

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 2:22-cv-00320	DATE FILED 8/19/2022	U.S. DISTRICT COURT Eastern District of Texas
PLAINTIFF Manufacturing Resources International, Inc.		DEFENDANT Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., Samsung SDS Co., Ltd., Samsung SDS America, Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,854,595	10/7/2014	Manufacturing Resources International, Inc.
2 9,173,322	10/27/2015	Manufacturing Resources International, Inc.
3 9,629,287	12/10/2019	Manufacturing Resources International, Inc.
4 10,506,740	4/18/2017	Manufacturing Resources International, Inc.
5 11,013,142	5/18/2021	Manufacturing Resources International, Inc.

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT		
CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

SEC et al. v. MRI
 SEC Exhibit 1031.0001
 IPR2023-00254



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.
15/789,331	12/10/2019	10506740	MAN2241-045P	2408

8698 7590 11/20/2019
STANDLEY LAW GROUP LLP
6300 Riverside Drive
Dublin, OH 43017

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 0 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):

William Dunn, Alpharetta, GA;
Manufacturing Resources International, Inc., Alpharetta, GA;
Tim Hubbard, Alpharetta, GA;

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.

IR103 (Rev. 10/09)

SEC et al. v. MRI
SEC Exhibit 1031.0002
IPR2023-00254

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
15789331	20-Oct-2017	William Dunn	MAN2241-045P	2408

TITLE OF INVENTION :

ELECTRONIC DISPLAY WITH COOLING

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	Utility under 35 USC 111(a)	2835	688000	MICHAEL MATEY
Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
\$1000	\$0	\$1000	10-Dec-2019	\$0

1.Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
8698 STANDLEY LAW GROUP LLP 6300 Riverside Drive Dublin OH 43017 UNITED STATES 6147925555 standleydocketing@standleyllp.com	
☐ Change of correspondence address requested, system generated AIA/122-EFS form attached	☐ Fee Address indication requested, system generated SB/47-EFS form attached

2.Entity Status**Change in Entity Status**

Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.

Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.



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.

Document Description: Issue Fee Payment (PTO-85B)

3.The Following Fee(s) Are Submitted:☒ Issue Fee

I authorize USPTO to apply my previously paid issue fee to the current fees due

☐ Publication Fee

The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____

☐ Advance Order - # of copies _____

If in addition to the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency or credit any overpayment, to Deposit Account Number 194076.

The issue fee must be submitted with this form. If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.

4.Firm and/or Attorney Names To Be Printed**NOTE: If no name is listed, no name will be printed**

For printing on the patent front page, list to be displayed as entered

1. STANDLEY LAW GROUP LLP

2. JEFFREY S. STANDLEY

3. ERIC M. GAYAN

5.Assignee Name(s) and Residence Data To Be Printed

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.

Name	City	State	Country	Category
Manufacturing Resources International, Inc.	Alpharetta	GEORGIA	united states	corporation

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/Eric M. Gayan/	Date	11-06-2019
Name	Eric Michael Gayan	Registration Number	46103

Electronic Patent Application Fee Transmittal				
Application Number:		15789331		
Filing Date:		20-Oct-2017		
Title of Invention:		ELECTRONIC DISPLAY WITH COOLING		
First Named Inventor/Applicant Name:		William Dunn		
Filer:		Eric Michael Gayan/Trisha Beachy-Bryant		
Attorney Docket Number:		MAN2241-045P		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1000

Electronic Acknowledgement Receipt	
EFS ID:	37668913
Application Number:	15789331
International Application Number:	
Confirmation Number:	2408
Title of Invention:	ELECTRONIC DISPLAY WITH COOLING
First Named Inventor/Applicant Name:	William Dunn
Customer Number:	8698
Filer:	Eric Michael Gayan/Trisha Beachy-Bryant
Filer Authorized By:	Eric Michael Gayan
Attorney Docket Number:	MAN2241-045P
Receipt Date:	06-NOV-2019
Filing Date:	20-OCT-2017
Time Stamp:	11:02:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 1000
RAM confirmation Number	E2019A6B02370645
Deposit Account	194076
Authorized User	Trisha Beachy-Bryant
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.20 (Post Issuance fees) 37 CFR 1.21 (Miscellaneous fees and charges)	

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)	Web85b.pdf	46211	no	2
			99291ef1dc4c186648b7ee1d28dc830c0b553277		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31899	no	2
			1775ce7af6e26bc1c1ba1abe155ba11b32e3c676		
Warnings:					
Information:					
Total Files Size (in bytes):			78110		
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.					



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

8698 7590 09/10/2019
STANDLEY LAW GROUP LLP
6300 Riverside Drive
Dublin, OH 43017

EXAMINER

MATEY, MICHAEL A

ART UNIT

PAPER NUMBER

2835

DATE MAILED: 09/10/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/789,331	10/20/2017	William Dunn	MAN2241-045P	2408

TITLE OF INVENTION: ELECTRONIC DISPLAY WITH COOLING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	12/10/2019

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: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

8698 7590 09/10/2019
STANDLEY LAW GROUP LLP
6300 Riverside Drive
Dublin, OH 43017

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

	(Typed or printed name)
	(Signature)
	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/789,331	10/20/2017	William Dunn	MAN2241-045P	2408

TITLE OF INVENTION: ELECTRONIC DISPLAY WITH COOLING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	12/10/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
MATEY, MICHAEL A	2835	361-688000

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 03-09 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, 1 _____
- (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. 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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

- ☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

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.

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.

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. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/789,331	10/20/2017	William Dunn	MAN2241-045P	2408
8698 7590 09/10/2019 STANDLEY LAW GROUP LLP 6300 Riverside Drive Dublin, OH 43017			EXAMINER MATEY, MICHAEL A	
			ART UNIT	PAPER NUMBER
			2835	

DATE MAILED: 09/10/2019

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.

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 30 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. 15/789,331	Applicant(s) Dunn et al.	
	Examiner MICHAEL A MATEY	Art Unit 2835	AIA (FITF) 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 08/05/19.
☐ 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 1-20. 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)	5. ☐ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/M.M/ Examiner, Art Unit 2835	/HUNG S. BUI/ Primary Examiner, Art Unit 2835
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Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Allowable Subject Matter

1. **Claims 1-20 are allowable.**

The following is an examiners statement of reasons for allowance:

Upon conclusion of a comprehensive search of the pertinent prior art, the office indicates that the claims are allowable.

Regarding independent claim 1, patentability exists, at least in part, with the claimed combination of elements and features of:

An electronic display comprising: an electronic image assembly having a front portion and a rear portion; **an open loop ambient air flow path behind the rear portion of the electronic image assembly; a closed loop gas circulation path about the electronic image assembly; a common heat exchanger located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path; a gas circulation device positioned to force circulating gas through the common heat exchanger; and an air circulation device positioned to force ambient air through the common heat exchanger.**

Regarding independent claim 8, patentability exists, at least in part, with the claimed combination of elements and features of:

An electronic display comprising: an electronic image assembly having a front portion and a rear portion; **a closed loop gas circulation path encircling the**

electronic image assembly; an open loop ambient air flow path behind the rear portion of the electronic image assembly; a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the space between the substantially planar surface and the rear portion of the electronic image assembly defining a rear channel; a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path; at least one fan positioned to force circulating gas through the closed loop gas circulation path; at least one fan positioned to force ambient air through the open loop ambient air flow path.

Regarding independent claim 17, patentability exists, at least in part, with the claimed combination of elements and features of:

A cooling system for an electronic image assembly, comprising: **an open loop ambient air flow path at a rear portion of the electronic image assembly; a closed loop gas circulation path encircling the electronic image assembly; a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path; a front channel defined by a space between a front portion of the electronic image assembly and a front display surface located forward of and spaced apart from the front portion of the electronic image assembly, the front channel forming a part of the closed loop gas circulation path; a rear channel defined by a space between the rear portion of the electronic image assembly and a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the rear channel forming a part of the open loop ambient air flow path; at least**

one fan positioned to force circulating gas through the closed loop gas circulation path and the common heat exchanger; and at least one fan positioned to force ambient air through the open loop ambient air flow path and the common heat exchanger.

2. 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."

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL A MATEY whose telephone number is (571)270-5648. The examiner can normally be reached on Monday-Friday 9AM-6PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JAYPRAKASH GANDHI can be reached on 5712723740. 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

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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.

/M. M./
Examiner, Art Unit 2835

/HUNG S. BUI/
Acting Patent Examiner, 2835/2800

Issue Classification 	Application/Control No. 15/789,331	Applicant(s)/Patent Under Reexamination Dunn et al.
	Examiner MICHAEL A MATEY	Art Unit 2835

CPC						
Symbol					Type	Version
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H05K	/	7	/	20136	I	2013-01-01
H05K	/	7	/	20163	I	2013-01-01
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CPC Combination Sets						
Symbol			Type	Set	Ranking	Version
	/		/			

/MICHAEL A MATEY/ Examiner, Art Unit 2835 (Assistant Examiner)	02 September 2019 (Date)	Total Claims Allowed: 20	
/HUNG S. BUI/ Primary Examiner, Art Unit 2835 (Primary Examiner)	02 September 2019 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 4

U.S. Patent and Trademark Office

Part of Paper No.: 20190902

Issue Classification 	Application/Control No. 15/789,331	Applicant(s)/Patent Under Reexamination Dunn et al.
	Examiner MICHAEL A MATEY	Art Unit 2835

INTERNATIONAL CLASSIFICATION			
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F28F	/	3	/ 02
F28D	/	9	/ 00
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

/MICHAEL A MATEY/ Examiner, Art Unit 2835 (Assistant Examiner)	02 September 2019 (Date)	Total Claims Allowed: 20	
/HUNG S. BUI/ Primary Examiner, Art Unit 2835 (Primary Examiner)	02 September 2019 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 4

Issue Classification 	Application/Control No. 15/789,331	Applicant(s)/Patent Under Reexamination Dunn et al.
	Examiner MICHAEL A MATEY	Art Unit 2835

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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2	2	11	11	20	20										
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/HUNG S. BUI/ Primary Examiner, Art Unit 2835 (Primary Examiner)	02 September 2019 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 4

