served. The previous designation filed on July 28, 2017 is hereby revoked.

Asetek Danmark A/S, a corporation of Denmark, is the assignee of the entire right, title, and interest in the patent identified above by virtue of an assignment from inventor André Sloth Eriksen to Asetek A/S, recorded in the United States Patent and

Trademark Office (USPTO) at Reel 042952, Frame 0177 on June 22, 2017, and a change of name from Asetek A/S to Asetek Danmark A/S, recorded in the USPTO at Reel 033748, Frame 0097 on September 16, 2014. Thus, in accordance with 37 C.F.R. § 3.73(b), the undersigned (whose title is supplied below) is empowered to sign this designation on behalf of the assignee.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Asetek Danmark A/S

Dated: September 30, 2020

By: /André Sloth Eriksen/
André Sloth ERIKSEN
Chief Executive Officer

Dated: September 30, 2020

By: /Peter Dam Madsen/
Peter Dam MADSEN
Chairman of the Board

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
13/861,593	09/30/2020 06:56:23 PM ET	10494.0003-03000

Title of Invention

COOLING SYSTEM FOR A COMPUTER SYSTEM

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	9733681
CONFIRMATION #	3473	FILED BY	Donna Studley
PATENT CENTER #	60090187	FILING DATE	04/12/2013
CUSTOMER #	22852	FIRST NAMED INVENTOR	André Sloth Eriksen
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Eric Raciti

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2020_09_30 As-Filed - 0003-03 - Executed Combined Designation of Domestic Rep and Statement Under 37 C.F.R. 3.73b.pdf	2	Miscellaneous Incoming Letter	143 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2020_09_30 As-Filed - 0003-03 - Executed Combined Designation of Domestic Rep	1D0B0D82881166OB12499F8CB1CEB08CFE0D533DE84541AE4 3B29E115D54A413B380E1D7D24AA655D4A383E832510DCAED 423BF2E208469AFC365EF52CF21732

and Statement Under 37 C.F.R.
3.73b.pdf

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/43 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DISCLAIMER IN PATENT UNDER 37 CFR 1.321(a)

Name of Patentee	Docket Number (Optional)
Asetek Danmark A/S	10494.0003-03000
Patent Number	**Date Patent Issued**
9,733,681	August 15, 2017

Title of Invention
COOLING SYSTEM FOR A COMPUTER SYSTEM

I hereby disclaim the following complete claims in the above identified patent: 8-16

The extent of my interest in said patent is (if assignee of record, state liber and page, or reel and frame, where assignment is recorded): Assignee of Record (Reel 033748/Frame 0097)

The fee for this disclaimer is set forth in 37 CFR 1.20(d).

- ☐ Patentee claims small entity status. See 37 CFR 1.27.
- ☐ Small entity status has already been established in this case, and is still proper.
- ☐ A check in the amount of the fee is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☑ The Director is hereby authorized to charge any fees which may be required or credit any overpayment to Deposit Account No. 06-0916 .

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

Signed at Reading, State of Massachusetts, this 30th day of November 2020.

/Eric P. Raciti/	41,475
Signature	Registration Number, if applicable
Eric P. Raciti (Attorney of Record for Asetek Danmark A/S)	617-646-1675
Typed or printed name of patentee/ attorney or agent of record	Telephone Number

Finnegan LLP, 2 Seaport Lane, Floor 6
Address

Boston, MA 02210
City, State, Zip Code or Foreign Country as applicable

This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	13861593
Filing Date:	12-Apr-2013
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Filer:	Eric Paul Raciti/Donna Studley
Attorney Docket Number:	10494.0003-03000

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	170	170
		Total in USD ($)		**170**

Electronic Acknowledgement Receipt	
EFS ID:	41247977
Application Number:	13861593
International Application Number:	
Confirmation Number:	3473
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	André Sloth Eriksen
Customer Number:	22852
Filer:	Eric Paul Raciti/Donna Studley
Filer Authorized By:	Eric Paul Raciti
Attorney Docket Number:	10494.0003-03000
Receipt Date:	30-NOV-2020
Filing Date:	12-APR-2013
Time Stamp:	16:28:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$170
RAM confirmation Number	E2020ATG29267682
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Statutory disclaimers per MPEP 1490	2020_11_30-As-Filed_Statutory_Disclaimer-US9733681.pdf	262093 c332f252693f391e1415027918fa800ee7135be8	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30363 699daa0ab0c08683967b3940fce5865812f7bca7	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	292456		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Trials@uspto.gov
Tel: 571-272-7822

Paper 35
Date: August 19, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COOLIT SYSTEMS, INC.,
Petitioner,

v.

ASETEK DANMARK A/S,
Patent Owner.

IPR2020-00524
Patent 9,733,681 B2

Before MICHAEL P. TIERNEY, *Vice Chief Administrative Patent Judge*, KEVIN W. CHERRY, and JASON W. MELVIN, *Administrative Patent Judges*.

CHERRY, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. BACKGROUND

CoolIT Systems, Inc. ("Petitioner") filed a petition (Paper 2, "Pet.") to institute an *inter partes* review of claims 1, 4, 8, 11, 15, and 16 of U.S. Patent No. 9,733,681 B2 (Ex. 1001, "the '681 patent"). *See* 35 U.S.C.

§ 311. Asetek Danemark A/S ("Patent Owner") timely filed a Preliminary Response. Paper 6 ("Prelim. Resp."). We also authorized Petitioner to file a Reply (Paper 8). Paper 7 (Order Authorizing Reply).

On August 24, 2020, based on the record before us at the time, we instituted an *inter partes* review of all challenged claims on all grounds alleged. Paper 9 ("Institution Decision" or "Dec."). After we instituted this review, Patent Owner filed a statutory disclaimer disclaiming claims 8–16 (Ex. 2015, "Statutory Disclaimer"). Thus, the only claims and ground remaining in this proceeding are indicated in the table below.

Claim(s) challenged	35 U.S.C. §	Reference(s)
1, 4	103(a)[1]	Duan,[2] Shin,[3] Cheon[4]

Petitioner supports its Petition with a Declaration by Marc Hodes, Ph.D., dated February 7, 2020. Ex. 1003.

Patent Owner filed a Response in opposition to the Petition (Paper 21, "PO Resp."). Patent Owner supported its Patent Owner Response with the Declaration of Donald E. Tilton, Ph.D., dated November 30, 2020

---

[1] Because the claims at issue have an effective filing date prior to March 16, 2013, the effective date of the applicable provisions of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), we apply the pre-AIA versions of 35 U.S.C. §§ 102 and 103 in this Decision.

[2] U.S. Patent Application Publication No. 2006/0185830, filed Feb. 18, 2005, published Aug. 24, 2006 (Ex. 1005, "Duan").

[3] Japanese Published Patent Application 2002-151638, published May 24, 2002 (Ex. 1006, "Shin"). The record includes a certified English translation of Shin. All citations will be to the certified English translation.

[4] U.S. Patent No. 5,731,954, issued Mar. 24, 1998 (Ex. 1007, "Cheon").

Cooler Master Co., Ltd. Exhibit 1006, Page 443 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

(Ex. 2018). Petitioner filed a Reply in support of the Petition (Paper 25, "Reply"). Petitioner supports the Reply with the Supplemental Declaration of Marc Hodes, Ph.D. (Ex. 1013). Patent Owner filed a Sur-reply responding to the Reply (Paper 28, "Sur-Reply"). Patent Owner did not move to amend any claim of the '681 patent.

Both parties requested an oral hearing. *See* Paper 31. A transcript of the oral hearing is entered in the record. Paper 33 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6. The evidentiary standard is a preponderance of the evidence. *See* 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2019). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons expressed below, we conclude that Petitioner has *not* demonstrated by a preponderance of evidence that claims 1 and 4 ("the remaining challenged claims") are unpatentable.

B. RELATED PROCEEDINGS

The parties identify *Asetek Danmark A/S v. CoolIT Systems, Inc.*, Case No. 3:19-cv-00410-EMC (N.D. Cal.) (complaint served on February 7, 2019, currently pending) as a related co-pending district court litigation. Pet. 1; Paper 4, 1. The parties also identify the following pending proceedings for *inter partes* review involving patents that are related to the '681 patent: IPR2020-00522; IPR2020-00523. Pet. 1; Paper 4, 1.

C. THE '681 PATENT

The '681 patent is titled "Cooling System for a Computer System." Ex. 1001, at [54]. The '681 patent issued from Application Serial No. 13/861,593, filed April 12, 2013. *Id.* at [21], [22]. The '593 application is a continuation of Application Serial No. 11/919,974, filed on January 6, 2009,

Cooler Master Co., Ltd. Exhibit 1006, Page 444 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

which is a U.S. national phase application of PCT/DK2005/00310, filed May 6, 2005. *Id.* at [63].

The '681 patent relates to a liquid-cooling system for a computer system. *Id.* at [57]. The Specification explains that, at the time of the invention, air cooling arrangements were the most-used cooling system for cooling central processing units (CPUs) in computer systems. *Id.* at 1:17–33. An alternative design known at the time of the invention was to use a cooling liquid circulating inside a closed system by means of a pumping unit with a heat exchanger past which the cooling liquid circulates. *Id.* at 1:34–38. The Specification contends that liquid cooling is generally more efficient and quieter than air cooling, but that a liquid cooling design consists of "many components," which increases the total installation time, size, and risk of leakage of the cooling liquid from the system. *Id.* at 1:39–49. Thus, it is one object of the invention to provide a small and compact liquid-cooling solution, which is more efficient than existing air-cooling arrangements, can be produced at low cost enabling high production volumes, is easy to use and implement, can be used with existing CPU types and computer systems, and requires a low level of maintenance or no maintenance at all. *Id.* at 1:53–63.

An illustrative embodiment of such a systemis depicted in Figures 7 and 8, reproduced below.

Cooler Master Co., Ltd. Exhibit 1006, Page 445 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

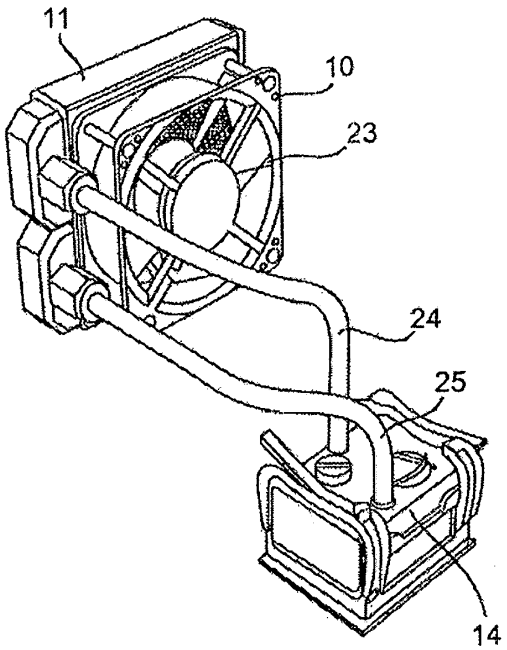


FIG. 7

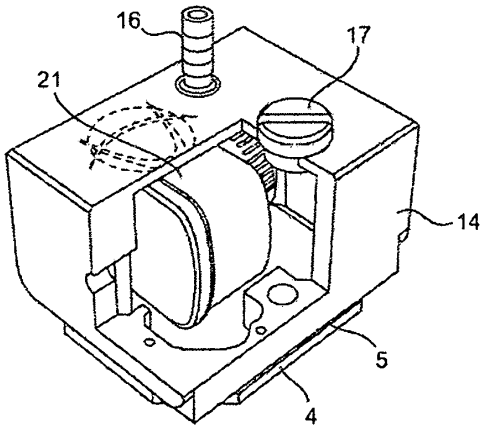


FIG. 8

Figure 7[5] is a perspective view of the cooling system showing reservoir housing 14 with heat exchanging surface 5 (shown in Figure 8) and pump 21 (shown in Figure 8) inside the reservoir. *Id.* at 16:16–19. Figure 8 is a cut-out view into reservoir housing 14, when the reservoir, pump 21, and heat exchanging surface 4 are situated inside the reservoir. *Id.* at 15:49–51. The reservoir has tube inlet connection 15 (not shown in Figure 8) through which the cooling liquid enters the reservoir. *Id.* at 15:51–53. From the tube

[5] We agree with Petitioner that it appears that the Specification transposes the description of Figure 7 with that of Figure 8. Pet. 5 n.1. We refer to the description of "Figure 8" in the Specification in our discussion of Figure 7, and we refer to the Specification's discussion of "Figure 7" in our discussion of Figure 8.

Cooler Master Co., Ltd. Exhibit 1006, Page 446 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

inlet connection, the cooling liquid flows through the reservoir passing heat exchanging surface 4 and enters the inlet of the pump. *Id.* at 15:54–56. After the cooling liquid flows through the pump, the cooling liquid passes out of the outlet of the pump and further out through tube outlet connection 16. *Id.* at 15:56–58. As shown in Figure 7, tube inlet connection 15 and tube outlet connection 16 are connected to heat radiator 11 by means of connecting tubes 24 and 25. *Id.* at 16:19–21. Cooling liquid flows into and out of the reservoir and the heat radiator through connecting tubes 24 and 25, respectively. *Id.* at 16:21–23. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir to prevent the cooling liquid from passing the reservoir too quickly to take up a sufficient amount of heat from the heat exchanging surface. *Id.* at 16:51–62.