<i>Search Notes</i> 	Application/Control No. 15/789,331	Applicant(s)/Patent Under Reexamination Dunn et al.
	Examiner MICHAEL A MATEY	Art Unit 2835

CPC - Searched*		
Symbol	Date	Examiner
H05K7/202 or G02F1/133385 or H05K7/20136 or H05K7/20163 or H05K7/20972	09/30/2018	MM

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Please see attached Inventor, Assignee East search History	09/30/2018	MM
Conducted an IP.com search	09/30/2018	MM
Please see updated IDS search	04/27/2019	MM
Please see interference search	09/02/2019	MM
Please see updated East search history	09/02/2019	MM

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	Please see East search History	09/02/2019	MM

/M.M/ Examiner, Art Unit 2835	/M.M/ Examiner, Art Unit 2835
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EAST Search History

EAST Search History (Prior Art)

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EAST Search History (I nterference)

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.: 15/789,331

Confirm. No.: 2408

Filed: 10/20/2017

Examiner: Michael A. Matey

Inventor: William Dunn; Tim Hubbard

Art Unit: 2835

Title: ELECTRONIC DISPLAY
WITH COOLING

Attorney
Docket No.: MAN2241-045P

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

FILED ELECTRONICALLY VIA EFS WEB ON 08/05/2019

RESPONSE TO FINAL OFFICE ACTION

The following amendments and remarks are in response to the final Office Action mailed on 06/03/2019. It is respectfully requested that the Examiner consider the following amendments and remarks prior to further examination of the present application.

AMENDMENTS

- **A Listing of the Claims** begins on page 3 of this Response.
- **Remarks/Arguments** begin on page 9 of this Response.

Listing of the Claims

The following listing of the claims is provided for the Examiner's convenience:

Claims:

1 (original): An electronic display comprising:

- an electronic image assembly having a front portion and a rear portion;
- an open loop ambient air flow path behind the rear portion of the electronic image assembly;
- a closed loop gas circulation path about the electronic image assembly;
- a common heat exchanger located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path;
- a gas circulation device positioned to force circulating gas through the common heat exchanger; and
- an air circulation device positioned to force ambient air through the common heat exchanger.

2 (original): The electronic display of claim 1, further comprising:

- a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly; and
- a space defined between the rear portion of the electronic image assembly and the substantially planar surface;

wherein the space is in gaseous communication with the open loop ambient air flow path.

3 (original): The electronic display of claim 2, wherein the substantially planar surface is a plate.

4 (original): The electronic display of claim 2, wherein the substantially planar surface is a portion of the heat exchanger.

5 (original): The electronic display of claim 1, further comprising:

a front display surface spaced apart from the front portion of the electronic image assembly; and

a front channel defined by the space between the front display surface and the front portion of the electronic image assembly, the front channel forming part of the closed loop gas circulation path.

6 (original): The electronic display of claim 1, further comprising at least one electronic component located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices, wiring, wiring harnesses, lights, thermo-electric devices, and switches.

7 (original): The electronic display of claim 1, further comprising a cooling device placed near an entrance to the open loop ambient air flow path for reducing the temperature of ambient air entering the open loop ambient air flow path.

8 (original): An electronic display comprising:

an electronic image assembly having a front portion and a rear portion;

a closed loop gas circulation path encircling the electronic image assembly;

an open loop ambient air flow path behind the rear portion of the electronic image assembly;

a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the space between the substantially planar surface and the rear portion of the electronic image assembly defining a rear channel;

a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;

at least one fan positioned to force circulating gas through the closed loop gas circulation path;

at least one fan positioned to force ambient air through the open loop ambient air flow path.

9 (original): The electronic display of claim 8, wherein the open loop ambient air flow path is also in gaseous communication with the rear channel.

10 (original): The electronic display of claim 8, further comprising a second open loop ambient air flow path in gaseous communication with the rear channel.

11 (original): The electronic display of claim 8, wherein:

the common heat exchanger includes first and second gas pathways, the first and second gas pathways being isolated from each other;

where the first gas pathway is in gaseous communication with the open loop ambient air flow path; and

where the second gas pathway is in gaseous communication with the closed loop gas circulation path.

12 (original): The electronic display of claim 11, wherein the first gas pathway is also in gaseous communication with the rear channel.

13 (original): The electronic display of claim 8, wherein the substantially planar surface is a plate.

14 (original): The electronic display of claim 8, wherein the substantially planar surface is a portion of the heat exchanger.

15 (original): The electronic display of claim 8, further comprising:

a front display surface spaced apart from the front portion of the electronic image assembly; and

a front channel defined by a space between the front display surface and the front portion of the electronic image assembly, the front channel forming part of the closed loop gas circulation path.

16 (original): The electronic display of claim 8, further comprising at least one electronic component located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices, wiring, wiring harnesses, lights, thermo-electric devices, and switches.

17 (original): A cooling system for an electronic image assembly, comprising:

an open loop ambient air flow path at a rear portion of the electronic image assembly;

a closed loop gas circulation path encircling the electronic image assembly;

a common heat exchanger in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path;

a front channel defined by a space between a front portion of the electronic image assembly and a front display surface located forward of and spaced apart from the front portion of the electronic image assembly, the front channel forming a part of the closed loop gas circulation path;

a rear channel defined by a space between the rear portion of the electronic image assembly and a substantially planar surface located behind and spaced apart from the rear portion of the electronic image assembly, the rear channel forming a part of the open loop ambient air flow path;

at least one fan positioned to force circulating gas through the closed loop gas circulation path and the common heat exchanger; and

at least one fan positioned to force ambient air through the open loop ambient air flow path and the common heat exchanger.

18 (original): The cooling system of claim 17, wherein the substantially planar surface is a plate.

19 (original): The cooling system of claim 17, wherein the substantially planar surface is a portion of the common heat exchanger.

20 (original): The cooling system of claim 17, further comprising at least one electronic component located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices, wiring, wiring harnesses, lights, thermo-electric devices, and switches.

REMARKS/ARGUMENTS

In the Claims:

Claims 1-20 were pending in the application as of the mailing date of the current Office Action, with all of said claims standing as rejected. Claims 1-20 remain pending in the application.

Rejection of Claims 1-20 Under 35 U.S.C. § 102

The Examiner rejected Claims 1-20 under 35 U.S.C. § 102(a)(1)¹ as being anticipated by Thielemans et al. (US 2004/0135482). The rejection is respectfully traversed.

As explained in the response to Office Action dated 01/07/2019, the rejected independent claims recite *an open loop ambient air flow path behind the rear portion of the electronic image assembly* (Claims 1 and 8) and *an open loop ambient air flow path at a rear portion of the electronic image assembly*. In addition to the open loop ambient air flow path, Independent Claim 1 also recites *a closed loop gas circulation path about the electronic image assembly*, and independent Claims 8 and 17 both recite *a closed loop gas circulation path encircling the electronic image assembly*. Consequently, all of the rejected claims of the present application recite both *an open loop ambient air flow path* and *a closed loop gas circulation path*, which work in conjunction to cool an electronic display/electronic image assembly.

¹ As noted in the previous response to Office Action dated 01/07/2019, the present application claims priority to U.S. Provisional Application No. 61/138,736, which has a pre-AIA filing date of December 18, 2008. Therefore, 35 U.S.C. § 102(a)(1) is not applicable to examination of the present application.

Furthermore, rejected independent Claim 1 recites a closed loop gas circulation path about the electronic image assembly, while rejected independent Claims 8 and 17 recite a closed loop gas circulation path encircling the electronic image assembly. Therefore, all of the rejected claims include not just an open loop ambient air flow path and a closed loop gas circulation path, but also a closed loop gas circulation path that travels about or encircles an electronic image assembly.

Thielemans et al. (hereinafter Thielemans) fails to teach or suggest the use of an open loop ambient air flow path and a closed loop gas circulation path. Thielemans also fails to teach or suggest a closed loop (or any) gas circulation path about or encircling an electronic image assembly.

As previously described, the electronic display arrangements of Thielemans, such as shown in cross-section in FIGS. 1a-1b, include an LED array (14) that is separated from associated drive circuitry (30) by some distance so that a cooling channel (34) is formed therebetween. A heat sink (22) is arranged along a rear surface of the LED array (14) so as to form one wall of the cooling channel (34). A thermal pad (24) may also be interposed between the heat sink (22) and the LED array (14). The opposite wall of the cooling channel is formed by the upper face of the drive circuitry (38). (See, e.g., ¶¶ [0047]-[0052]).

Notably, the LED array (14) is sealed from the cooling channel (34) and any air or other fluid that passes therethrough. In this regard, the LED array (14) itself is shown and described as being sealed in a package such as encapsulation (20). (See ¶ [0048], ll. 13-15; FIG. 1a-1b). And while the heat sink (22) is shown and described as including holes (26) that permit electrical connections between the LED array (14) and the drive circuitry

(30), the holes (26) are filled with electrical insulation (32) to maintain the sealed nature of the cooling channel (34). (See, e.g., ¶ [0050]; FIG. 1a-1b).

In applying the teachings of Thielemans to the rejected claims, the Examiner appears to assert that: (1) in open loop cooling according to Thielemans, the cooling fluid is discarded after passing through the cooling channel, while in the case of closed loop cooling, the cooling fluid is recirculated through a heat exchanger (OA at p. 8, § 2, ll. 8-11); (2) the cooling fluid in Thielemans “could be gas going through one part of the channel around the display and also be liquid going through another cooling channel going through the display to cool the display tiles” (*Id.* at ll. 12-14); and FIG. 1b shows both open loop cooling and closed loop cooling (*Id.* at ll. 17-22).

Applicants addressed the Examiner’s first contention above in the response of 01/07/2019 by explaining how Thielemans describes that the fluid flow through the cooling channel (34) may be an open loop of outside air forced through the channel by a fan (40), or that the air flow through the cooling channel (34) may instead be a be a closed loop of air (such as an air flow that is recirculated through a heat exchanger). It was also disclosed that Thielemans further describes other embodiments in which a liquid may be forced through the cooling channel instead of a gas, such as air.

However, regardless of whether the air flow through the cooling channel (34) is an open loop air flow, or a closed loop air flow, Thielemans still fails to teach or suggest the simultaneous presence and use of an open loop ambient air flow path and a closed loop gas circulation path as is recited in the rejected claims. The fluid flow through the cooling channel (34) in Thielemans is open loop **or** closed loop – not both.

In support of a contrary conclusion, the Examiner appears to rely on the argument in contention (3) above – that is, that FIG. 1b shows both open loop cooling and closed loop cooling. But this is simply not correct. As explained in the very portions of Thielemans cited by the Examiner, it is clear that the open loop versus closed loop distinction in Thielemans depends only on whether the cooling air is discarded after passing through the cooling channel (34) or, instead, subsequently passed through a separate heat exchanger (note that the air leaves the display device in either case) and recirculated. Therefore, the air flow through the cooling channel (34) is either open loop or closed loop, but not both as asserted by the Examiner. In this regard, it is also pointed out that Thielemans itself actually describes both FIG. 1a and FIG. 1b as illustrating *open loop* gas cooling. (See ¶ [0055] relative to FIG. 1a; see ¶ [0056] relative to FIG. 1b (“FIG. 1b shows an alternative *open loop* gas cooling arrangement.”) (emphasis added)).

The only difference between the cooling methodology shown in FIG. 1a and FIG. 1b is that the cooling channel (34) of FIG. 1b turns the air flow back toward the inlet so that the air flow exits the same side of the channel that it entered (versus entering at one end and exiting at the opposite end). But the air flow as shown is still *only* an open loop air flow, and could be *only* a closed loop air flow if recirculated through an external heat exchanger, etc. There is absolutely nothing about the flow of air (or liquid) through the display device (10) itself that would make the flow a closed loop flow.

The Examiner’s rejection of Claims 1-20 of the present application based on Thielemans also ignores that the recited closed loop gas circulation path is *about* the electronic image assembly according to Claim 1, and *encircling* the electronic image assembly in Claims 8 and 17. Whether the electronic image assembly of Thielemans is

considered to be only the LED array (14); the LED array (14) and the heat exchanger (22); the LED array (14), the heat exchanger (22) and the drive circuitry (30), or some other combination of elements, there is simply no closed loop gas circulation path *about* the electronic image assembly or *encircling* the electronic image assembly in Thielemans.

It is clear in Thielemans that all air (or liquid) circulation occurs through the cooling channel (34), or through a plurality of such cooling channels. Contrarily, the Examiner contends that the cooling fluid in Thielemans “could be gas going through one part of the channel around the display and also be liquid going through another cooling channel going through the display to cool the display tiles” (OA at p. 8, § 2, ll. 12-14).

The Examiner’s position in this regard is not understood. First, there appears to be no teaching in Thielemans that air cooling and liquid cooling can be used simultaneously or that a plurality of channels can be separated in such a manner. Also, Applicants’ attorney can find no support in Thielemans for the Examiner’s assertion that gas may go “through one part of the channel around the display.” As is quite clear from the drawing figures and the written description in Thielemans, there is no pathway between air or liquid flowing through the cooling channel (34) – or any cooling channel when a plurality of such cooling channels are provided – and the LED array (14). And no matter how the “electronic image assembly” of Thielemans is construed, it most certainly must include the LED array. Since no air or liquid may travel to the area of the display device (10) occupied by the LED array (14), there can be no closed loop gas circulation path *about* or *encircling* the electronic image assembly, as is required by the rejected claims.

In further support of this argument, it is first noted that the entire LED array (14) is shown and described to be packaged or contained in encapsulation (20). Further, the heat sink (22) wholly separates the cooling channel (34) from the LED array (14) because the only passages (i.e., electrical connection holes (26)) passing therethrough are deliberately filled with electrical insulation (32). Additional separation is also provided by the thermal pad (24) when present. Thus, there is no path via which air or liquid from the cooling channel (34) can travel *about* or *encircle* the LED array (14) – nor the electronic image assembly.

Separation of the cooling air/liquid from the electronic components of the display device (10) is an intentional design feature of the Thielemans system, as evidenced by the disclosure that “[t]he cooling channel is sealed with respect to both the array of addressable light emitting devices, and with respect to the drive circuitry for said array of light emitting devices.” (See ¶ [0012], ll. 20-23; see also ¶¶ [0023], [0029]). Thielemans further specifies that “[a]ccording to an aspect of the present invention, the cooling channel 34 is sealed from both the array 14 and the drive circuitry 30” and “[t]he cooling channel 34 is completely sealed from the drive circuitry 30, the electrical connections 28 and the array 14 of light emitting devices.” (See ¶ [0051], ll. 8-10 and ¶ [0052], ll. 1-2). Therefore, not only does Thielemans fail to teach or suggest a closed loop gas circulation path *about* or *encircling* an electronic image assembly, the design of the Thielemans device actually teaches away from such a closed loop gas (or liquid) circulation path.

With respect to Claims 5 and 15, Thielemans very clearly fails to teach or suggest a front channel defined by a space between the front display surface and the front portion of the electronic image assembly and forming part of the closed loop gas circulation path,

as is recited in said claims. As explained above, the display side of the LED array (14) is shown to be encapsulated, such as by polycarbonate or epoxy. (See, e.g., ¶¶ [0015], [0048]; FIGS. 1a-1b). Therefore, there is no space between a front display surface and a front portion of the LED array that can form a part of a closed loop gas circulation path.

From the foregoing remarks, it can be even further understood that there are significant differences between the teachings of Thielemans and the subject matter of the rejected claims. Consequently, it is submitted that Thielemans cannot support a rejection of Claims 1-20 under 35 U.S.C. § 102, and withdrawal of said rejection is accordingly requested.

CONCLUSION

The subject matter of the rejected claims has been further distinguished over the teachings of the reference cited as prior art by the Examiner.

Therefore, it is respectfully submitted that the present application is now in condition for allowance, and entry of this response and allowance of the application is earnestly requested. If, however, the Examiner maintains the stated rejections, entry of this response is respectfully requested as reducing the number of issues and placing this application in better condition for appeal.

Telephone inquiry to the undersigned in order to clarify or otherwise expedite prosecution of the present application is encouraged.

Respectfully submitted,

Date: 08/05/2019

By: /Eric M. Gayan/
Eric M. Gayan
Attorney for Applicants

Response to Office Action of: 06/03/2019
Response Dated: 08/05/2019
Title: ELECTRONIC DISPLAY WITH COOLING

App. No.: 15/789,331
Inventor: William Dunn et al.
Examiner: Michael A. Matey

Registration No. 46,103
Standley Law Group LLP
6300 Riverside Drive
Dublin, Ohio 43017
Telephone: (614) 792-5555
Facsimile: (614) 792-5536
E-mail: egayan@standleyllp.com

Electronic Acknowledgement Receipt	
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Application Number:	15789331
International Application Number:	
Confirmation Number:	2408
Title of Invention:	ELECTRONIC DISPLAY WITH COOLING
First Named Inventor/Applicant Name:	William Dunn
Customer Number:	8698
Filer:	Eric Michael Gayan
Filer Authorized By:	
Attorney Docket Number:	MAN2241-045P
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Time Stamp:	19:39:16
Application Type:	Utility under 35 USC 111(a)

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Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2nd_Response_MAN2241-045P_8-5-2019.pdf	79316	yes	16
			7cdee3ec108646ed17c72e91cfe97645ece11313		

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Response After Final Action	1	2
	Claims	3	8
	Applicant Arguments/Remarks Made in an Amendment	9	16
Warnings:			
Information:			
Total Files Size (in bytes):		79316	
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.			

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 15/789,331		Filing Date 10/20/2017		☐ 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), (l), 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 \$80 =				
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *				x \$420 =				
☐ 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										
		(Column 1)		(Column 2)		(Column 3)				
AMENDMENT	08/05/2019		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))		* 20	Minus	** 20	= 0		x \$100 =		0
	Independent (37 CFR 1.16(h))		* 3	Minus	*** 3	= 0		x \$460 =		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			CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))		*	Minus	**	=		x \$0 =		
	Independent (37 CFR 1.16(h))		*	Minus	***	=		x \$0 =		
	☐ 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.								LIE		
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".								/AMANDA N FORD/		
*** 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.										

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.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/789,331	10/20/2017	William Dunn	MAN2241-045P	2408
8698	7590	06/03/2019		
STANDLEY LAW GROUP LLP			EXAMINER	
6300 Riverside Drive			MATEY, MICHAEL A	
Dublin, OH 43017				
			ART UNIT	PAPER NUMBER
			2835	
			NOTIFICATION DATE	DELIVERY MODE
			06/03/2019	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):

standleydocketing@standleyllp.com

Office Action Summary	Application No. 15/789,331	Applicant(s) Dunn et al.	
	Examiner MICHAEL A MATEY	Art Unit 2835	AIA (FITF) 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 01/07/19.
☐ 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) 1-20 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) 1-20 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 10/20/17 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: ____.

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. In the event that 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.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale or otherwise available to the public before the effective filing date of the claimed invention.

Claim(s) 1-20 is/are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Thielemans et al. US2004/0135482.

Per claim 1 Thielemans et al. teaches an electronic display (10, see fig.1a-1b) comprising: an electronic image assembly ((12, 28), (22, 24) & 30, see fig.1a-1b) having a front portion (22 & 24, see fig.1b) and a rear portion (30); an open loop ambient air flow path ((42, 44) & 34) behind the rear portion (see fig.1b, “38 is the behind portion”) of the electronic image assembly ([0051]-[0053] & [0056]); a closed loop gas circulation

path (22 & 34; [0051] & [0052], line 7-9) about the electronic image assembly ([0051]-[0053] & [0054]); a common heat exchanger (22) located in the pathway of both the closed loop gas circulation path and the open loop ambient air flow path ([0051]-[0053]); a gas circulation device positioned to force circulating gas through the common heat exchanger ([0053]); and an air circulation device positioned to force ambient air through the common heat exchanger ([0055]).