Within heat radiator 11 (shown in Figure 7), the cooling liquid passes a number of channels for radiating the heat carried in the cooling fluid from heat exchanging surface 4 (shown in Figure 8). *Id.* at 16:23–26. Air fan 10 (with propeller 23) of Figure 7 blows air past the channels of the heat radiator in order to cool the radiator and thereby cool the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir. *Id.* at 16:26–30.

Figures 17 and 20 show the internal structures of a preferred embodiment of the reservoir according to the invention and are reproduced below. *Id.* at 21:48–50.

Cooler Master Co., Ltd. Exhibit 1006, Page 447 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

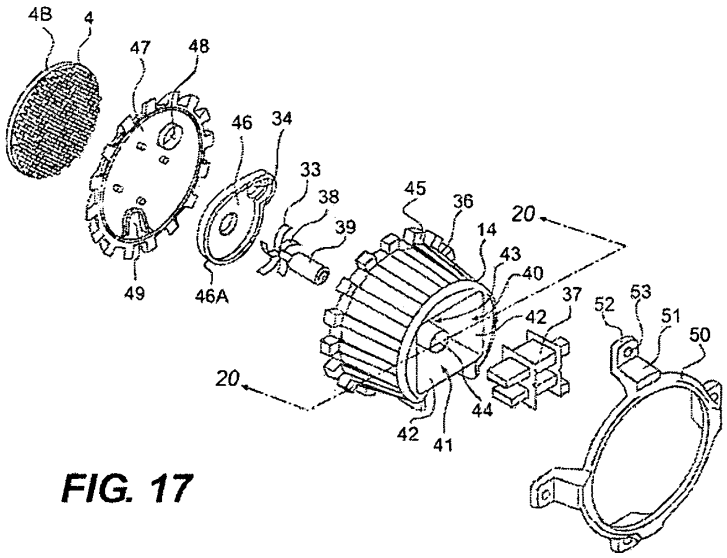


FIG. 17

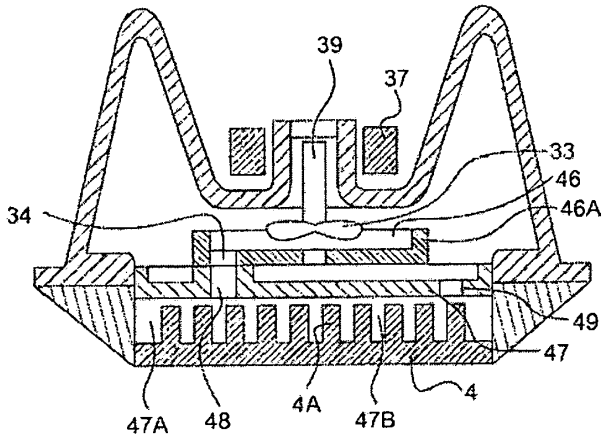


FIG. 20

Figure 17 is an exploded perspective view of a preferred embodiment of a reservoir, pump, and heat exchanging surface. *Id.* at 10:7–9. Figure 20 is a simplified schematic showing a cross-sectional view of the reservoir along plane 20-20 of Figure 17. *Id.* at 10:16–17. Reservoir housing 14, as shown in Figures 17 and 20, is in the form of a double-sided chassis having a substantially conical, circular configuration with stiffening ribs 36

Cooler Master Co., Ltd. Exhibit 1006, Page 448 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

extending axially along the exterior of the reservoir housing and configured to mount an electrical motor. *Id.* at 21:49–57. Reservoir housing 14 has recess 40 intended for accommodating stator 37 of electrical motor driving impellor 33 of the pump, which is attached to shaft 38 of rotor 39 of the electric motor. *Id.* at 21:58–22:1. The Specification explains that "a liquid-proof division" is made between rotor 39 of the motor, which is submerged in the cooling liquid, and stator 37 of the pump. *Id.* at 22:1–22:6.

The enclosed space between impeller 33 and heating exchanging interface 4 is divided into two separate chambers by impeller cover 46A and intermediate member 47, as shown in Figure 20. The chamber formed by impeller 33 and impeller cover 46A is described as "pump chamber 46" and has outlet 34. *Id.* at 22:64–67. A second chamber termed "thermal exchange chamber 47A" is formed by intermediate member 47 and heat exchanging interface 4. *Id.* at 23:5–11. Intermediate member 47 has two passages through it—first passage 48 and second passage 49. *Id.* at 23:7–15. First passage 48 connects to outlet 34 and provides a passage for the cooling liquid to flow from pump chamber 46 to thermal exchange chamber 47A. *Id.* Second passage 49 leads cooling liquid from thermal exchange chamber 47A to the interior of reservoir housing 14 allowing for the circulation of the liquid out of reservoir housing 14 to heat radiator 11. *Id.* at 23:11–19.

Claim 1 is the sole independent claim among the remaining challenged claims. Claim 4 depends from claim 1. Independent claim 1, which is illustrative, recites:

> 1. A liquid cooling system for cooling a heat-generating component of a computer, comprising:
>
> a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor

Cooler Master Co., Ltd. Exhibit 1006, Page 449 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

with a stator and an impeller, the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:

a pump chamber including the impeller; and

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled;

a heat-exchanging interface removably coupled to the reservoir, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component;

a heat radiator adapted to pass the cooling liquid therethrough, the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;

a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump; and

a control system configured to independently control a speed of the pump and a speed of the fan;

wherein the pump chamber includes:

an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber;

an outlet that fluidly couples the pump chamber to the thermal exchange chamber via a first

Cooler Master Co., Ltd. Exhibit 1006, Page 450 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

> passage, the outlet is positioned along an outer circumference of the pump chamber and is configured to direct the cooling liquid driven by the impeller through the first passage to the thermal exchange chamber;
>
> wherein the first passage directs the cooling liquid into the thermal exchange chamber between a first end and a second end of the thermal exchange chamber;
>
> wherein the thermal exchange chamber includes at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber.

Ex. 1001, 28:18–67.

II. ANALYSIS

A. CLAIM INTERPRETATION

We interpret claims in the same manner used in a civil action under 35 U.S.C. § 282(b), "including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R. § 42.100(b) (2019).[6] When applying that standard, we interpret

[6] On October 11, 2018, the USPTO revised its rules to harmonize the Board's claim construction standard with that used in federal district court. Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (now codified at 37 C.F.R. § 42.100(b) (2019)). This rule change applies to petitions filed on or after November 13, 2018. *Id.*

Cooler Master Co., Ltd. Exhibit 1006, Page 451 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

the claim language as it would be understood by one of ordinary skill in the art in light of the specification. *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010). Thus, we give claim terms their ordinary and customary meaning as they would be understood by an ordinarily skilled artisan. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) ("The ordinary and customary meaning 'is the meaning that the term would have to a person of ordinary skill in the art in question.'" (quoting *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005))). Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

In the Petition, Petitioner identifies "reservoir," "chamber," "impeller," "stator," "heat radiator," "an inlet positioned below the center of the impeller," and "intermediate member" as needing construction. Pet. 14–20. Petitioner submits that the other terms do not require construction. *Id.* at 20. In its Preliminary Response, Patent Owner agreed with Petitioner's proposed constructions for "reservoir," "chamber," "impeller," and "heat radiator." Prelim. Resp. 21. Patent Owner disagreed with Petitioner's constructions of "stator," "intermediate member," "an inlet positioned below the center of the impeller," "double-sided chassis," and "a first end or a second end of the thermal exchange chamber." *Id.* at 21. In addition, Patent Owner proposed a construction for "the pump chamber defined by an intermediate and double-sided chassis housing." *Id.* Patent Owner submitted that, although it disputes Petitioner's constructions of "stator," "intermediate member," "double-sided chassis," and "a first end or a second end of the thermal exchange chamber," no construction of these terms was

Cooler Master Co., Ltd. Exhibit 1006, Page 452 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

necessary. *Id.* Patent Owner further submitted that resolving the parties' conflicting constructions of the terms "an inlet positioned below the center of the impeller" and "the pump chamber defined by an intermediate member and a double-sided chassis housing" would aid our institution decision. *Id.*

In our Institution Decision, we agreed with Patent Owner that no construction was necessary of "reservoir," "chamber," "impeller," "heat radiator," "stator," "intermediate member," "double-sided chassis," and "a first end or a second end of the thermal exchange chamber" for our determination of whether to institute *inter partes* review. Dec. 13. We also agreed with the parties that resolving the constructions of "an inlet positioned below the center of the impeller" and "the pump chamber defined by an intermediate member and a double-sided chassis housing" would be helpful for the Institution Decision. *Id.* at 13–14.

At this stage of the proceeding, the parties' sole remaining claim construction dispute centers on the claim phrase "an inlet positioned below the center of the impeller," which we consider below.

1. "an inlet positioned below the center of the impeller"

In the Petition, Petitioner submitted that the phrase "an inlet positioned below the center of the impeller" should be construed as including an "opening for fluid near the center of the impeller along the axis around which the impeller rotates." Pet. 16. In its Patent Owner Response, Patent Owner argues that the phrase should be given its plain and ordinary meaning. PO Resp. 8. In its Reply, Petitioner offers a new construction ("New Construction"), and argues that we should instead construe the term to mean "on the 'cooling liquid' side of the impeller's center." Reply 1–2. In its Sur-Reply, Patent Owner argues that we should reject this new

Cooler Master Co., Ltd. Exhibit 1006, Page 453 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

construction because it is untimely and incorrect. Sur-Reply 1–9. We agree with Patent Owner that this phrase should receive its plain and ordinary meaning.[7]

We begin with the claim language. The full limitation in claim 1 states "an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber." Ex. 1001, 28:50–53. Petitioner argues that the end portion of this limitation—"configured to enable the cooling liquid to flow into the center of the pump chamber"—supports its new construction that "below," recited earlier in the limitation, refers not to a direction, but instead to the cooling liquid side of the apparatus. Reply 1–3. However, we agree with Patent Owner that rather than support Petitioner's construction, this language suggests that Petitioner's construction is not correct. Sur-Reply 4–5. As Patent Owner explains, the claim already recites the functional relationship between the inlet and the coolant; namely, the inlet is "configured to enable the cooling liquid to flow into the center of the pump chamber." *Id.* Furthermore, the claim uses the word "below" in another limitation—"a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber." Petitioner's new construction would require us to construe the term "below" differently in different limitations. Moreover, consistent with Petitioner's initial construction, we agree with Patent Owner that the claim consistently uses "below" in a directional, not functional sense. Thus, we agree with Patent Owner that the claim language

[7] We also agree with Patent Owner's argument that Petitioner's new claim construction is untimely. However, given that the issue is fully briefed and discussed, we will consider it.

Cooler Master Co., Ltd. Exhibit 1006, Page 454 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

does not support Petitioner's new construction. *See Epcon Gas Sys., Inc. v. Bauer Compressors, Inc.*, 279 F.3d 1022, 1030–31 (Fed. Cir. 2002) ("A word or phrase used consistently throughout a claim should be interpreted consistently." (quoting *Phonometrics, Inc. v. Northern Telecom Inc.*, 133 F.3d 1459, 1465 (Fed. Cir. 1998))).

The written description does not compel departing from the ordinary understanding of the word "below" as indicating a direction. As Patent Owner explains, nothing in the written description supports reading "below" as only describing a relationship with the cooling fluid side of the system. Sur-Reply 6. Thus, the written description does not weigh in favor of the construction.

Finally, Petitioner points to the testimony of Patent Owner's expert agreeing that the inlet is on the coolant liquid side of the apparatus. *See* Reply 6 (citing Ex. 1012, 34:16–35:17). The fact that Petitioner's new construction is not inconsistent with the preferred embodiment does not mean that this construction is correct. Instead, we find the claim language to be clear on this point. Thus, we do not find the extrinsic evidence to compel a particular construction. *See Seabed Geosolutions (US) Inc. v. Magseis FF LLC*, --- F.4th ---, 2021 WL 3520472, at *3 (Fed. Cir. Aug. 11, 2021) ("Given the clarity of the intrinsic evidence, resort to extrinsic evidence is unnecessary.")

In sum, we determine that the claim language is clear. The claim already explicitly recites the functional relationship that with its new construction Petitioner seeks to construe into the word "below." We find the better reading of claim 1's usage of the term "below" to be in its ordinary directional sense—as Petitioner originally proposed. Thus, we decline to

Cooler Master Co., Ltd. Exhibit 1006, Page 455 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

adopt Petitioner's new construction of "below," and instead give this limitation its plain and ordinary meaning.