Per claim 2 Thielemans et al. teaches the electronic display of claim 1, further comprising: a substantially planar surface (36, “the heat exchange face of the heat sink”) located behind and spaced apart from the rear portion (38) of the electronic image assembly (see fig.1b; [0051]); and a space (34) defined between the rear portion of the electronic image assembly and the substantially planar surface; wherein the space is in gaseous communication with the open loop ambient air flow path ([0051]-[0053] & [0056]).

Per claim 3 Thielemans et al. teaches the electronic display of claim 2, wherein the substantially planar surface is a plate ([0049], “heat transporting plate”).

Per claim 4 Thielemans et al. teaches the electronic display of claim 2, wherein the substantially planar surface is a portion of the heat exchanger ([0049] & [0051]).

Per claim 5 Thielemans et al. teaches the electronic display of claim 1, further comprising: a front display surface (16) spaced apart from the front portion (22 & 24) of the electronic image assembly (see fig.1b); and a front channel (20) defined by the space between the front display surface and the front portion of the electronic image assembly, the front channel forming part of the closed loop gas circulation path ([0049], “discloses a heat sink/heat exchanger and its properties”) [0052], “discloses a closed

loop cooling... preferably being cooled between cycles by for example a heat exchange/heat sink” & [0054], “discloses the properties of a closed loop cooling arrangement).

Per claim 6 Thielemans et al. teaches the electronic display of claim 1, further comprising at least one electronic component ([0051], “LED”) located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices ([0014], LED), wiring, wiring harnesses, lights, thermo-electric devices, and switches.

Per claim 7 Thielemans et al. teaches the electronic display of claim 1, further comprising a cooling device (40) placed near an entrance (42) to the open loop ambient air flow path for reducing the temperature of ambient air entering the open loop ambient air flow path ([0044]).

Per claim 8 Thielemans et al. teaches an electronic display (10, see fig.1a-1b) comprising: an electronic image assembly ((12, 28), (22, 24) & 30, see fig.1a-1b) having a front portion (22, see fig.1b) and a rear portion (30); a closed loop gas circulation path (22 & 34; [0051] & [0052], line 7-9) encircling the electronic image assembly ([0051]-[0053] & [0054]); an open loop ambient air flow path ((42, 44) & 34) behind the rear portion (see fig.1b, “38 is the behind portion”) of the electronic image assembly ([0051]-[0053] & [0056]); a substantially planar surface (36, “the heat exchange face of the heat sink”) located behind and spaced apart from the rear portion of the electronic image assembly (See fig.1b), the space between the substantially planar surface (36) and the rear portion (38) of the electronic image assembly defining a rear channel (34); a

common heat exchanger (22) in gaseous communication with both the closed loop gas circulation path and the open loop ambient air flow path (see fig.1b); at least one fan (40) positioned to force circulating gas through the closed loop gas circulation path; at least one fan positioned to force ambient air through the open loop ambient air flow path ([0055]).

Per claim 9 Thielemans et al. teaches the electronic display of claim 8, wherein the open loop ambient air flow path is also in gaseous communication with the rear channel ([0051]-[0053]).

Per claim 10 Thielemans et al. teaches the electronic display of claim 8, further comprising a second open loop ambient air flow path in gaseous communication with the rear channel ([0056], see fig.1b).

Per claim 11 Thielemans et al. teaches the electronic display of claim 8, wherein: the common heat exchanger includes first and second gas pathways (see fig.1b), the first and second gas pathways being isolated from each other; where the first gas pathway is in gaseous communication with the open loop ambient air flow path (see fig.1b, bottom portion of 34"); and where the second gas pathway is in gaseous communication with the closed loop gas circulation path (see fig.1b, "top portion of 34").

Per claim 12 Thielemans et al. teaches the electronic display of claim 11, wherein the first gas pathway is also in gaseous communication with the rear channel (see fig.1b).

Per claim 13 Thielemans et al. teaches the electronic display of claim 8, wherein the substantially planar surface is a plate ([0049], "heat transporting plate").

Per claim 14 Thielemans et al. teaches the electronic display of claim 8, wherein the substantially planar surface is a portion of the heat exchanger ([0049] & [0051]).

Per claim 15 Thielemans et al. teaches the electronic display of claim 8, further comprising: a front display surface (16) spaced apart from the front portion (22 & 24) of the electronic image assembly; and a front channel (20) defined by a space between the front display surface and the front portion of the electronic image assembly, the front channel forming part of the closed loop gas circulation path ([0049], “discloses a heat sink/heat exchanger and its properties”) [0052], “discloses a closed loop cooling... preferably being cooled between cycles by for example a heat exchange/heat sink” & [0054], “discloses the properties of a closed loop cooling arrangement).

Per claim 16 Thielemans et al. teaches the electronic display of claim 8, further comprising at least one electronic component ([0051], “LED”) located in the pathway of the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices ([0014], LED), wiring, wiring harnesses, lights, thermo-electric devices, and switches.

Per claim 17 Thielemans et al. teaches a cooling system for an electronic image assembly ((12, 28), (22, 24) & 30, see fig.1a-1b; [0001]), comprising: an open loop ambient air flow path ((42, 44) & 34) at a rear portion (see fig.1b, “38 is the behind portion”) of the electronic image assembly ([0051]-[0053] & [0056]); a closed loop gas circulation path (22 & 34; [0051] & [0052], line 7-9) encircling the electronic image assembly ([0051]-[0053] & [0054]); a common heat exchanger (22) in gaseous communication with both the closed loop gas circulation path and the open loop

ambient air flow path ([0051]-[0053]); a front channel (20) defined by a space between a front portion (22 & 24) of the electronic image assembly and a front display surface (16) located forward of and spaced apart from the front portion of the electronic image assembly (see fig.1b), the front channel forming a part of the closed loop gas circulation path ([0049], “discloses a heat sink/heat exchanger and its properties”) [0052], “discloses a closed loop cooling... preferably being cooled between cycles by for example a heat exchange/heat sink” & [0054], “discloses the properties of a closed loop cooling arrangement); a rear channel (34) defined by a space between the rear portion (see fig.1b, “38”) of the electronic image assembly and a substantially planar surface (36, “the heat exchange face of the heat sink”) located behind and spaced apart from the rear portion of the electronic image assembly (see fig.1b), the rear channel forming a part of the open loop ambient air flow path (see fig.1b); at least one fan (40) positioned to force circulating gas through the closed loop gas circulation path (22 & 34, see fig.1b) and the common heat exchanger (22); and at least one fan (40) positioned to force ambient air through the open loop ambient air flow path ((42, 44) & 34) and the common heat exchanger ([0055]).

Per claim 18 Thielemans et al. teaches the cooling system of claim 17, wherein the substantially planar surface is a plate ([0049], “heat transporting plate”).

Per claim 19 Thielemans et al. teaches the cooling system of claim 17, wherein the substantially planar surface is a portion of the common heat exchanger ([0049] & [0051]).

Per claim 20 Thielemans et al. teaches the cooling system of claim 17, further comprising at least one electronic component ([0051], “LED”) located in the pathway of

the closed loop gas circulation path, the at least one electronic component selected from the group consisting of transformers, circuit boards, resistors, capacitors, batteries, power modules, motors, inductors, illumination devices ([0014], LED), wiring, wiring harnesses, lights, thermo-electric devices, and switches.

Response to Arguments

2. Applicant's arguments filed 01/07/19 have been fully considered but they are not persuasive.

Examiner asserts that Thielemans et al. US2004/0135482 discloses in paragraph [0017], "said cooling fluid may comprise a gas or may comprise a liquid... one or more cooling channels..." [0018], "Each cooling channel may discharge the fluid separately, for instance. Alternatively, the cooling may be provided by forcing a cooling fluid through several or all of the display tiles, some of which are connected in series to form a cooling circuit..." , paragraph [0052], "... In the case of open loop cooling, the cooling fluid is discarded after passing along the cooling channel 34. In closed loop cooling, the cooling liquid is recycled, preferably being cooled between cycles by for example a heat exchanger."

Examiner asserts that from the above paragraph's the cooling fluid could be gas going through one part of the channel around the display and also be liquid going through another cooling channel going through the display to cool the display tiles.

Examiner further asserts that a closed loop cooling as disclosed above is a recycled cooling liquid cooled between cycles by for example a heat exchanger, thus fig.1b shows a closed loop cooling, with the cooling liquid or ambient air entering the flat panel display device, which is then cooled by the heat sink (heat exchanger) about the

electronic image assembly. The cooled air is forced out by a fan, which creates the open loop cooling. The figure is shown to have the ambient air recycling through the inlet 42 and outlet 44, which creates the closed loop with 22 and the open loop via 42 & 44.

Email Communication

3. Applicant is encouraged to authorize the Examiner to communicate via email by filing form PTO/SB/439 either via USPS, Central Fax, or EFS-Web. See MPEP 502.01, 502, 502.05.

Conclusion

4. **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 MICHAEL A MATEY whose telephone number is

(571)270-5648. The examiner can normally be reached on Monday-Friday 9AM-6PM EST.

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, JAYPRAKASH GANDHI can be reached on 5712723740. 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.

/M.M/
Examiner, Art Unit 2835

/JAMES WU/
Primary Examiner, Art Unit 2835

<i>Search Notes</i> 	Application/Control No. 15/789,331	Applicant(s)/Patent Under Reexamination Dunn et al.
	Examiner MICHAEL A MATEY	Art Unit 2835

CPC - Searched*		
Symbol	Date	Examiner
H05K7/202 or G02F1/133385 or H05K7/20136 or H05K7/20163 or H05K7/20972	09/30/2018	MM

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Please see attached Inventor, Assignee East search History	09/30/2018	MM
Conducted an IP.com search	09/30/2018	MM
Please see updated IDS search	04/27/2019	MM

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/M.M/ Examiner, Art Unit 2835	/M.M/ Examiner, Art Unit 2835
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<i>Index of Claims</i> 	Application/Control No. 15/789,331	Applicant(s)/Patent Under Reexamination Dunn et al.
	Examiner MICHAEL A MATEY	Art Unit 2835

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	09/30/2018	04/27/2019							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							
	19	✓	✓							
	20	✓	✓							

Receipt date: 12/11/2018

15/789,331 - GAU: 2835

Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031

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

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15789331
	Filing Date	2017-10-20
	First Named Inventor	William Dunn
	Art Unit	2835
	Examiner Name	Michael A Matey
	Attorney Docket Number	MAN2241-045P

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	8590602	B2	2013-11-26	Fernandez	
	2	6043979	A	2000-03-28	Shim	
	3	6742583	B2	2004-06-01	Tikka	

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	1	20090302727	A1	2009-12-10	Vincent et al.	
	2	20090009047	A1	2009-01-08	Yanagawa et al.	
	3	20090122218	A1	2009-05-14	Oh et al.	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

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Art Unit	2835
Examiner Name	Michael A Matey
Attorney Docket Number	MAN2241-045P

4	20120188481	A1	2012-07-26	Kang et al.
5	20070081344	A1	2007-04-12	Cappaert et al.
6	20110085302	A1	2011-04-14	Nakamichi et al.

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	1	JP2010-102227	JP	A	2010-05-06	Kita Denshi Corp		×
	2	JP2011-75819	JP	A	2011-04-14	Sanyo Electric Co		☒
	3	JP2012-133254	JP	A	2012-07-12	Sanyo Electric Co		☒
	4	JP2004286940	JP	A	2004-10-14	Hitachi Ie Systems Co Ltd.		☒

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(Not for submission under 37 CFR 1.99)

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Examiner Name	Michael A Matey
Attorney Docket Number	MAN2241-045P

1	CIVIQ SMARTSCAPES, LLC V. MANUFACTURING RESOURCES INTERNATIONAL, INC., Memorandum Opinion re claim construction, September 27, 2018, 16 pages
2	CIVIQ SMARTSCAPES, LLC V. MANUFACTURING RESOURCES INTERNATIONAL, INC., Claim Construction Order, October 3, 2018, 2 pages
3	ANANDAN, MUNISMAY, Progress of LED backlights for LCDs, 2008, 24 pages

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EXAMINER SIGNATURE

Examiner Signature	/MICHAEL A MATEY/	Date Considered	04/27/2019
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¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

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	Art Unit	2835
	Examiner Name	Michael A Matey
	Attorney Docket Number	MAN2241-045P

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Eric M. Gayan/	Date (YYYY-MM-DD)	2018-12-11
Name/Print	Eric M. Gayan	Registration Number	46103

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.M/

Receipt date: 05/02/2019

15/789,331 - GAU: 2835

Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15789331
	Filing Date	2017-10-20
	First Named Inventor	William Dunn
	Art Unit	2835
	Examiner Name	Michael A. Mately
	Attorney Docket Number	MAN2241-045P

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	1	6476883	B1	2002-11-05	Salimes et al.	
	2	7762707	B2	2010-07-27	Kim et al.	

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	1	20050127796	A1	2005-06-16	Olesen et al.	
	2	20040042174	A1	2004-03-04	Tomioka et al.	
	3	20090231807	A1	2009-09-17	Bouissier	

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	Filing Date		2017-10-20	
	First Named Inventor	William Dunn		
	Art Unit	2835		
	Examiner Name	Michael A. Matey		
	Attorney Docket Number	MAN2241-045P		

1	KR20000000118	KR	U	2000-01-15	Samsung Electronics Co., Ltd.	×
2	KR20000047899	KR	A	2000-07-25	Sony Corp.	☒

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	Art Unit	2835
	Examiner Name	Michael A. Mately
	Attorney Docket Number	MAN2241-045P

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See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Eric M. Gayan/	Date (YYYY-MM-DD)	2019-05-02
Name/Print	Eric M. Gayan	Registration Number	46103

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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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.M/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
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EAST Search History

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Doc code: IDS

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Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15789331
	Filing Date	2017-10-20
	First Named Inventor	William Dunn
	Art Unit	2835
	Examiner Name	Michael A. Mately
	Attorney Docket Number	MAN2241-045P

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	1	20050127796	A1	2005-06-16	Olesen et al.			
	2	20040042174	A1	2004-03-04	Tomioka et al.			
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15789331	
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	Attorney Docket Number	MAN2241-045P		

1	KR20000000118	KR	U	2000-01-15	Samsung Electronics Co., Ltd.	×
2	KR20000047899	KR	A	2000-07-25	Sony Corp.	☒

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15789331
	Filing Date	2017-10-20
	First Named Inventor	William Dunn
	Art Unit	2835
	Examiner Name	Michael A. Mately
	Attorney Docket Number	MAN2241-045P

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Eric M. Gayan/	Date (YYYY-MM-DD)	2019-05-02
Name/Print	Eric M. Gayan	Registration Number	46103

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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.



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Bibliographic data: KR200000047899 (A) — 2000-07-25

COOLING DEVICE, COOLING METHOD AND ELECTRONIC APPARATUS

Inventor(s): MIZOGUCHI MOTOSHI [JP]; HOKAO SHIGEYUKI [JP]; NAKAI YASUHIRO [JP]; OZAKI YUZO [JP]; SONEHARA TAKASHI [JP] ± (MIZOGUCHI MOTOSHI, ; HOKAO SHIGEYUKI, ; NAKAI YASUHIRO, ; OZAKI YUZO, ; SONEHARA TAKASHI)

Applicant(s): SONY CORP ± (SONY CORPORATION)

Classification: - **international:** G06F1/20; (IPC1-7): G06F1/20
- **cooperative:** G06F1/203

Application number: KR19990054783 19991203 Global Dossier

Priority number(s): JP19980345847 19981204 ; JP19980345849 19981204

Also published as: AT260483 (T) CN1258032 (A) DE69915010 (T2)
EP1006426 (A2) EP1006426 (A3) EP1006426 (B1)
KR100702344 (B1) TW558937 (B) US2002012228 (A1)
US6437978 (B1) US6599090 (B2) less

Abstract of KR200000047899 (A)

PURPOSE: A cooling device, a cooling method and an electronic apparatus are provided to be capable of easily discharging air in a main body of an electronic apparatus of even a miniature type in which a gap between an air inlet of the cooling device and the inner wall of the main body is narrow, a cooling method therefor, and an electronic apparatus having a main body to be cooled by the cooling device, and discharging air even in a space, opposite to an air inlet of the cooling device, in a main body of an electronic apparatus. **CONSTITUTION:** An electronic apparatus includes a main body having a movable bottom surface portion and a display unit openable/closeable relative to the main body. In one arrangement the cooling device includes means for transmitting an opening/closing angle of the display unit, and means for driving the movable bottom surface portion in accordance with the opening/closing angle of the display unit transmitted by the transmission means, to enlarge the inner space of the main body, thereby cooling the interior of the main body. In another arrangement the cooling device includes means for sucking a first gas, means for discharging the first gas sucked by the sucking means, and means for sucking and discharging a second gas by the action of the first gas discharged by the discharging means.

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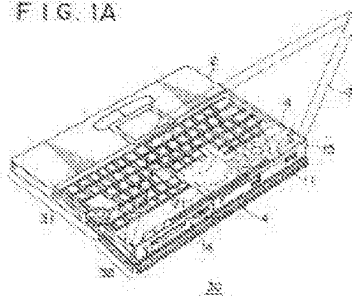


FIG. 1B

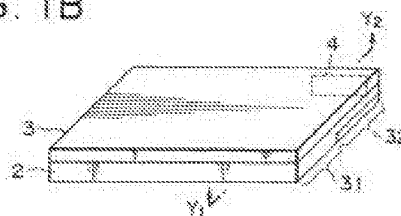
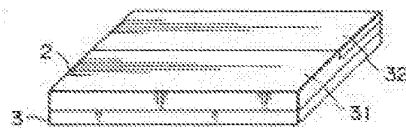


FIG. 1C



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(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(51) Int. Cl.⁶
G06F 1/20

(11) 공개번호 특2000-0047899
(43) 공개일자 2000년07월25일

(21) 출원번호	10-1999-0054783
(22) 출원일자	1999년12월03일
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(71) 출원인	소니 가부시키 가이샤 이데이 노부유키
(72) 발명자	일본국 도쿄도 시나가와쿠 키타시나가와 6초메 7반 35고 오자키유조 일본도쿄도시나가와쿠키타시나가와6초메7반35고소니가부시키가이샤내 나카이야스히로 일본아이치켄누카타군오아자사카자키아자스즈메가이리1소니코다가부시키가이 샤내 소네하라타카시 일본나가노켄아즈미군토요시나쵸오아자토요시나5432소니디지털프로덕츠가부 시키가이샤내 호카오시게유키 일본도쿄도시나가와쿠키타시나가와6초메7반35고소니가부시키가이샤내 미조구치모토시 일본도쿄도시나가와쿠키타시나가와6초메7반35고소니가부시키가이샤내
(74) 대리인	이병호

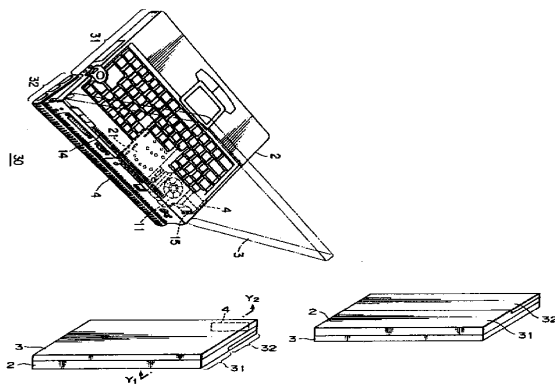
실시예 : 2

(54) 냉각 장치, 냉각 방법 및, 전자 기기

요약

전자 기기의 본체 내부를 냉각시키기 위한 냉각 장치를 제공한다. 전자 기기는 가동 바닥면부를 갖는 본체와 이 본체에 대해 개폐될수 있는 디스플레이 유닛을 구비한다. 상기 냉각 장치는 디스플레이 유닛의 개폐 각도를 전송하기 위한 수단과, 전송 수단에 의해 전송된 상기 디스플레이 유닛의 개폐 각도에 따라 가동 바닥면부를 구동시켜 본체의 내부 공간을 확장시키고 그로 인해 본체의 내부를 냉각시키는 구동 수단을 포함하는 것을 특징으로 한다. 제 1 가스를 흡입하는 흡입 수단과, 상기 흡입 수단으로부터 흡입된 제 1 가스를 방출하는 방출 수단 및, 상기 방출 수단에 의해 방출된 제 1 가스의 작용에 의해 제 2 가스를 흡입 및 방출하는 수단을 포함하는 다른 냉각 장치도 개시되어 있다.