We note, however, that Patent Owner additionally contends that "the two limitations 'a thermal exchange chamber formed below the pump chamber' and 'an inlet positioned below the center of the impeller' together impose a positional requirement for the term 'below' which must be applied consistently to both limitations." PO Resp. 19. We begin again with the language of claim 1. Claim 1 recites that the "thermal exchange chamber" is "formed below the pump chamber and vertically spaced apart from the pump chamber," and that the "heat radiator" is "positioned at a location horizontally spaced apart from the heat generating component." Thus, claim 1 contains "vertical" or "horizontal" references in addition to a requirement that the "thermal exchange chamber" be "below" the "pump chamber." We find that the combination of this language suggests a specific frame of reference for the components of the claimed system.[8]

Petitioner argues that Patent Owner is attempting to read the limitation "vertically" into the term "below," and that this would render claim 1's recitation of "vertically spaced apart" superfluous. Reply 9. However, we agree with Patent Owner that it is not seeking to read the limitation

---

[8] The language of disclaimed claim 8, in contrast to the language of claim 1, does not impose any specific particular positional/directional frame of reference on the entire claimed cooling device, which indicates that Patent Owner knew how to claim a device with multiple frames of reference. *See Intellectual Ventures I LLC v. T-Mobile USA, Inc.*, 902 F.3d 1372, 1379 (Fed. Cir. 2018) ("This shows that the patentee knew how to restrict the resource allocator to using information obtained from layer 7. If the patentee had intended to similarly restrict the resource allocator in claim 1, it could have done so using the language of claim 19, but did not.").

Cooler Master Co., Ltd. Exhibit 1006, Page 456 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

"vertically" into term "below." The frame of reference of the claims comes from the other limitations in claim 1, which directionally orient the thermal exchange chamber, pump chamber, and heat exchanger. Sur-Reply 9–10. We agree with Patent Owner that its arguments arise not from importing a limitation into "below," but instead from applying the ordinary meaning of "below" once that positional frame of reference in the claim is established. *See id.*

On this point of whether Patent Owner is reading limitations into "below," Petitioner relies heavily on testimony of Patent Owner's expert, Dr. Tilton, where Dr. Tilton characterizes "vertically spaced apart" as seeming "superfluous" to him. Reply 10–11 (citing Ex. 1012, 27:19–28:1, 34:16–35:17). However, we agree with Patent Owner that when this testimony is read in context, Dr. Tilton clarifies that "vertically spaced apart" is not "completely redundant," Ex. 1012, 28:24–29:9, because two things "could also be below and horizontally spaced apart, . . . meaning it would be below it, but off to the side," *id.* at 27:6–11. Thus, when read in context, we do not agree with Petitioner's characterization of Dr. Tilton's overall testimony as reading a limitation into "below." Moreover, given the clear and simple claim language, we do not find either parties' extrinsic evidence to be helpful in resolving this dispute.

We further note that the Specification is consistent with this construction. Figures 17 and 20 and the supporting discussion are consistent with understanding the claim language as imposing an express limitation of the positional/directional frame in claim 1. The embodiment shown in Figures 17 and 20 of the '681 patent shows a device with an inlet "below" the center of the impeller and a consistent positional frame of reference for

Cooler Master Co., Ltd. Exhibit 1006, Page 457 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

the entire device. "[W]hile it is of course improper to limit the claims to the particular preferred embodiments described in the specification, the patentee's choice of preferred embodiments can shed light on the intended scope of the claims." *Astrazeneca AB v. Mut. Pharm. Co.*, 384 F.3d 1333, 1340 (Fed. Cir. 2004).

Accordingly, we determine that "an inlet positioned below the center of the impeller" should be given its plain and ordinary meaning. We further determine that Patent Owner is correct that claim 1 does have a particular positional/directional frame of reference that is used throughout the claim.

2. Other Claim Terms

We discern no other terms in need of express interpretation. Accordingly, we apply the legal standards set forth above when reading the claims.

B. THE PARTIES' POST-INSTITUTION ARGUMENTS

In our Institution Decision, we concluded that the argument and evidence adduced by Petitioner demonstrated a reasonable likelihood that claims 8, 11, 15, and 16, which have now been disclaimed, were unpatentable. Dec. 31–32. We noted that Petitioner had not shown a reasonable likelihood that claims 1 and 4 were unpatentable (*id.*), but we instituted on those claims under governing precedent and guidance. *See SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018); *see also PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute to require "a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition"); Consolidated Trial Practice Guide 64 (Nov. 2019), https://www.uspto.gov/TrialPractice

Cooler Master Co., Ltd. Exhibit 1006, Page 458 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

GuideConsolidated ("Consolidated TPG") ("The Board will not institute on fewer than all claims or all challenges in a petition.").

We must now determine whether Petitioner has established by a preponderance of the evidence that the remaining challenged claims are unpatentable over the cited prior art. 35 U.S.C. § 316(e) (2018). We previously instructed Patent Owner that "any arguments not raised in the [Patent Owner Response] may be deemed waived." Paper 10, 8; *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (holding that patent owner's failure to proffer argument at trial as instructed in scheduling order constitutes waiver). Additionally, the Board's Trial Practice Guide states that the Patent Owner Response "should identify all the involved claims that are believed to be patentable and state the basis for that belief." Consolidated TPG at 66.

C. LEGAL STANDARDS

Petitioner challenges the patentability of claims 1 and 4 on the ground that the claims are unpatentable as obvious over Duan, Shin, and Cheon. To prevail in its challenge to the patentability of the claims, Petitioner must establish unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d) (2019). "In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). This burden never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing*

Cooler Master Co., Ltd. Exhibit 1006, Page 459 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Corp. v. Videotek, Inc., 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burdens of proof in *inter partes* review).

The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), reaffirmed the framework for determining obviousness as set forth in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). The *KSR* Court summarized the four factual inquiries set forth in *Graham* that we apply in determining whether a claim is unpatentable as obvious under 35 U.S.C. § 103(a) as follows: (1) determining the scope and content of the prior art, (2) ascertaining the differences between the prior art and the claims at issue, (3) resolving the level of ordinary skill in the pertinent art, and (4) when in evidence, considering objective evidence indicating obviousness or nonobviousness. *KSR*, 550 U.S. at 406 (citing *Graham*, 383 U.S. at 17–18). In an *inter partes* review, Petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

Petitioner must explain how the proposed combinations of prior art would have rendered the challenged claims unpatentable. An obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418; *accord Translogic*, 504 F.3d at 1259. Petitioner also must articulate a reason why a person of ordinary skill in the art would have combined the prior art references. *NuVasive*, 842 F.3d at 1382.

At this final stage of the proceeding, we determine whether a preponderance of the evidence of record shows that the remaining challenged claims would have been rendered obvious in view of the asserted

Cooler Master Co., Ltd. Exhibit 1006, Page 460 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

prior art. We analyze the asserted ground of unpatentability in accordance with these principles.

D. LEVEL OF ORDINARY SKILL

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 17. Petitioner proposes that a person of ordinary skill

> would have been knowledgeable regarding liquid cooling systems for computer systems, would have earned at least a bachelor's degree, such as an B.S. (bachelor of science), or equivalent thereof, in electrical or mechanical engineering or a closely-related field, and would have possessed at least two or three years of experience in liquid cooling systems for computer systems, or in similar systems.

Pet. 4 (citing Ex. 1003 ¶¶ 25–30). Patent Owner does not dispute this definition of a person of ordinary skill. *See generally* PO Resp. Patent Owner's expert, Dr. Tilton, however, testifies that

> A person having ordinary skill in the field of liquid cooling systems at that time (i.e., in May 2005) would have (i) completed college level course work in thermodynamics, fluid mechanics, and heat transfer, and (ii) attained two or more years of experience in designing liquid cooling systems for computers, servers, or other electronic devices, or very similar technology. Alternatively, a person with a more advanced degree in the above fields may have had less practical experience and be a person of ordinary skill in the art.

Ex. 2018 ¶ 23.

We see no meaningful distinction between these definitions relevant to the particular issues necessary to decide this case. We adopt Petitioner's proposed level of ordinary skill, as it appears to be consistent with the level of skill reflected by the Specification and in the asserted prior art references.

Cooler Master Co., Ltd. Exhibit 1006, Page 461 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

See Okajima v. Bourdeau, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself can reflect the appropriate level of ordinary skill in the art).

E. CLAIMS 1, 4:
OBVIOUSNESS BASED ON DUAN, SHIN, CHEON

Petitioner argues that the combination of Duan, Shin, and Cheon renders claims 1 and 4 unpatentable as obvious. Pet. 26–68. Claim 1 is independent and claim 4 depends from claim 1. Ex. 1001, 28:18–67, 29:10–14. Patent Owner argues that, given the positional frame of reference of the claim, Petitioner's challenge to claims 1 and 4 fails. *See* PO Resp. 15–21. We have agreed with Patent Owner's proposed construction and agree with its effect on Petitioner's challenge. Accordingly, as explained below, we determine that Petitioner *has not proven* by a preponderance of evidence that the combination of Duan, Shin, and Cheon renders claims 1 and 4 unpatentable as obvious.

1. Independent Claim 1

We first consider Petitioner's argument that the combination of Duan, Shin, and Cheon renders obvious claim 1. Pet. 26–64.

a. Duan

Duan is titled "Cooling Plate Module." Ex. 1005, at [54]. Duan discloses a cooling plate module for cooling a CPU. *Id.* ¶ 2. Duan's system includes a cooling plate module with a cooling plate integrally formed with a liquid driving module such that the layout of the cooling plate module can be minimized to reduce space. *Id.* ¶ 7. Figure 6, reproduced below, is a view of the liquid cooling cyclic mechanism of Duan. *Id.* ¶ 17.

Cooler Master Co., Ltd. Exhibit 1006, Page 462 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

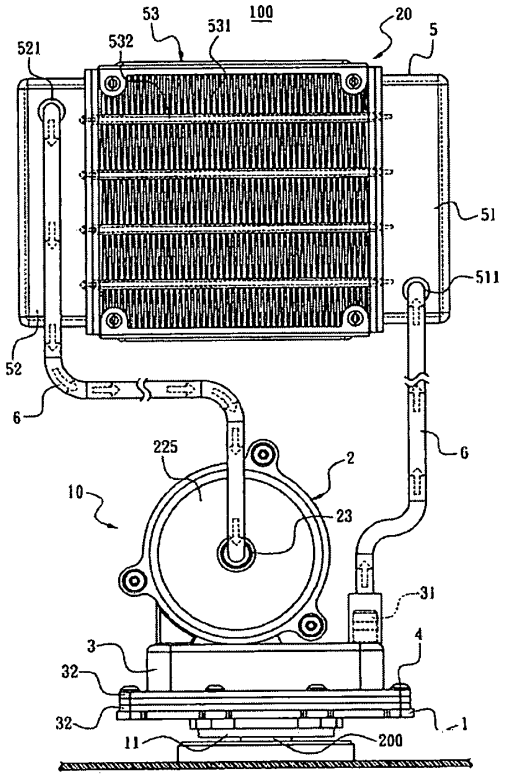


FIG. 6

Figure 6, reproduced above, shows liquid cooling cyclic mechanism 100 for cooling CPU 200. *Id.* ¶ 22. Liquid cooling cyclic mechanism 100 consists of cooling module 10 and water tank module 20, which is connected with cooling plate module 10 through ducts. *Id.* Cooling plate module 10 includes cooling plate 1, liquid driving module 2, and heat absorbing interface 11. *Id.* Heat absorbing face 11 is in contact with CPU 200 for dissipating heat generated by CPU 200. *Id.* ¶ 26.

Water tank 20 includes box 5, with liquid entrance region 51 and liquid exit region 52 on either side of box 5 and cooling stage 53 in the center of box 5. *Id.* ¶ 25. Cooling stage 53 has a plurality of heat-dissipating fins 531 arranged in rows with runners 532 defined between rows

Cooler Master Co., Ltd. Exhibit 1006, Page 463 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

of heat dissipating fins 531. *Id.* When hot liquid in liquid entrance region 51 flows to liquid exit region 52, heat from the hot liquid dissipates through heat-dissipating fins 531 and the resulting cool liquid flows to liquid exit region 52. *Id.*

Liquid inlet 23 of cooling plate module 10 is connected to liquid outlet 521 of liquid exit region 52 of water tank 20 through duct 6. *Id.* Second liquid outlet 31 of cooling plate module 10 is connected to liquid inlet 511 of liquid entrance region 51 of water tank 20 through duct 6, which allows hot liquid from cooling plate module 10 to be cooled and cycled back to cooling plate module 10. *Id.*

Figure 2, reproduced below, is an exploded view of cooling plate module 10 of Duan. *Id.* ¶ 13.

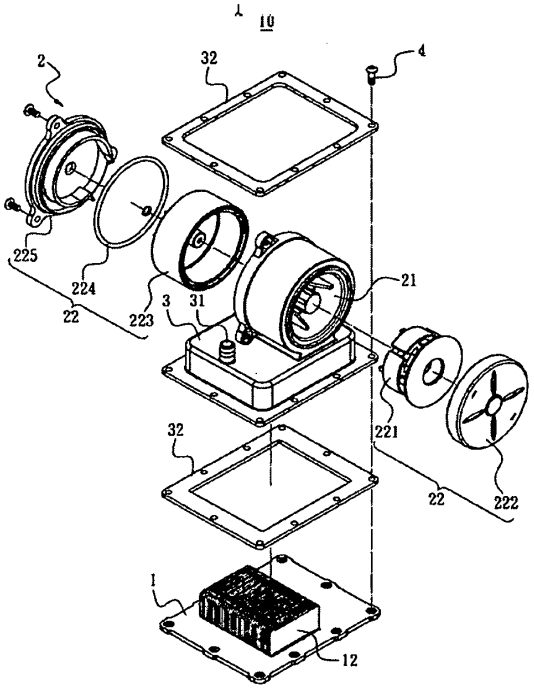


FIG. 2

Figure 2, reproduced above, shows a detailed exploded view of cooling plate module 10. Liquid driving module 2 of cooling plate module 10 includes accommodation chamber 21 and liquid driving unit 22 located in accommodation chamber 21 to drive the cool liquid. *Id.* ¶ 23. Liquid driving unit 22 includes coil stage 221, upper cover 222, impeller stage 223, sealing washer 224, and lower cover 225. *Id.* Lower cover 225 includes liquid inlet 23 connected with accommodation chamber 21. *Id.* First liquid outlet 24 connects to the bottom of accommodation chamber 21 and is enclosed by cap 3. *Id.* Cap 3 includes second liquid outlet 31, cooling plate 1 is assembled with cap 3 to define a closed space therein, and first liquid outlet 24 is corresponding to heat-dissipating plates 12. *Id.* Duan explains that liquid driving module 2 can be a reciprocating pump, centrifugal pump, or axial-flow pump. *Id.*

Figure 7 of Duan, reproduced below, is a sectional view of the cooling plate module. *Id.* ¶ 18.

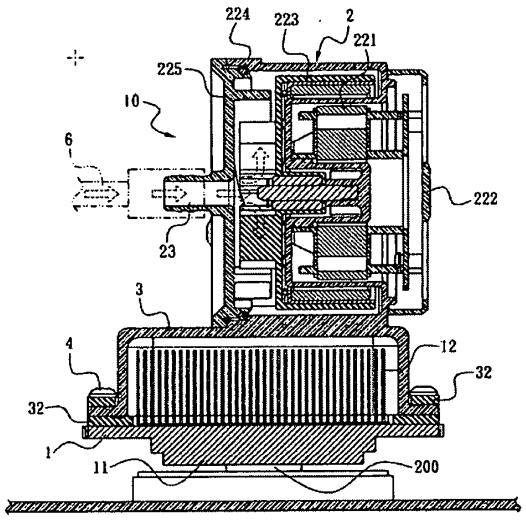


FIG. 7

Cooler Master Co., Ltd. Exhibit 1006, Page 465 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Figure 7, reproduced above, is a sectional view of the cooling plate module of Duan. As shown in Figure 7, the cool liquid in water tank 20 flows to accommodation chamber 21 through duct 6 and liquid inlet 23 of cooling plate module 10 and is driven by liquid driving unit 22. *Id.* ¶ 27. The cool liquid then flows to cap 3 through first liquid outlet 24 for heat dissipating heat-dissipating plates 12 in cap 3. *Id.* The cool liquid is then heat exchanged with heat-dissipating plates 12 into hot liquid. *Id.* The hot liquid then flows to liquid entrance region 51 of water tank 20 through second liquid outlet 31 of cooling plate module 10 and another duct 6.

b. Shin

Shin is titled "Cooling device for electronic equipment." Ex. 1006, at [54]. Shin discloses "a cooling structure for liquid cooling of heat generating electronic circuit components such as LSI chips installed on a wiring board, relating in particular to a cooling structure for compactly mounting a liquid cooled heat sink and pump." *Id.* ¶ 1. Shin teaches that "[u]sing a DC motor allows the motor speed to be easily changed by changing the DC voltage, thus enabling control of cooling power. Moreover, making the motor into a DC brushless motor makes it possible to implement a pump of low noise and long service life." *Id.* ¶ 19. Shin also teaches the following:

> Besides the heat generating element 1, heat generating elements 22a, 22b, 22c, such as memory LSI and driver LSI chips, which can be cooled by air cooling, as well as an IO card, memory card, hard disk or other card mounting board 23 are also installed on the wiring board 2. The wiring board 2 is housed inside case 24, which is an electronic equipment case. An air cooling fan 34 is installed in the case 24, and the aforementioned multiple air cooled components are air-cooled by cooling air 25.

Id. ¶¶ 23, 24.

Cooler Master Co., Ltd. Exhibit 1006, Page 466 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

c. Cheon

Cheon is titled "Cooling System for Computer." Ex. 1007, at [54]. Cheon discloses a cooling system for a computer having a heat transfer device contacting a computer component and communicating with a liquid coolant reservoir via first and second conduits, a radiator mounted on the outside of the computer housing and in heat exchanging contact with the reservoir, and a pump and brushless motor therefor mounted on the reservoir casing. *Id.* at 1:5–12. Specifically, Cheon discloses such a cooling system that has a control circuit that controls circulation of coolant based on feedback from one or more sensors indicating the temperatures of the components attached to the heat transfer device. *Id.* at 5:66–6:16.

d. Analysis

Patent Owner argues that Petitioner fails to prove the unpatentability of claim 1 because Duan fails to disclose both an "inlet" and a "thermal exchange chamber" that are positioned below the "pump chamber." PO Resp. 1. We agree.

In the Petition, Petitioner argues that Duan accounts for the limitation "an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber." *See* Pet. 51–53. Petitioner submits that "Duan discloses an inlet (e.g., an opening below the impeller that receives liquid from liquid inlet 23) positioned below the center of the impeller (e.g., impeller stage 223) configured to enable the cooling liquid to flow into the center of the pump chamber (e.g., accommodation chamber 21 and lower cover 225)." *Id.* at 51. Petitioner provides a side-by-side annotated comparison of Figure 7 of Duan and Figure 20 of the '681 patent, which is reproduced below.

Cooler Master Co., Ltd. Exhibit 1006, Page 467 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

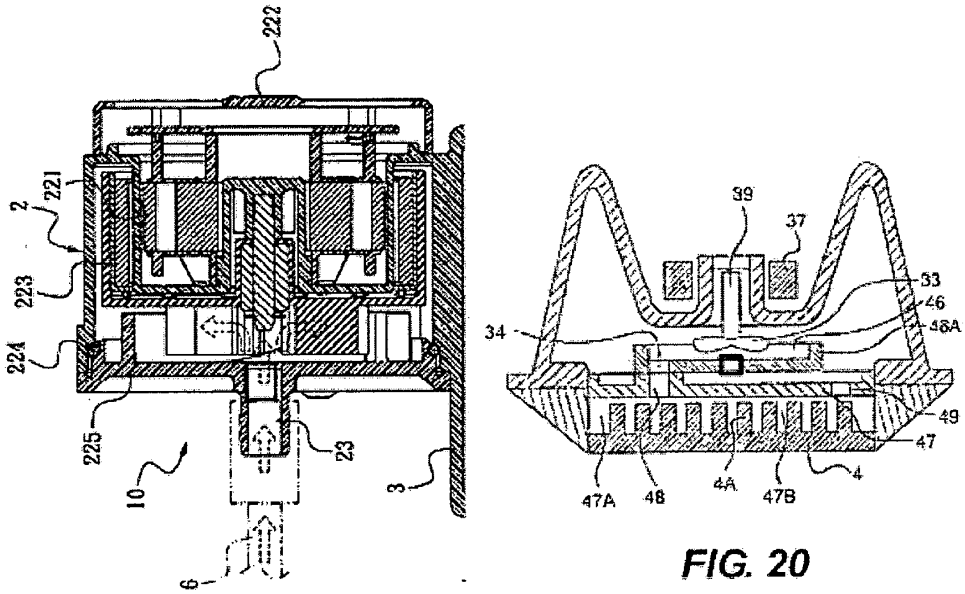


FIG. 20

Petitioner's illustration is an annotated side-by-side comparison of Figure 7 of Duan and Figure 20 of the '681 patent with a red box identifying the portion of each device, which Petitioner identifies as the "inlet below the center of the impeller." Pet. 52.

With respect to the limitation of claim 1 of "a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled," Petitioner relies exclusively on Duan and offers the following annotated version of Figure 8 of Duan to support its analysis.

Cooler Master Co., Ltd. Exhibit 1006, Page 468 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

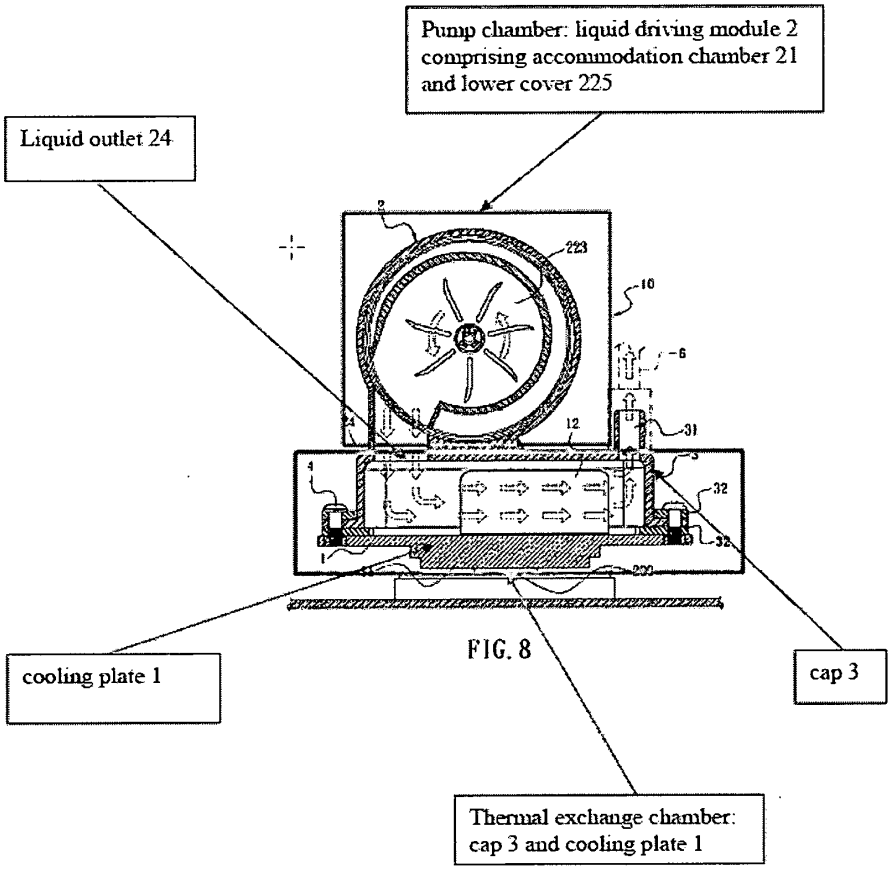


FIG. 8

Petitioner's illustration shows Figure 8 of Duan, as annotated by Petitioner showing a red box around the upper part of the device, which Petitioner identifies as the "pump chamber" and a blue box around the bottom portion of the device, which Petitioner identifies as the "thermal exchange chamber." Pet. 35. Petitioner submits that the thermal exchange chamber is shown in the blue box of this annotated version of Figure 8 and the pump chamber is shown in the red box. *Id.* Petitioner further submits that the chamber is vertically spaced apart as required by the claim. *Id.* at 35–36.

Cooler Master Co., Ltd. Exhibit 1006, Page 469 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

As explained above in the claim construction section, claim 1 requires a single frame of reference throughout the claim. *See supra* II.A.1. Given this requirement, we determine that Petitioner has failed to establish by a preponderance of the evidence that Duan accounts for both "an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber" and "a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled." Patent Owner's expert and Petitioner's expert both agree that when a consistent frame of reference is applied, Duan cannot teach both of these limitations. *See* Ex. 2018 ¶ 40; *see also* Ex. 2016, 40:3–44:2, 47:6–49:14 (Petitioner's expert agreeing that if a single directional frame of reference is applied to all features in Duan's cooling device, then Duan does not teach both these limitations). Accordingly, we agree with the expert's testimony and determine that Duan does not account for the limitations of claim 1, as properly construed.

e. Conclusion

Based on our review of Petitioner's argument and evidence of record, and for all the reasons expressed above, we conclude that Petitioner has *not* established by a preponderance of evidence that claim 1 is unpatentable as obvious over Duan, Shin, and Cheon.

2. Dependent Claim 4

Claim 4 depends from claim 1. Petitioner provides no additional evidence or argument as to why claim 4 should be treated differently than

Cooler Master Co., Ltd. Exhibit 1006, Page 470 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

claim 1 regarding the directional limitations in claim 1. Because we have determined that Petitioner has failed to show by a preponderance of the evidence that claim 1 is unpatentable as obvious over Duan, Shin, and Cheon, we also determine that Petitioner has failed to show by a preponderance of the evidence that claim 4 is unpatentable over Duan, Shin, and Cheon.