도면



개요

가동 바닥면부, 본체, 디스플레이 유닛, 개폐 각도, 전송 수단

본체

본체 상면도

도 1a 는 본 발명이 적용되는 개인용 컴퓨터의 외관을 도시하는 사시도로서, 상기 개인용 컴퓨터로부터 디스플레이 유닛이 제거되어 있는 상태의 도면이고, 도 1b 와 도 1c 는 본체상에서 디스플레이 유닛이 폐쇄된 상태를 도시하는 개인용 컴퓨터의 외관을 도시하는 사시도.

도 2a 는 도 1b 의 $Y_1 - Y_2$ 선상에서 취한 단면도이며, 도 2b 는 냉각 유닛의 장착 상태를 도시하는 도면.

도 3a 는 디스플레이가 본체로부터 개방되어 있고 개방가능한 바닥면부가 개방되어 있는 상태에서의 개인용 컴퓨터의 외관을 도시하는 사시도이며, 도 3b 내지 도 3d 는 개방가능한 바닥면부의 작용을 도시하는 도면.

도 4 는 개방가능한 바닥면부가 개방된 상태로 개인용 컴퓨터가 사용자의 무릎위에 놓여있는 상태를 도시하는 도면.

도 5a 는 도 3b 의 $P_1 - P_2$ 선상에서 취한 단면도이고, 도 5b 와 도 5c 는 본체의 내부를 냉각시키는 작용을 도시하는 도면.

도 6 은 본체상으로 디스플레이가 폐쇄된 상태를 도시하는 개인용 컴퓨터의 우측면도.

도 7 은 도 6 에 도시된 범위 A의 확대 도시도.

도 8 은 디스플레이 유닛이 대략 15° 각도로 개방되는 상태를 도시하는 개인용 컴퓨터의 다른 우측면도.

도 9 는 도 8 에 도시된 범위 A의 확대 도시도.

도 10 은 디스플레이 유닛이 대략 90° 각도로 개방되는 상태를 도시하는 개인용 컴퓨터의 또 다른 우측면도.

도 11 은 도 10 에 도시된 범위 A의 확대 도시도.

도 12 는 릴리스 버튼이 사용자에게 의해 안쪽으로 눌러진 상태를 도시하는 개인용 컴퓨터의 또 다른 우측면도.

도 13 은 개방가능한 바닥면부가 상향 이동된 상태를 도시하는 개인용 컴퓨터의 또 다른 우측면도.

도 14 는 개방가능한 바닥면부가 폐쇄된 상태를 도시하는 개인용 컴퓨터의 또 다른 우측면도.

도 15 는 냉각 기구를 갖는 도킹 스테이션의 도시도.

도 16a 및 도 16b 는 냉각 기구를 갖는 다른 도킹 스테이션의 도시도.

도 17a 및 도 17b 는 본 발명이 적용되는 냉각 유닛의 외관을 도시하는 도면.

도 18 은 개인용 컴퓨터의 본체에 장착되는, 도 17a 와 도 17b 에 도시된 냉각 유닛의 단면도.

도 19 는 본체내에 공기 유입구가 제공된 개인용 컴퓨터의 도시도.

도 20 은 도 19 에 도시된 개인용 컴퓨터의 본체에 장착되는, 도 17a 와 도 17b 에 도시된 냉각 유닛의 단면도.

도 21 은 편평 핀이 장착되는 도 17a 및 도 17b 에 도시된 냉각 유닛의 도시도.

도 22 는 공기 유입구가 측면에 제공되어 있는, 도 17a 및 도 17b 에 도시된 냉각 유닛의 도시도.

도 23 은 종래의 개인용 컴퓨터의 외관을 도시하는 도면.

도 24 는 종래의 냉각 유닛의 외관을 도시하는 도면.

도 25a 및 도 25b 는 각각 도 24 에 도시된 냉각 유닛의 정면도 및 배면도.

도 26 은 도 23 에 도시된 개인용 컴퓨터의 $X_1 - X_2$ 선상에서 취한 단면도.

* 도면의 주요 부분에 대한 부호의 설명 *

2 : 본체 3 : 디스플레이 유닛

11 : 냉각 유닛 30 : 개인용 컴퓨터

31,32 : 바닥면부 62 : 캠

본체 하면도

발명의 효과

발명이 속하는 기술분야 및 그 분야의 종래기술

본 발명은 냉각 장치와, 이 냉각 장치를 냉각하는 방법 및, 상기 냉각 장치에 의해 냉각될 전자 기기에 관한 것으로, 특히 전자 기기의 본체 내부 전체를 냉각하기 위한 냉각 장치와, 이를 냉각하기 위한 방법 및, 상기 냉각장치에 의해 냉각될 본체를 갖는 전자 기기에 관한 것이다.

도 23 은 본체(2)와 디스플레이 유닛(3)을 구비한 종래의 개인용 컴퓨터(personal computer:PC)(1)를 도시한다. 상기 본체(2)는 예를 들어 CPU 및 비디오칩과 같이 보드상에 장착되어 그 작동중에 열을 발생시키는 디바이스들을 구비한다. 전체 본체(2)의 온도 상승을 억제하기 위하여 본체(2)는 일반적으로 본체(2)의 윗면에 배치되는 공기 유출구(4)를 구비하며, 또한 도 24 에 도시된 냉각 유닛(11)을 포함한다. 상기 디바이스에서 발생된 열에 의해 뜨거워지는 본체(2)내의 공기는 냉각 유닛(11)에 의해 공기 유출구(4)를 통하여 외부로 배출된다.

도 24에 도시된 냉각 유닛(11)은 팬(13)이 내장되는 하우징(12)을 구비한다. 하우징(12)의 윗면에는 팬(13)의 회전에 의해 외부 공기를 흡입하는 공기 유입구(14)가 제공되고, 하우징(12)의 한 측면에는 공기 유입구(14)로부터 흡입된 공기가 배출되는 공기 유출구(15)가 제공된다.

도 25a 와 25b 는 냉각 유닛(11)의 정면도 및 배면도이다.

도 26 은 도 23 에 도시된 개인용 컴퓨터(1)의 $X_1 - X_2$ 선상에서 취한 단면도이다. 도 26 과 관련하여 냉각 유닛(11)의 하우징(12)은 열 파이프와 같은 열 전도체(22)를 통하여, CPU 및 비디오 칩과 같은 디바이스가 장착되는 보드(21)에 연결된다. 상기 냉각 유닛(11)은 공기 유출구(15)가 본체(2)의 공기 유출구(4)에 정렬되는 방식으로 장착된다.

냉각 유닛(11)의 제 1 냉각 작용을 후술한다. 상기 디바이스들로부터 발생된 열은 하우징(12)내의 공기를 뜨겁게 하기 위해 보드(21) 및 열 전도체(22)를 통하여 냉각 유닛(11)의 하우징(12)에 전달된다. 냉각 유닛(11)의 팬(13)이 회전하여 공기 유입구(14)로부터 외부 공기를 흡입하고 이를 공기 유출구(15)를 통하여 배출하므로, 하우징(12) 내에서 더워진 공기는 냉각 유닛(11)의 공기 유출구(15) 및 본체(2)의 공기 유출구(4)를 통하여 외부로 배출된다. 이런 식으로, 열 소스와 같은 디바이스 또는 이들 디바이스가 장착되는 보드(21)는, 보드(21)및 열 전도체(22)를 통해 전달된 열에 의해 더워진 하우징(12)내 공기를 배출함으로써 냉각된다.

냉각 유닛(11)의 제 2 냉각 작용에 대해 후술한다. 디바이스 또는 보드로부터의 열은 또한 공간(F)내의 공기를 뜨겁게 하여 공간(F)내의 공기 온도를 증대시킨다. 공간(F)내의 뜨거워진 공기는 공기 유입구(14)로부터 냉각 유닛(11)에 흡입되고, 냉각 유닛(11)의 팬(13)의 회전에 의해 냉각 유닛(11)으로부터 외부로 공기 유출구(15,4)를 통해 배출된다. 이런 식으로, 공간(F)은 공간(F)내의 뜨거워진 공기를 배출하므로 냉각된다. 냉각 유닛(11)의 공기 유입구(14)와 본체(2)의 내벽 사이의 갭이 넓어지면, 공간(G)이 제 2 냉각 작용에 따라 유사하게 냉각된다.

발명이 이루고자 하는 기술적 과제

전체 본체(2)의 온도 상승은 전술했듯이 본체(2)내의 각 부분을 냉각시키므로써 억제된다.

그러나, 개인용 컴퓨터(1)의 소형화와 더불어 본체(2)는 점점 두께가 얇아지고 있고 보다 정확히 말하면 본체(2)의 높이가 점점 낮아지고 있다. 따라서, 냉각 유닛(11)의 공기 유입구(14)와 본체(2)의 내벽 사이의 갭이 점점 좁아지고 있다. 이에 따르면, 갭 또는 공기 유동 통로의 공기 저항이 높아져서 공기가 갭 내를 원활하게 유동하지 못하게 되고 결과적으로 공기 유입구(14)로부터 냉각 유닛(11)의 공기를 흡입하는 것으로는 본체(2)의 온도 상승을 충분히 억제하기에 불충분하다는 문제를 야기한다.

본체(2)내의 공기가 높은 공기 저항을 갖는 공기 유동 통로를 통하여 공기 유입구(14)로부터 냉각 유닛(11)내로 흡입될수 있도록 하려면, 냉각 유닛(11)의 크기를 크게 할 필요가 있다. 이에 따르면 본체(2)의 크기를 소형화하기가 곤란하다는 문제가 생긴다.