3. Summary

For all the reasons expressed above, we conclude that Petitioner has failed to establish by a preponderance of evidence that the combination of Duan, Shin, and Cheon renders claims 1 and 4 unpatentable as obvious under § 103(a).

III. CONCLUSION

In summary,

Claim(s)	35 U.S.C. §	Reference(s)	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1, 4	103	Duan, Shin, Cheon		1, 4
		Overall Outcome		1, 4

IV. ORDER

For the reasons given, it is:

ORDERED that Petitioner *has not shown* based on a preponderance of evidence that claims 1 and 4 of U.S. Patent No. 9,399,531 B2 are unpatentable; and

Cooler Master Co., Ltd. Exhibit 1006, Page 471 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

FURTHER ORDERED because this is a final written decision, the parties to this proceeding seeking judicial review of our Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER:

Heath Briggs
GREENBERG TRAURIG, LLP
briggsh@gtlaw.com

For PATENT OWNER:

Eric Raciti
Arpita Bhattacharyya
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
eric.raciti@finnegan.com
arpita.bhattacharyya@finnegan.com

Cooler Master Co., Ltd. Exhibit 1006, Page 472 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Trials@uspto.gov
Tel: 571-272-7822

Paper 34
Date: August 19, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COOLIT SYSTEMS, INC.,
Petitioner,

v.

ASETEK DANMARK A/S,
Patent Owner.

IPR2020-00524
Patent 9,733,681 B2

Before MICHAEL P. TIERNEY, *Vice Chief Administrative Patent Judge*, KEVIN W. CHERRY, and JASON W. MELVIN, *Administrative Patent Judges*.

CHERRY, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. BACKGROUND

CoolIT Systems, Inc. ("Petitioner") filed a petition (Paper 2, "Pet.") to institute an *inter partes* review of claims 1, 4, 8, 11, 15, and 16 of U.S. Patent No. 9,733,681 B2 (Ex. 1001, "the '681 patent"). *See* 35 U.S.C.

§ 311. Asetek Danemark A/S ("Patent Owner") timely filed a Preliminary Response. Paper 6 ("Prelim. Resp."). We also authorized Petitioner to file a Reply (Paper 8). Paper 7 (Order Authorizing Reply).

On August 24, 2020, based on the record before us at the time, we instituted an *inter partes* review of all challenged claims on all grounds alleged. Paper 9 ("Institution Decision" or "Dec."). After we instituted this review, Patent Owner filed a statutory disclaimer disclaiming claims 8–16 (Ex. 2015, "Statutory Disclaimer"). Thus, the only claims and ground remaining in this proceeding are indicated in the table below.

Claim(s) challenged	35 U.S.C. §	Reference(s)
1, 4	103(a)[1]	Duan,[2] Shin,[3] Cheon[4]

Petitioner supports its Petition with a Declaration by Marc Hodes, Ph.D., dated February 7, 2020. Ex. 1003.

Patent Owner filed a Response in opposition to the Petition (Paper 21, "PO Resp."). Patent Owner supported its Patent Owner Response with the Declaration of Donald E. Tilton, Ph.D., dated November 30, 2020

[1] Because the claims at issue have an effective filing date prior to March 16, 2013, the effective date of the applicable provisions of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), we apply the pre-AIA versions of 35 U.S.C. §§ 102 and 103 in this Decision.

[2] U.S. Patent Application Publication No. 2006/0185830, filed Feb. 18, 2005, published Aug. 24, 2006 (Ex. 1005, "Duan").

[3] Japanese Published Patent Application 2002-151638, published May 24, 2002 (Ex. 1006, "Shin"). The record includes a certified English translation of Shin. All citations will be to the certified English translation.

[4] U.S. Patent No. 5,731,954, issued Mar. 24, 1998 (Ex. 1007, "Cheon").

Cooler Master Co., Ltd. Exhibit 1006, Page 474 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

(Ex. 2018). Petitioner filed a Reply in support of the Petition (Paper 25, "Reply"). Petitioner supports the Reply with the Supplemental Declaration of Marc Hodes, Ph.D. (Ex. 1013). Patent Owner filed a Sur-reply responding to the Reply (Paper 28, "Sur-Reply"). Patent Owner did not move to amend any claim of the '681 patent.

Both parties requested an oral hearing. *See* Paper 31. A transcript of the oral hearing is entered in the record. Paper 33 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6. The evidentiary standard is a preponderance of the evidence. *See* 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2019). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons expressed below, we conclude that Petitioner has *not* demonstrated by a preponderance of evidence that claims 1 and 4 ("the remaining challenged claims") are unpatentable.

B. RELATED PROCEEDINGS

The parties identify *Asetek Danmark A/S v. CoolIT Systems, Inc.*, Case No. 3:19-cv-00410-EMC (N.D. Cal.) (complaint served on February 7, 2019, currently pending) as a related co-pending district court litigation. Pet. 1; Paper 4, 1. The parties also identify the following pending proceedings for *inter partes* review involving patents that are related to the '681 patent: IPR2020-00522; IPR2020-00523. Pet. 1; Paper 4, 1.

C. THE '681 PATENT

The '681 patent is titled "Cooling System for a Computer System." Ex. 1001, at [54]. The '681 patent issued from Application Serial No. 13/861,593, filed April 12, 2013. *Id.* at [21], [22]. The '593 application is a continuation of Application Serial No. 11/919,974, filed on January 6, 2009,

Cooler Master Co., Ltd. Exhibit 1006, Page 475 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

which is a U.S. national phase application of PCT/DK2005/00310, filed May 6, 2005. *Id.* at [63].

The '681 patent relates to a liquid-cooling system for a computer system. *Id.* at [57]. The Specification explains that, at the time of the invention, air cooling arrangements were the most-used cooling system for cooling central processing units (CPUs) in computer systems. *Id.* at 1:17–33. An alternative design known at the time of the invention was to use a cooling liquid circulating inside a closed system by means of a pumping unit with a heat exchanger past which the cooling liquid circulates. *Id.* at 1:34–38. The Specification contends that liquid cooling is generally more efficient and quieter than air cooling, but that a liquid cooling design consists of "many components," which increases the total installation time, size, and risk of leakage of the cooling liquid from the system. *Id.* at 1:39–49. Thus, it is one object of the invention to provide a small and compact liquid-cooling solution, which is more efficient than existing air-cooling arrangements, can be produced at low cost enabling high production volumes, is easy to use and implement, can be used with existing CPU types and computer systems, and requires a low level of maintenance or no maintenance at all. *Id.* at 1:53–63.

An illustrative embodiment of such a systemis depicted in Figures 7 and 8, reproduced below.

Cooler Master Co., Ltd. Exhibit 1006, Page 476 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

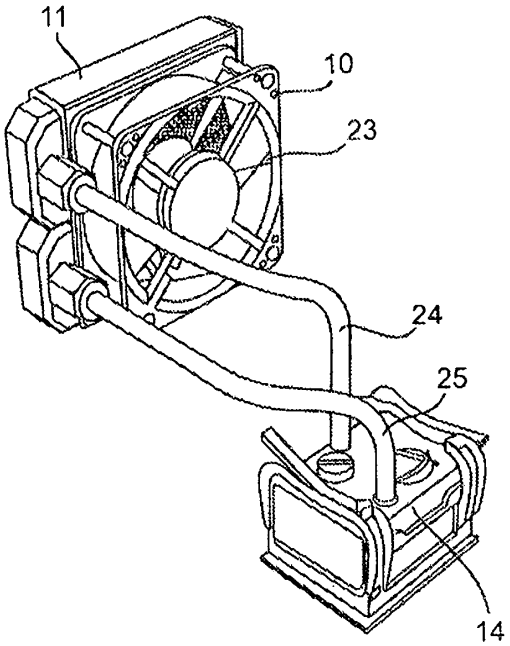


FIG. 7

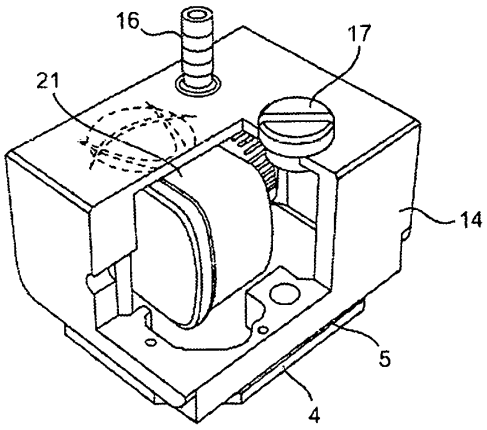


FIG. 8

Figure 7[5] is a perspective view of the cooling system showing reservoir housing 14 with heat exchanging surface 5 (shown in Figure 8) and pump 21 (shown in Figure 8) inside the reservoir. *Id.* at 16:16–19. Figure 8 is a cut-out view into reservoir housing 14, when the reservoir, pump 21, and heat exchanging surface 4 are situated inside the reservoir. *Id.* at 15:49–51. The reservoir has tube inlet connection 15 (not shown in Figure 8) through which the cooling liquid enters the reservoir. *Id.* at 15:51–53. From the tube

[5] We agree with Petitioner that it appears that the Specification transposes the description of Figure 7 with that of Figure 8. Pet. 5 n.1. We refer to the description of "Figure 8" in the Specification in our discussion of Figure 7, and we refer to the Specification's discussion of "Figure 7" in our discussion of Figure 8.

Cooler Master Co., Ltd. Exhibit 1006, Page 477 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

inlet connection, the cooling liquid flows through the reservoir passing heat exchanging surface 4 and enters the inlet of the pump. *Id.* at 15:54–56. After the cooling liquid flows through the pump, the cooling liquid passes out of the outlet of the pump and further out through tube outlet connection 16. *Id.* at 15:56–58. As shown in Figure 7, tube inlet connection 15 and tube outlet connection 16 are connected to heat radiator 11 by means of connecting tubes 24 and 25. *Id.* at 16:19–21. Cooling liquid flows into and out of the reservoir and the heat radiator through connecting tubes 24 and 25, respectively. *Id.* at 16:21–23. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir to prevent the cooling liquid from passing the reservoir too quickly to take up a sufficient amount of heat from the heat exchanging surface. *Id.* at 16:51–62.

Within heat radiator 11 (shown in Figure 7), the cooling liquid passes a number of channels for radiating the heat carried in the cooling fluid from heat exchanging surface 4 (shown in Figure 8). *Id.* at 16:23–26. Air fan 10 (with propeller 23) of Figure 7 blows air past the channels of the heat radiator in order to cool the radiator and thereby cool the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir. *Id.* at 16:26–30.

Figures 17 and 20 show the internal structures of a preferred embodiment of the reservoir according to the invention and are reproduced below. *Id.* at 21:48–50.

Cooler Master Co., Ltd. Exhibit 1006, Page 478 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

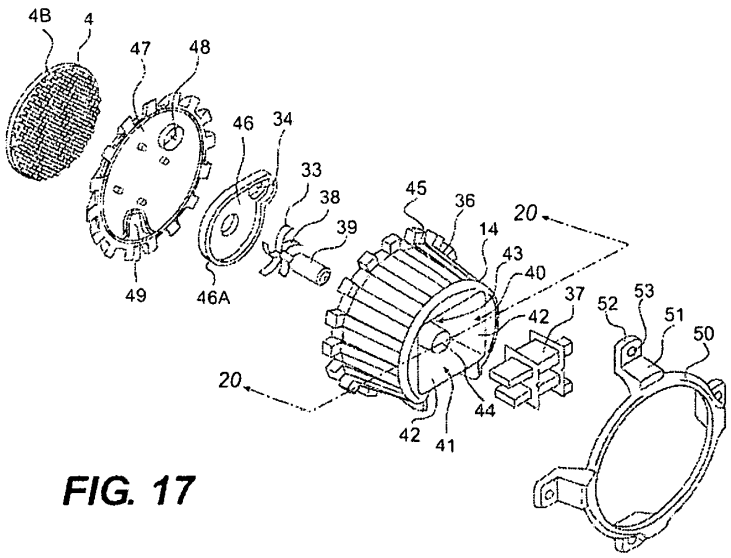


FIG. 17

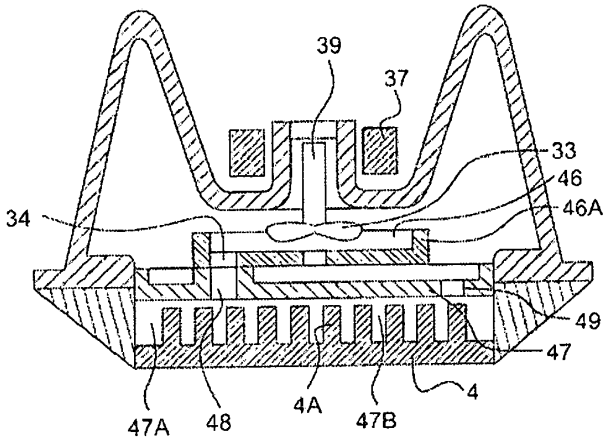


FIG. 20

Figure 17 is an exploded perspective view of a preferred embodiment of a reservoir, pump, and heat exchanging surface. *Id.* at 10:7–9. Figure 20 is a simplified schematic showing a cross-sectional view of the reservoir along plane 20-20 of Figure 17. *Id.* at 10:16–17. Reservoir housing 14, as shown in Figures 17 and 20, is in the form of a double-sided chassis having a substantially conical, circular configuration with stiffening ribs 36

Cooler Master Co., Ltd. Exhibit 1006, Page 479 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

extending axially along the exterior of the reservoir housing and configured to mount an electrical motor. *Id.* at 21:49–57. Reservoir housing 14 has recess 40 intended for accommodating stator 37 of electrical motor driving impellor 33 of the pump, which is attached to shaft 38 of rotor 39 of the electric motor. *Id.* at 21:58–22:1. The Specification explains that "a liquid-proof division" is made between rotor 39 of the motor, which is submerged in the cooling liquid, and stator 37 of the pump. *Id.* at 22:1–22:6.