종래의 냉각 유닛(11)에 따르면, 디바이스로부터 발생된 열에 의해 뜨거워지는 공기 유입구(24)와 대향하는 공간(G)내의 공기는 공기 유입구(24)로부터 냉각 유닛(11)내로 덜 흡입되고, 따라서 공간(G)내의 뜨거워진 공기는 외부로 충분히 배출될 수 없다. 따라서, 전체 본체(2)의 온도 상승을 충분히 억제하기 곤란하다는 문제가 떠오른다.

발명의 구성

본 발명의 제 1 목적은 냉각 장치의 공기 유입구와 본체의 내벽 사이의 갭이 좁은 소형 타입의 전자 기기의 본체 내의 공기를 쉽게 배출할수 있는 냉각 장치와, 이를 위한 냉각 방법 및, 상기 냉각 장치에 의해 냉각될 본체를 갖는 전자 기기를 제공하는 것이다.

본 발명의 제 2 목적은, 전자 기기의 본체내에서 그 공기 유입구와 대향하는 공간내의 공기를 배출할수 있는 냉각 장치와, 이를 위한 냉각 방법 및, 상기 냉각 장치에 의해 냉각될 본체를 갖는 전자 기기를 제공하는 것이다.

상기 제 1 목적을 달성하기 위하여, 본 발명에 따르면, 가동 바닥면부를 갖는 본체와 이 본체에 대하여 개폐 가능한 디스플레이 유닛을 구비한 전자 기기의 본체의 내부를 냉각하기 위한 냉각 장치로서, 상기 디스플레이 유닛의 개폐 각도를 전술하기 위한 전술 수단과, 상기 전술 수단에 의해 전술된 디스플레이 유닛의 개폐 각도에 따라 상기 본체의 내부 공간이 확장되도록 상기 가동 바닥면부를 구동하여 상기 본체의 내부를 냉각하는 수단을 포함하는 냉각 장치가 제공된다.

상기 제 1 목적을 달성하기 위하여, 본 발명에 따르면, 가동 바닥면부를 갖는 본체와 이 본체에 대하여 개폐가능한 디스플레이 유닛을 구비하는 전자 기기의 본체의 내부를 냉각하기 위한 냉각 방법으로서, 상기 디스플레이 유닛의 개폐 각도를 전송하는 단계와, 상기 전송 단계에서 전송된 디스플레이 유닛의 개폐 각도에 따라 상기 본체의 내부 공간이 확장되도록 상기 가동 바닥면부를 구동하여 본체의 내부를 냉각하는 단계를 포함하는 냉각 방법이 제공된다.

상기 제 1 목적을 달성하기 위하여, 본 발명에 따르면, 가동 바닥면부를 갖는 본체와 이 본체에 대하여 개폐 가능한 디스플레이 유닛을 구비한 전자 기기로서, 상기 디스플레이 유닛의 개폐 각도를 전송하기 위한 전송 수단과, 상기 전송 수단에 의해 전송된 디스플레이 유닛의 개폐 각도에 따라 상기 본체의 내부 공간이 확장되도록 상기 가동 바닥면부를 구동하여 상기 본체의 내부를 냉각하는 수단을 포함하는 전자 기기가 제공된다.

상기 형태의 냉각 장치와 냉각 방법에 의하면, 가동 바닥면부가 상기 디스플레이 유닛의 전송된 개폐 각도에 따라 본체의 내부 공간을 확장하도록 구동되므로, 본체의 내부를 충분히 냉각할 수 있다.

상기 형태의 전자 기기에 의하면, 가동 바닥면부가 디스플레이 유닛의 전송된 개폐 각도에 따라 본체의 내부 공간을 확장하도록 구동되어 본체의 내부를 냉각하므로, 본체의 내부 공간을 효율적으로 이용할 수 있다.

상기 제 2 목적을 달성하기 위하여, 본 발명에 따르면, 제 1 가스를 흡입하기 위한 수단과, 상기 흡입 수단에 의해 흡입된 제 1 가스를 배출하기 위한 배출 수단 및, 상기 배출 수단에 의해 배출된 제 1 가스의 작용에 의해 제 2 가스를 흡입 및 배출하기 위한 수단을 포함하는 냉각 장치가 제공된다.

상기 제 2 목적을 달성하기 위하여, 본 발명에 따르면, 제 1 가스를 흡입하는 단계와, 상기 흡입 단계에서 흡입된 제 1 가스를 배출하는 단계와, 상기 배출 단계에서 배출된 제 1 가스의 작용에 의해 제 2 가스를 흡입 및 배출하는 단계를 포함하는 냉각 방법이 제공된다.

상기 제 2 목적을 달성하기 위하여, 본 발명에 따르면, 제 1 가스를 흡입하는 수단과, 상기 흡입 수단에 의해 흡입된 제 1 가스를 배출하는 수단 및, 상기 배출 수단에 의해 배출된 제 1 가스의 작용에 의해서 제 2 가스를 흡입 및 배출하기 위한 수단을 포함하는 전자 기기가 제공된다.

상기 형태의 냉각 장치 및 냉각 방법에 의하면, 제 1 가스가 흡입 및 배출되고 제 2 가스가 배출된 제 1 가스의 작용에 의해서 흡입되므로, 냉각 장치 주위의 전체 공간을 냉각시킬 수 있다.

상기 형태의 전자 기기에 의하면, 제 1 가스가 흡입 수단에 의해서 흡입되어 배출 수단에 의해서 배출되고 제 2 가스가 상기 배출된 제 1 가스의 작용을 이용하는 흡입 및 배출 수단에 의해서 흡입되므로, 전자 기기의 전체 내부를 냉각시킬 수 있다.

본 발명의 실시예를 기술하기 이전에, 실시예에 나타나는 부분들과 청구범위에 기술된 발명의 수단 사이의 대응을 명료히 하기 위하여, 수단 위에 괄호로 표시된 수단에 대응하는 부분으로 본 발명의 특징을 기술하기로 한다. 그러나, 이렇게 괄호로 표기한 부분의 기재는 단지 예시적인 것이며, 본 발명의 수단이 괄호로 표기한 부분에 제한되지는 않는 것이다.

청구항 1 에 기재된 냉각 장치는 디스플레이 유닛의 개폐 각도를 전송하기 위한 전송 수단(예를 들어, 도 9 에 도시된 캠(62))과, 상기 전송 수단에 의해 전송된 디스플레이 유닛의 개폐 각도에 따라 본체의 내부 공간이 확장되도록 가동 바닥면부(예를 들어 도 3a 에 도시된 개방가능한 바닥면부(32))를 구동하여 본체의 내부를 냉각하기 위한 수단(예를 들어 도 9 에 도시된 힌지(63))를 포함한다.

청구항 3 에 기재된 전자 기기는 디스플레이 유닛의 개폐 각도를 전송하기 위한 수단(예를 들어 도 9 에 도시된 캠(62))과, 상기 전송 수단에 의해 전송된 디스플레이 유닛의 개폐 각도에 따라 본체의 내부 공간이 확장되도록 가동 바닥면부(예를 들어 도 3a 에 도시된 개방가능한 바닥면부(32))를 구동하여 본체의 내부를 냉각하기 위한 수단(예를 들어 도 9 에 도시된 힌지(63))를 구비한다.

청구항 4 에 기재된 냉각 장치는 제 1 가스를 흡입하기 위한 수단(예를 들어 도 17a 와 도 17b 에 도시된 공기 유입구(24))와, 상기 흡입 수단에 의해 흡입된 제 1 가스를 배출하기 위한 수단(예를 들어 도 17a 와 도 17b 에 도시된 공기 유출구(25)) 및, 상기 배출 수단에 의해 배출된 제 1 가스의 작용에 의해서 제 2 가스를 흡입 및 배출하기 위한 수단(예를 들어 도 17a 와 도 17b 에 도시된 공기 유입구(43))를 구비한다.

청구항 6 에 기재된 전자 기기는 제 1 가스를 흡입하기 위한 수단(예를 들어 도 17a 와 도 17b 에 도시된 공기 유입구(24))와, 상기 흡입 수단에 의해 흡입된 제 1 가스를 배출하기 위한 수단(예를 들어 도 17a 와 도 17b 에 도시된 공기 유출구(25)) 및, 상기 배출 수단에 의해 배출된 제 1 가스의 작용에 의해서 제 2 가스를 흡입 및 배출하기 위한 수단(예를 들어 도 17a 와 도 17b 에 도시된 공기 유입구(43))를 구비한다.

제 1 실시예

도 1a 내지 1c 는 본 발명이 적용되는 개인용 컴퓨터(30)의 외관을 위에서 비스듬히 연장되는 방향을 따라 바라보아서 도시한 사시도로서, 도 1a 는 개인용 컴퓨터(30)로부터 디스플레이 유닛(3)이 제거된 상태를, 도 1b 는 디스플레이 유닛(3)이 본체(2) 상으로 폐쇄된 상태를, 도 1c 는 디스플레이 유닛(3)이 본체(2) 상으로 폐쇄된 상태를 각각 도시하고 있다. 이들 도면에서, 도 23 에 대응하는 부분들은 동일한 문자로 표시되고 중복되는 설명은 생략한다.

도 1a 내지 1c 에 있어서, 본체(2)의 바닥면부는 고정 바닥면부(31) 및, 디스플레이 유닛(3)의 개폐에 따라 개폐되는 개방가능한 바닥면부(32)로 나뉘어진다. 디스플레이 유닛(3)이 본체(2) 상으로 폐쇄된 상태에서 개방가능한 바닥면부(32)는 폐쇄된다.