The enclosed space between impeller 33 and heating exchanging interface 4 is divided into two separate chambers by impeller cover 46A and intermediate member 47, as shown in Figure 20. The chamber formed by impeller 33 and impeller cover 46A is described as "pump chamber 46" and has outlet 34. *Id.* at 22:64–67. A second chamber termed "thermal exchange chamber 47A" is formed by intermediate member 47 and heat exchanging interface 4. *Id.* at 23:5–11. Intermediate member 47 has two passages through it—first passage 48 and second passage 49. *Id.* at 23:7–15. First passage 48 connects to outlet 34 and provides a passage for the cooling liquid to flow from pump chamber 46 to thermal exchange chamber 47A. *Id.* Second passage 49 leads cooling liquid from thermal exchange chamber 47A to the interior of reservoir housing 14 allowing for the circulation of the liquid out of reservoir housing 14 to heat radiator 11. *Id.* at 23:11–19.

Claim 1 is the sole independent claim among the remaining challenged claims. Claim 4 depends from claim 1. Independent claim 1, which is illustrative, recites:

> 1. A liquid cooling system for cooling a heat-generating component of a computer, comprising:
>
> a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor

with a stator and an impeller, the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:

a pump chamber including the impeller; and

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled;

a heat-exchanging interface removably coupled to the reservoir, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component;

a heat radiator adapted to pass the cooling liquid therethrough, the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;

a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump; and

a control system configured to independently control a speed of the pump and a speed of the fan;

wherein the pump chamber includes:

an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber;

an outlet that fluidly couples the pump chamber to the thermal exchange chamber via a first

Cooler Master Co., Ltd. Exhibit 1006, Page 481 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

> passage, the outlet is positioned along an outer circumference of the pump chamber and is configured to direct the cooling liquid driven by the impeller through the first passage to the thermal exchange chamber;
>
> wherein the first passage directs the cooling liquid into the thermal exchange chamber between a first end and a second end of the thermal exchange chamber;
>
> wherein the thermal exchange chamber includes at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber.

Ex. 1001, 28:18–67.

II. ANALYSIS

A. CLAIM INTERPRETATION

We interpret claims in the same manner used in a civil action under 35 U.S.C. § 282(b), "including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R. § 42.100(b) (2019).[6] When applying that standard, we interpret

[6] On October 11, 2018, the USPTO revised its rules to harmonize the Board's claim construction standard with that used in federal district court. Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (now codified at 37 C.F.R. § 42.100(b) (2019)). This rule change applies to petitions filed on or after November 13, 2018. *Id.*

Cooler Master Co., Ltd. Exhibit 1006, Page 482 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

the claim language as it would be understood by one of ordinary skill in the art in light of the specification. *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010). Thus, we give claim terms their ordinary and customary meaning as they would be understood by an ordinarily skilled artisan. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) ("The ordinary and customary meaning 'is the meaning that the term would have to a person of ordinary skill in the art in question.'" (quoting *Phillips v. AWII Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005))). Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

In the Petition, Petitioner identifies "reservoir," "chamber," "impeller," "stator," "heat radiator," "an inlet positioned below the center of the impeller," and "intermediate member" as needing construction. Pet. 14–20. Petitioner submits that the other terms do not require construction. *Id.* at 20. In its Preliminary Response, Patent Owner agreed with Petitioner's proposed constructions for "reservoir," "chamber," "impeller," and "heat radiator." Prelim. Resp. 21. Patent Owner disagreed with Petitioner's constructions of "stator," "intermediate member," "an inlet positioned below the center of the impeller," "double-sided chassis," and "a first end or a second end of the thermal exchange chamber." *Id.* at 21. In addition, Patent Owner proposed a construction for "the pump chamber defined by an intermediate and double-sided chassis housing." *Id.* Patent Owner submitted that, although it disputes Petitioner's constructions of "stator," "intermediate member," "double-sided chassis," and "a first end or a second end of the thermal exchange chamber," no construction of these terms was

Cooler Master Co., Ltd. Exhibit 1006, Page 483 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

necessary. *Id.* Patent Owner further submitted that resolving the parties' conflicting constructions of the terms "an inlet positioned below the center of the impeller" and "the pump chamber defined by an intermediate member and a double-sided chassis housing" would aid our institution decision. *Id.*

In our Institution Decision, we agreed with Patent Owner that no construction was necessary of "reservoir," "chamber," "impeller," "heat radiator," "stator," "intermediate member," "double-sided chassis," and "a first end or a second end of the thermal exchange chamber" for our determination of whether to institute *inter partes* review. Dec. 13. We also agreed with the parties that resolving the constructions of "an inlet positioned below the center of the impeller" and "the pump chamber defined by an intermediate member and a double-sided chassis housing" would be helpful for the Institution Decision. *Id.* at 13–14.

At this stage of the proceeding, the parties' sole remaining claim construction dispute centers on the claim phrase "an inlet positioned below the center of the impeller," which we consider below.

1. "an inlet positioned below the center of the impeller"

In the Petition, Petitioner submitted that the phrase "an inlet positioned below the center of the impeller" should be construed as including an "opening for fluid near the center of the impeller along the axis around which the impeller rotates." Pet. 16. In its Patent Owner Response, Patent Owner argues that the phrase should be given its plain and ordinary meaning. PO Resp. 8. In its Reply, Petitioner offers a new construction ("New Construction"), and argues that we should instead construe the term to mean "on the 'cooling liquid' side of the impeller's center." Reply 1–2. In its Sur-Reply, Patent Owner argues that we should reject this new

construction because it is untimely and incorrect. Sur-Reply 1–9. We agree with Patent Owner that this phrase should receive its plain and ordinary meaning.[7]

We begin with the claim language. The full limitation in claim 1 states "an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber." Ex. 1001, 28:50–53. Petitioner argues that the end portion of this limitation—"configured to enable the cooling liquid to flow into the center of the pump chamber"—supports its new construction that "below," recited earlier in the limitation, refers not to a direction, but instead to the cooling liquid side of the apparatus. Reply 1–3. However, we agree with Patent Owner that rather than support Petitioner's construction, this language suggests that Petitioner's construction is not correct. Sur-Reply 4–5. As Patent Owner explains, the claim already recites the functional relationship between the inlet and the coolant; namely, the inlet is "configured to enable the cooling liquid to flow into the center of the pump chamber." *Id.* Furthermore, the claim uses the word "below" in another limitation—"a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber." Petitioner's new construction would require us to construe the term "below" differently in different limitations. Moreover, consistent with Petitioner's initial construction, we agree with Patent Owner that the claim consistently uses "below" in a directional, not functional sense. Thus, we agree with Patent Owner that the claim language

[7] We also agree with Patent Owner's argument that Petitioner's new claim construction is untimely. However, given that the issue is fully briefed and discussed, we will consider it.

Cooler Master Co., Ltd. Exhibit 1006, Page 485 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

does not support Petitioner's new construction. *See Epcon Gas Sys., Inc. v. Bauer Compressors, Inc.*, 279 F.3d 1022, 1030–31 (Fed. Cir. 2002) ("A word or phrase used consistently throughout a claim should be interpreted consistently." (quoting *Phonometrics, Inc. v. Northern Telecom Inc.*, 133 F.3d 1459, 1465 (Fed. Cir. 1998))).

The written description does not compel departing from the ordinary understanding of the word "below" as indicating a direction. As Patent Owner explains, nothing in the written description supports reading "below" as only describing a relationship with the cooling fluid side of the system. Sur-Reply 6. Thus, the written description does not weigh in favor of the construction.

Finally, Petitioner points to the testimony of Patent Owner's expert agreeing that the inlet is on the coolant liquid side of the apparatus. *See* Reply 6 (citing Ex. 1012, 34:16–35:17). The fact that Petitioner's new construction is not inconsistent with the preferred embodiment does not mean that this construction is correct. Instead, we find the claim language to be clear on this point. Thus, we do not find the extrinsic evidence to compel a particular construction. *See Seabed Geosolutions (US) Inc. v. Magseis FF LLC*, --- F.4th ---, 2021 WL 3520472, at *3 (Fed. Cir. Aug. 11, 2021) ("Given the clarity of the intrinsic evidence, resort to extrinsic evidence is unnecessary.")

In sum, we determine that the claim language is clear. The claim already explicitly recites the functional relationship that with its new construction Petitioner seeks to construe into the word "below." We find the better reading of claim 1's usage of the term "below" to be in its ordinary directional sense—as Petitioner originally proposed. Thus, we decline to

Cooler Master Co., Ltd. Exhibit 1006, Page 486 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

adopt Petitioner's new construction of "below," and instead give this limitation its plain and ordinary meaning.

We note, however, that Patent Owner additionally contends that "the two limitations 'a thermal exchange chamber formed below the pump chamber' and 'an inlet positioned below the center of the impeller' together impose a positional requirement for the term 'below' which must be applied consistently to both limitations." PO Resp. 19. We begin again with the language of claim 1. Claim 1 recites that the "thermal exchange chamber" is "formed below the pump chamber and vertically spaced apart from the pump chamber," and that the "heat radiator" is "positioned at a location horizontally spaced apart from the heat generating component." Thus, claim 1 contains "vertical" or "horizontal" references in addition to a requirement that the "thermal exchange chamber" be "below" the "pump chamber." We find that the combination of this language suggests a specific frame of reference for the components of the claimed system.[8]

Petitioner argues that Patent Owner is attempting to read the limitation "vertically" into the term "below," and that this would render claim 1's recitation of "vertically spaced apart" superfluous. Reply 9. However, we agree with Patent Owner that it is not seeking to read the limitation

[8] The language of disclaimed claim 8, in contrast to the language of claim 1, does not impose any specific particular positional/directional frame of reference on the entire claimed cooling device, which indicates that Patent Owner knew how to claim a device with multiple frames of reference. *See Intellectual Ventures I LLC v. T-Mobile USA, Inc.*, 902 F.3d 1372, 1379 (Fed. Cir. 2018) ("This shows that the patentee knew how to restrict the resource allocator to using information obtained from layer 7. If the patentee had intended to similarly restrict the resource allocator in claim 1, it could have done so using the language of claim 19, but did not.").

Cooler Master Co., Ltd. Exhibit 1006, Page 487 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

"vertically" into term "below." The frame of reference of the claims comes from the other limitations in claim 1, which directionally orient the thermal exchange chamber, pump chamber, and heat exchanger. Sur-Reply 9–10. We agree with Patent Owner that its arguments arise not from importing a limitation into "below," but instead from applying the ordinary meaning of "below" once that positional frame of reference in the claim is established. *See id.*

On this point of whether Patent Owner is reading limitations into "below," Petitioner relies heavily on testimony of Patent Owner's expert, Dr. Tilton, where Dr. Tilton characterizes "vertically spaced apart" as seeming "superfluous" to him. Reply 10–11 (citing Ex. 1012, 27:19–28:1, 34:16–35:17). However, we agree with Patent Owner that when this testimony is read in context, Dr. Tilton clarifies that "vertically spaced apart" is not "completely redundant," Ex. 1012, 28:24–29:9, because two things "could also be below and horizontally spaced apart, . . . meaning it would be below it, but off to the side," *id.* at 27:6–11. Thus, when read in context, we do not agree with Petitioner's characterization of Dr. Tilton's overall testimony as reading a limitation into "below." Moreover, given the clear and simple claim language, we do not find either parties' extrinsic evidence to be helpful in resolving this dispute.

We further note that the Specification is consistent with this construction. Figures 17 and 20 and the supporting discussion are consistent with understanding the claim language as imposing an express limitation of the positional/directional frame in claim 1. The embodiment shown in Figures 17 and 20 of the '681 patent shows a device with an inlet "below" the center of the impeller and a consistent positional frame of reference for

Cooler Master Co., Ltd. Exhibit 1006, Page 488 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

the entire device. "[W]hile it is of course improper to limit the claims to the particular preferred embodiments described in the specification, the patentee's choice of preferred embodiments can shed light on the intended scope of the claims." *Astrazeneca AB v. Mut. Pharm. Co.*, 384 F.3d 1333, 1340 (Fed. Cir. 2004).

Accordingly, we determine that "an inlet positioned below the center of the impeller" should be given its plain and ordinary meaning. We further determine that Patent Owner is correct that claim 1 does have a particular positional/directional frame of reference that is used throughout the claim.

2. Other Claim Terms

We discern no other terms in need of express interpretation. Accordingly, we apply the legal standards set forth above when reading the claims.

B. THE PARTIES' POST-INSTITUTION ARGUMENTS

In our Institution Decision, we concluded that the argument and evidence adduced by Petitioner demonstrated a reasonable likelihood that claims 8, 11, 15, and 16, which have now been disclaimed, were unpatentable. Dec. 31–32. We noted that Petitioner had not shown a reasonable likelihood that claims 1 and 4 were unpatentable (*id.*), but we instituted on those claims under governing precedent and guidance. *See SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018); *see also PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute to require "a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition"); Consolidated Trial Practice Guide 64 (Nov. 2019), https://www.uspto.gov/TrialPractice

Cooler Master Co., Ltd. Exhibit 1006, Page 489 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

GuideConsolidated ("Consolidated TPG") ("The Board will not institute on fewer than all claims or all challenges in a petition.").

We must now determine whether Petitioner has established by a preponderance of the evidence that the remaining challenged claims are unpatentable over the cited prior art. 35 U.S.C. § 316(e) (2018). We previously instructed Patent Owner that "any arguments not raised in the [Patent Owner Response] may be deemed waived." Paper 10, 8; *see also In re NuVasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (holding that patent owner's failure to proffer argument at trial as instructed in scheduling order constitutes waiver). Additionally, the Board's Trial Practice Guide states that the Patent Owner Response "should identify all the involved claims that are believed to be patentable and state the basis for that belief." Consolidated TPG at 66.

C. LEGAL STANDARDS

Petitioner challenges the patentability of claims 1 and 4 on the ground that the claims are unpatentable as obvious over Duan, Shin, and Cheon. To prevail in its challenge to the patentability of the claims, Petitioner must establish unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d) (2019). "In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). This burden never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing*

Corp. v. Videotek, Inc., 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burdens of proof in *inter partes* review).

The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), reaffirmed the framework for determining obviousness as set forth in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). The *KSR* Court summarized the four factual inquiries set forth in *Graham* that we apply in determining whether a claim is unpatentable as obvious under 35 U.S.C. § 103(a) as follows: (1) determining the scope and content of the prior art, (2) ascertaining the differences between the prior art and the claims at issue, (3) resolving the level of ordinary skill in the pertinent art, and (4) when in evidence, considering objective evidence indicating obviousness or nonobviousness. *KSR*, 550 U.S. at 406 (citing *Graham*, 383 U.S. at 17–18). In an *inter partes* review, Petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

Petitioner must explain how the proposed combinations of prior art would have rendered the challenged claims unpatentable. An obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418; *accord Translogic*, 504 F.3d at 1259. Petitioner also must articulate a reason why a person of ordinary skill in the art would have combined the prior art references. *NuVasive*, 842 F.3d at 1382.

At this final stage of the proceeding, we determine whether a preponderance of the evidence of record shows that the remaining challenged claims would have been rendered obvious in view of the asserted

Cooler Master Co., Ltd. Exhibit 1006, Page 491 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

prior art. We analyze the asserted ground of unpatentability in accordance with these principles.

D. LEVEL OF ORDINARY SKILL

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention. *Graham*, 383 U.S. at 17. Petitioner proposes that a person of ordinary skill

> would have been knowledgeable regarding liquid cooling systems for computer systems, would have earned at least a bachelor's degree, such as an B.S. (bachelor of science), or equivalent thereof, in electrical or mechanical engineering or a closely-related field, and would have possessed at least two or three years of experience in liquid cooling systems for computer systems, or in similar systems.

Pet. 4 (citing Ex. 1003 ¶¶ 25–30). Patent Owner does not dispute this definition of a person of ordinary skill. *See generally* PO Resp. Patent Owner's expert, Dr. Tilton, however, testifies that

> A person having ordinary skill in the field of liquid cooling systems at that time (i.e., in May 2005) would have (i) completed college level course work in thermodynamics, fluid mechanics, and heat transfer, and (ii) attained two or more years of experience in designing liquid cooling systems for computers, servers, or other electronic devices, or very similar technology. Alternatively, a person with a more advanced degree in the above fields may have had less practical experience and be a person of ordinary skill in the art.

Ex. 2018 ¶ 23.

We see no meaningful distinction between these definitions relevant to the particular issues necessary to decide this case. We adopt Petitioner's proposed level of ordinary skill, as it appears to be consistent with the level of skill reflected by the Specification and in the asserted prior art references.

Cooler Master Co., Ltd. Exhibit 1006, Page 492 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

See Okajima v. Bourdeau, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself can reflect the appropriate level of ordinary skill in the art).

E. CLAIMS 1, 4:
OBVIOUSNESS BASED ON DUAN, SHIN, CHEON

Petitioner argues that the combination of Duan, Shin, and Cheon renders claims 1 and 4 unpatentable as obvious. Pet. 26–68. Claim 1 is independent and claim 4 depends from claim 1. Ex. 1001, 28:18–67, 29:10–14. Patent Owner argues that, given the positional frame of reference of the claim, Petitioner's challenge to claims 1 and 4 fails. *See* PO Resp. 15–21. We have agreed with Patent Owner's proposed construction and agree with its effect on Petitioner's challenge. Accordingly, as explained below, we determine that Petitioner *has not proven* by a preponderance of evidence that the combination of Duan, Shin, and Cheon renders claims 1 and 4 unpatentable as obvious.

1. Independent Claim 1

We first consider Petitioner's argument that the combination of Duan, Shin, and Cheon renders obvious claim 1. Pet. 26–64.

a. Duan

Duan is titled "Cooling Plate Module." Ex. 1005, at [54]. Duan discloses a cooling plate module for cooling a CPU. *Id.* ¶ 2. Duan's system includes a cooling plate module with a cooling plate integrally formed with a liquid driving module such that the layout of the cooling plate module can be minimized to reduce space. *Id.* ¶ 7. Figure 6, reproduced below, is a view of the liquid cooling cyclic mechanism of Duan. *Id.* ¶ 17.

Cooler Master Co., Ltd. Exhibit 1006, Page 493 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

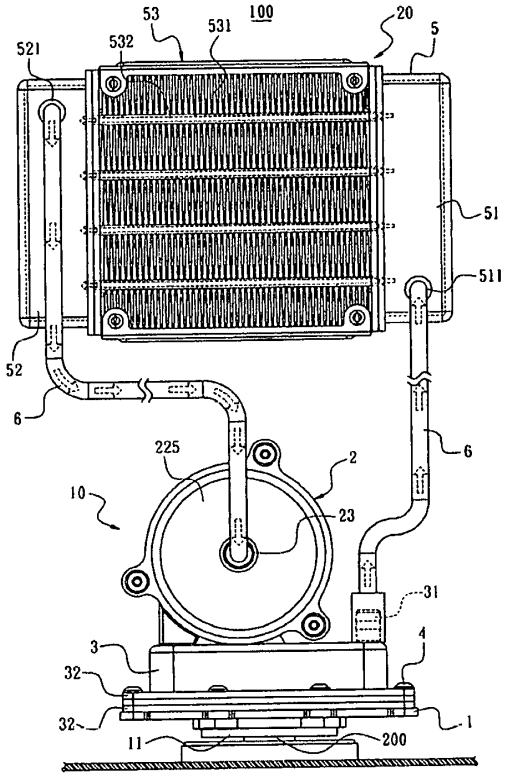


FIG. 6

Figure 6, reproduced above, shows liquid cooling cyclic mechanism 100 for cooling CPU 200. *Id.* ¶ 22. Liquid cooling cyclic mechanism 100 consists of cooling module 10 and water tank module 20, which is connected with cooling plate module 10 through ducts. *Id.* Cooling plate module 10 includes cooling plate 1, liquid driving module 2, and heat absorbing interface 11. *Id.* Heat absorbing face 11 is in contact with CPU 200 for dissipating heat generated by CPU 200. *Id.* ¶ 26.

Water tank 20 includes box 5, with liquid entrance region 51 and liquid exit region 52 on either side of box 5 and cooling stage 53 in the center of box 5. *Id.* ¶ 25. Cooling stage 53 has a plurality of heat-dissipating fins 531 arranged in rows with runners 532 defined between rows

Cooler Master Co., Ltd. Exhibit 1006, Page 494 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

of heat dissipating fins 531. *Id.* When hot liquid in liquid entrance region 51 flows to liquid exit region 52, heat from the hot liquid dissipates through heat-dissipating fins 531 and the resulting cool liquid flows to liquid exit region 52. *Id.*

Liquid inlet 23 of cooling plate module 10 is connected to liquid outlet 521 of liquid exit region 52 of water tank 20 through duct 6. *Id.* Second liquid outlet 31 of cooling plate module 10 is connected to liquid inlet 511 of liquid entrance region 51 of water tank 20 through duct 6, which allows hot liquid from cooling plate module 10 to be cooled and cycled back to cooling plate module 10. *Id.*

Figure 2, reproduced below, is an exploded view of cooling plate module 10 of Duan. *Id.* ¶ 13.

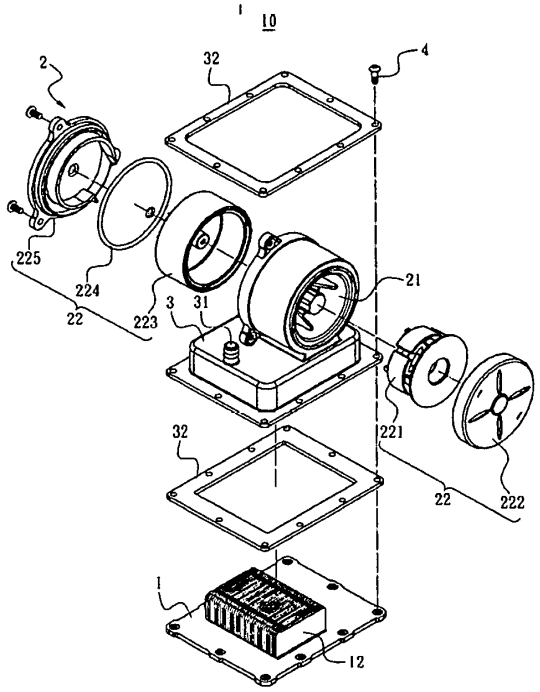


FIG. 2

Cooler Master Co., Ltd. Exhibit 1006, Page 495 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Figure 2, reproduced above, shows a detailed exploded view of cooling plate module 10. Liquid driving module 2 of cooling plate module 10 includes accommodation chamber 21 and liquid driving unit 22 located in accommodation chamber 21 to drive the cool liquid. *Id.* ¶ 23. Liquid driving unit 22 includes coil stage 221, upper cover 222, impeller stage 223, sealing washer 224, and lower cover 225. *Id.* Lower cover 225 includes liquid inlet 23 connected with accommodation chamber 21. *Id.* First liquid outlet 24 connects to the bottom of accommodation chamber 21 and is enclosed by cap 3. *Id.* Cap 3 includes second liquid outlet 31, cooling plate 1 is assembled with cap 3 to define a closed space therein, and first liquid outlet 24 is corresponding to heat-dissipating plates 12. *Id.* Duan explains that liquid driving module 2 can be a reciprocating pump, centrifugal pump, or axial-flow pump. *Id.*

Figure 7 of Duan, reproduced below, is a sectional view of the cooling plate module. *Id.* ¶ 18.

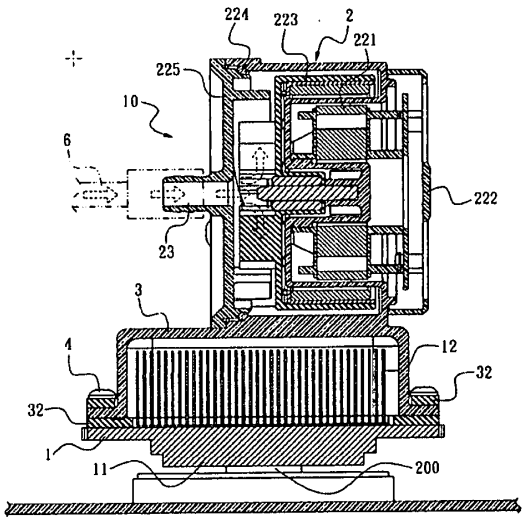


FIG. 7

Cooler Master Co., Ltd. Exhibit 1006, Page 496 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Figure 7, reproduced above, is a sectional view of the cooling plate module of Duan. As shown in Figure 7, the cool liquid in water tank 20 flows to accommodation chamber 21 through duct 6 and liquid inlet 23 of cooling plate module 10 and is driven by liquid driving unit 22. *Id.* ¶ 27. The cool liquid then flows to cap 3 through first liquid outlet 24 for heat dissipating heat-dissipating plates 12 in cap 3. *Id.* The cool liquid is then heat exchanged with heat-dissipating plates 12 into hot liquid. *Id.* The hot liquid then flows to liquid entrance region 51 of water tank 20 through second liquid outlet 31 of cooling plate module 10 and another duct 6.

b. Shin

Shin is titled "Cooling device for electronic equipment." Ex. 1006, at [54]. Shin discloses "a cooling structure for liquid cooling of heat generating electronic circuit components such as LSI chips installed on a wiring board, relating in particular to a cooling structure for compactly mounting a liquid cooled heat sink and pump." *Id.* ¶ 1. Shin teaches that "[u]sing a DC motor allows the motor speed to be easily changed by changing the DC voltage, thus enabling control of cooling power. Moreover, making the motor into a DC brushless motor makes it possible to implement a pump of low noise and long service life." *Id.* ¶ 19. Shin also teaches the following:

> Besides the heat generating element 1, heat generating elements 22a, 22b, 22c, such as memory LSI and driver LSI chips, which can be cooled by air cooling, as well as an IO card, memory card, hard disk or other card mounting board 23 are also installed on the wiring board 2. The wiring board 2 is housed inside case 24, which is an electronic equipment case. An air cooling fan 34 is installed in the case 24, and the aforementioned multiple air cooled components are air-cooled by cooling air 25.

Id. ¶¶ 23, 24.

Cooler Master Co., Ltd. Exhibit 1006, Page 497 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

c. Cheon

Cheon is titled "Cooling System for Computer." Ex. 1007, at [54]. Cheon discloses a cooling system for a computer having a heat transfer device contacting a computer component and communicating with a liquid coolant reservoir via first and second conduits, a radiator mounted on the outside of the computer housing and in heat exchanging contact with the reservoir, and a pump and brushless motor therefor mounted on the reservoir casing. *Id.* at 1:5–12. Specifically, Cheon discloses such a cooling system that has a control circuit that controls circulation of coolant based on feedback from one or more sensors indicating the temperatures of the components attached to the heat transfer device. *Id.* at 5:66–6:16.

d. Analysis

Patent Owner argues that Petitioner fails to prove the unpatentability of claim 1 because Duan fails to disclose both an "inlet" and a "thermal exchange chamber" that are positioned below the "pump chamber." PO Resp. 1. We agree.

In the Petition, Petitioner argues that Duan accounts for the limitation "an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber." *See* Pet. 51–53. Petitioner submits that "Duan discloses an inlet (e.g., an opening below the impeller that receives liquid from liquid inlet 23) positioned below the center of the impeller (e.g., impeller stage 223) configured to enable the cooling liquid to flow into the center of the pump chamber (e.g., accommodation chamber 21 and lower cover 225)." *Id.* at 51. Petitioner provides a side-by-side annotated comparison of Figure 7 of Duan and Figure 20 of the '681 patent, which is reproduced below.

Cooler Master Co., Ltd. Exhibit 1006, Page 498 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

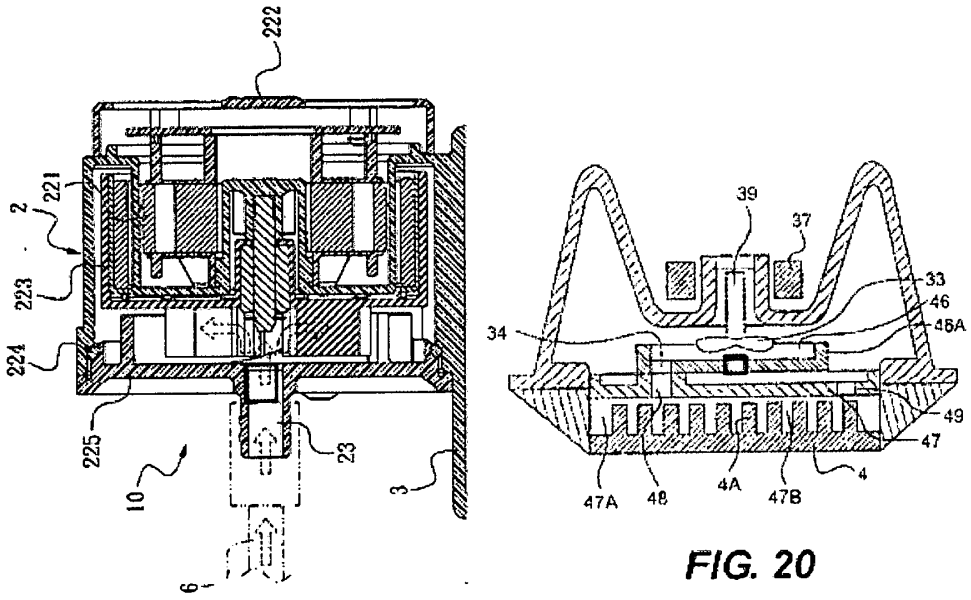


FIG. 20

Petitioner's illustration is an annotated side-by-side comparison of Figure 7 of Duan and Figure 20 of the '681 patent with a red box identifying the portion of each device, which Petitioner identifies as the "inlet below the center of the impeller." Pet. 52.

With respect to the limitation of claim 1 of "a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled," Petitioner relies exclusively on Duan and offers the following annotated version of Figure 8 of Duan to support its analysis.

Cooler Master Co., Ltd. Exhibit 1006, Page 499 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

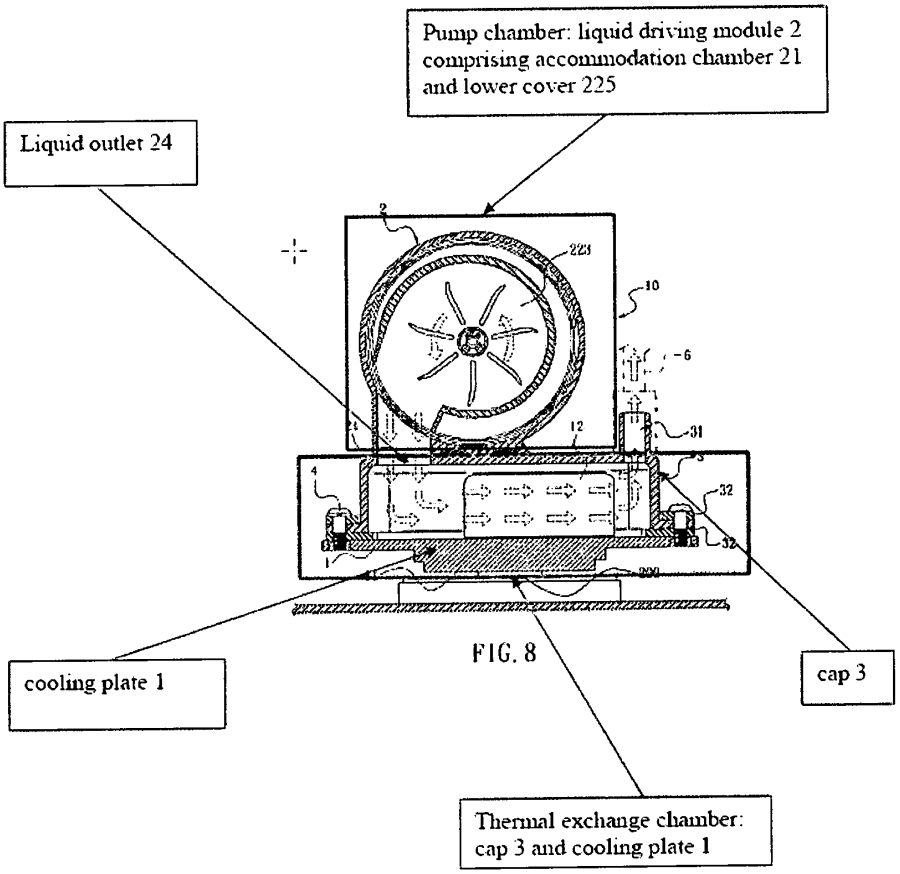


FIG. 8

Petitioner's illustration shows Figure 8 of Duan, as annotated by Petitioner showing a red box around the upper part of the device, which Petitioner identifies as the "pump chamber" and a blue box around the bottom portion of the device, which Petitioner identifies as the "thermal exchange chamber." Pet. 35. Petitioner submits that the thermal exchange chamber is shown in the blue box of this annotated version of Figure 8 and the pump chamber is shown in the red box. *Id.* Petitioner further submits that the chamber is vertically spaced apart as required by the claim. *Id.* at 35–36.

Cooler Master Co., Ltd. Exhibit 1006, Page 500 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

As explained above in the claim construction section, claim 1 requires a single frame of reference throughout the claim. *See supra* II.A.1. Given this requirement, we determine that Petitioner has failed to establish by a preponderance of the evidence that Duan accounts for both "an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber" and "a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled." Patent Owner's expert and Petitioner's expert both agree that when a consistent frame of reference is applied, Duan cannot teach both of these limitations. *See* Ex. 2018 ¶ 40; *see also* Ex. 2016, 40:3–44:2, 47:6–49:14 (Petitioner's expert agreeing that if a single directional frame of reference is applied to all features in Duan's cooling device, then Duan does not teach both these limitations). Accordingly, we agree with the expert's testimony and determine that Duan does not account for the limitations of claim 1, as properly construed.

e. Conclusion

Based on our review of Petitioner's argument and evidence of record, and for all the reasons expressed above, we conclude that Petitioner has *not* established by a preponderance of evidence that claim 1 is unpatentable as obvious over Duan, Shin, and Cheon.

2. Dependent Claim 4

Claim 4 depends from claim 1. Petitioner provides no additional evidence or argument as to why claim 4 should be treated differently than

Cooler Master Co., Ltd. Exhibit 1006, Page 501 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

claim 1 regarding the directional limitations in claim 1. Because we have determined that Petitioner has failed to show by a preponderance of the evidence that claim 1 is unpatentable as obvious over Duan, Shin, and Cheon, we also determine that Petitioner has failed to show by a preponderance of the evidence that claim 4 is unpatentable over Duan, Shin, and Cheon.

3. Summary

For all the reasons expressed above, we conclude that Petitioner has failed to establish by a preponderance of evidence that the combination of Duan, Shin, and Cheon renders claims 1 and 4 unpatentable as obvious under § 103(a).

III. CONCLUSION

In summary,

Claim(s)	35 U.S.C. §	Reference(s)	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1, 4	103	Duan, Shin, Cheon		1, 4
		Overall Outcome		1, 4

IV. ORDER

For the reasons given, it is:

ORDERED that Petitioner *has not shown* based on a preponderance of evidence that claims 1 and 4 of U.S. Patent No. 9,399,531 B2 are unpatentable; and

Cooler Master Co., Ltd. Exhibit 1006, Page 502 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

FURTHER ORDERED because this is a final written decision, the parties to this proceeding seeking judicial review of our Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER:

Heath Briggs
GREENBERG TRAURIG, LLP
briggsh@gtlaw.com

For PATENT OWNER:

Eric Raciti
Arpita Bhattacharyya
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
eric.raciti@finnegan.com
arpita.bhattacharyya@finnegan.com

Cooler Master Co., Ltd. Exhibit 1006, Page 503 of 506
Cooler Master Co., Ltd. v. Asetek Danmark A/S
IPR2024-01497

Disclaimer and Dedication

9,733,681 B2 - Eriksen, Andre Sloth, Morgan Hill, CA (US). COOLING SYSTEM FOR A COMPUTER SYSTEM. Patent dated August 15, 2017. Disclaimer filed November 30, 2020 by the assignee, Asetek Danmark A/S.

I hereby disclaim the following complete claims 8-16 of said patent.

(Official Gazette, November 16, 2021)

(12) **INTER PARTES REVIEW CERTIFICATE** (3073rd)
United States Patent
Eriksen

(10) **Number: US 9,733,681 K1**
(45) **Certificate Issued: Apr. 4, 2023**

(54) **COOLING SYSTEM FOR A COMPUTER SYSTEM**

(71) Applicant: **André Sloth Eriksen**

(72) Inventor: **André Sloth Eriksen**

(73) Assignee: **ASETEK DANMARK A/S**

Trial Number:

IPR2020-00524 filed Feb. 7, 2020

Inter Partes Review Certificate for:

Patent No.: **9,733,681**
Issued: **Aug. 15, 2017**
Appl. No.: **13/861,593**
Filed: **Apr. 12, 2013**

The results of IPR2020-00524 are reflected in this inter partes review certificate under 35 U.S.C. 318(b).

AS A RESULT OF THE INTER PARTES REVIEW PROCEEDING, IT HAS BEEN DETERMINED THAT:

Claims **1** and **4** are found patentable.

Claims **8**, **11**, **15** and **16** are disclaimed.

* * * * *