도 2a 는 도 1b 의 Y₁ - Y₂ 선상에서 취한 단면도이다. 도 24 에 도시된 것과 동일한 냉각 유닛(11)이 도

2a 에 도시된 바와 같이 본체(2)내에 장착된다. 냉각 유닛(11)의 장착 상태는 또한 도 2b 에도 도시되어 있다. 보다 자세히 말하면, 냉각 유닛(11)은 공기 유출구(15)가 본체(2)의 공기 유출구(4)와 정렬되고 공기 유출구(14)가 개방가능한 바닥면부(32)에 하향 정렬되도록 장착된다. 도면부호 33 은 공기는 통과할 수 있지만 외부 찌꺼기는 통과할 수 없는 망(net)을 지칭한다.

도 3a 는 디스플레이(3)가 본체(2)로부터 개방되고 개방가능한 바닥면부(32)가 개방되어 있는 상태에서의 개인용 컴퓨터(30)의 외관을 도시하는 사시도이며, 도 3b 내지 3d 는 개방가능한 바닥면부의 작용을 도시하는 도면이다. 도 3a에서, 본체(2)의 윗면에는 마우스 커서를 이동시키도록 작동되는 트랙 패드(35)와 문자 및 기호를 입력하기 위한 키보드(14)가 제공된다.

도 4 에 도시되어 있듯이, 개인용 컴퓨터(30)는 개방가능한 바닥면부(32)가 개방된 상태에서 사용자의 무릎에 놓인다.

도 5a 는 도 3a 의 $P_2 - P_1$ 선상에서 취한 단면도이다. 도 5a 에 있어서, 작동가능한 바닥면부(32)가 개방되었을 때는, 냉각 유닛(11)의 공기 유입구(14)와 개방가능한 바닥면부(32) 사이에 넓은 공간(P)이 형성된다. 개방가능한 바닥면부(32)의 개폐 기구는 후술될 것이다.

도 5a 에 도시된 상태에서의 본체(2)의 내부를 냉각하는 작용은 도 5b 및 도 5c를 참조하여 설명될 것이다. 전술했듯이, 디스플레이(3)가 개방되었을 때, 개방가능한 바닥면부(32)는 공기 저항이 적은 공기 통로로서의 넓은 공간(P)을 얻기 위하여 공기 유입구(14)의 본체(2) 측부 상에서 개방가능한 바닥면부(32)가 개방된다. 그 결과, 공기는 공기 유입구(14)로부터 냉각 유닛(11)내에 충분히 흡입될 수 있으며, 또한, 디바이스 등에서 발생된 열은 공간(P) 내에서 자연스럽게 방출될 수 있다.

이런 식으로, 전체 본체(2)의 온도 상승은 바닥면, 즉 본체(2)의 개방가능한 바닥면부(32)의 개방부에 의해 충분히 억제될 수 있다.

개방가능한 바닥면부(32)는 다른 장점을 갖는데, 말하자면 개방가능한 바닥면부(32)가 개방되므로써 냉각 유닛(11)의 공기 유입구(14)와 본체(2) 사이의 공간, 예를 들어 도 2a 에 도시된 높이(H)를 갖는 공간을 확보할 필요가 없어지고, 그로 인해 본체(2)내의 공간이 효과적으로 이용될 수 있다.

개방가능한 바닥면부(32)의 또 다른 장점은 사용자가 개인용 컴퓨터(30)를 조작할 때 개방가능한 바닥면부의 일부만이 사용자의 무릎과 접촉되어, 즉 본체(2)의 전체 바닥면부가 사용자의 무릎과 접촉되지 않게 되어서, 본체의 온도 상승으로 인한 사용자의 불편함이 감소될 수 있다는 것이다. 또한, 사용자가 개인용 컴퓨터(30)를 조작할 때 개방가능한 바닥면부(32)가 개방되므로, 본체(2)가 전방으로 경사지고 따라서 키보드(34)의 작동성이 향상된다.

개방가능한 바닥면부(32)를 개방하는 메카니즘에 대해서는 후술한다. 도 6 은 디스플레이 유닛(3)이 본체(2) 상으로 폐쇄되는 상태를 도시하는 우측면도이고, 도 7 은 도 6 에 도시된 범위(A)의 확대 도시도이다. 도 7 에서는 디스플레이 유닛(3)의 개폐에 따라 회전 샤프트(61)에 캠(62)이 장착된다. 돌출부(63A)가 형성되는 힌지(63)의 일단부는 단부 회전 샤프트(64)에 연결되고, 힌지(63)의 다른 단부는 개방가능한 바닥면부(32)에 연결된다. 돌출부(65A)가 형성되는 레버(65)의 일단부는 단부 회전 샤프트(64)에 연결되고, 키이부(65B) 형상을 하는 레버(65)의 다른 단부는 로크부(66)에 의해 래칭된다. 본체(2) 상에는 망(33)의 윗면에 배치된 상태에서 릴리스 버튼(67)이 포함된다.

상기 디스플레이 유닛(3)이 도 8 에 도시된 범위 A 의 확대도인 도 9 에 도시되어 있듯이 도 6 에 도시된 상태에서부터 도 8 에 도시된 상태로 대략 15° 개방되면 캠(62)은 화살표 A 로 도시된 방향으로 회전된다. 이 때, 레버(65)의 돌출부(65A)는 화살표 B 방향으로 구동되고 키이부(65B)는 분리되어 로크부(66)로부터 언래칭되며, 동시에 힌지(63)의 돌출부(63A)는 화살표 C 방향으로 구동되고 따라서 힌지 샤프트(63B)는 화살표 D 방향으로 이동된다.

디스플레이 유닛(3)이 도 10 에 도시된 범위 A 의 확대 도시도인 도 11 에 도시되어 있듯이, 도 6 에 도시된 상태에서부터 도 10 에 도시된 상태로 대략 90° 개방되면, 힌지(63)는 수직 방향으로 완전히 연장된다. 이때, 본체(2)에 포함된 릴리스 버튼(67)은 힌지 샤프트(63B)에 의해 본체(2) 밖으로 밀려나간다.

개방가능한 바닥면부(32)가 힌지(63)가 일단 완전히 연장된 상태로 되고 나면, 힌지(63)의 돌출부(63A)는 어떤 방향으로도 구동되지 않는다. 예를 들어, 디스플레이 유닛(3)이 90° 이상의 각도로 개방될 때에도 개방가능한 바닥면부(32)가 도 10 및 도 11 에 도시된 바와 같이 개방된 상태는 유지된다. 또한, 디스플레이 유닛(3)이 힌지(63)가 완전히 연장된 상태에서 도 12 에 도시된 상태로 폐쇄될 때에도, 개방가능한 바닥면부(32)는 도 10 및 도 11 과 관련하여 기술된 위의 경우와 마찬가지로 개방 상태를 유지한다.

개방가능한 바닥면부(32)의 폐쇄 메카니즘을 후술한다. 디스플레이 유닛(3)이 도 12 에 도시되었을 때 폐쇄되는 상태에서 사용자에게 의해 릴리스된 버튼(67)이 내측으로 눌리면, 도 13 에 도시되어 있듯이 힌지 샤프트(63)는 화살표 E 방향으로 이동되고 그로 인해 개방가능한 바닥면부(32)는 상향으로 이동된다. 그 결과, 도 14 에 도시되어 있듯이, 개방가능한 바닥면부(32)가 폐쇄 상태로 복귀된다. 이 때, 레버(65)의 키이 부분(65B)은 로크부(66)에 의해 래칭된다.

이러한 메카니즘에 의하면, 디스플레이 유닛(3)이 일단 90° 이상의 각도로 개방되고 개방가능한 바닥면부(32)가 도 10 에 도시되었을 때 완전히 개방되면, 디스플레이 유닛(3)의 개폐 각도가 변화하더라도 개방가능한 바닥면부(32)의 개방된 상태는 변하지 않는다. 그 결과, 디스플레이 유닛(2)의 개폐 각도가 변화하더라도, 도 5a 에 도시된 공간(P)이 확보될 수 있고, 그로 인해 전체 본체(2)의 온도 상승을 충분히 억제할 수 있다.

다음으로, 냉각 기구를 갖는 도킹 스테이션을 사용할 경우에 대해 도 15를 참조로 하여 설명하기로 한다. 도 15 에 도시된 도킹 스테이션(81)은 팬(82), 공기 유입구(83), 공기 유출구(84)를 구비한다. 공기 유입구(83)로부터 도킹 스테이션(81)내에 흡입된 외부 공기는 팬(82)의 회전에 의해 공기 유출구(84)를 통해 개방가능한 바닥면부(32)의 개방부로 이송된다. 이러한 메카니즘에 의하면, 다량의 공기가 공기 유입구

(14)로부터 냉각 유닛(11)에 흡입된다.

도 16a 및 도 16b 에 도시된 본체(2)는 냉각 유닛(11) 대신에 열전도체 (22) 상에 장착된 열 전도체(91)를 구비한다. 도 16a 및 도 16b 에 도시된 도킹 스테이션(101)은 열 싱크(102)와 공기 유출구(103)를 구비한다. 디바이스로부터 발생된 열은 보드(21) 및 열 전도체(22)를 통하여 도킹 스테이션(101)의 열 싱크(102)로 전달된다. 이렇게 열 싱크(102)로 전달된 열은 도킹 스테이션(101) 내의공기를 통해 공기 유출구(103)로부터 배출된다.

이런 식으로, 도킹 스테이션(81 또는 101)을 본 발명이 적용되는 개인용 컴퓨터(30)와 조합함으로써, 본체(2)의 내부를 보다 효과적으로 냉각하고 전체 본체(2)의 온도 상승을 억제할수 있다.

제 2 실시예

도 17a 와 도 17b 는 본 발명이 적용되는 냉각 유닛(41)의 외관을 도시하는 도면이다. 도 24 에 도시된 것과 동일한 부분들은 동일한 도면부호로 지칭되고 중복되는 설명은 생략된다. 이 실시예에서는, 냉각 유닛(41)의 저면도인 도 17b 에 도시되듯이, 하우징(42)의 바닥면부에 있어서 공기 유출구(25) 측부상의 위치에 공기 유입구(43)가 제공된다.

도 18 은 개인용 컴퓨터(30)의 본체(2)에 장착된 냉각 유닛(41)의 단면도이다. 냉각 유닛(41)의 냉각 작용은 도 18을 참조하여 설명될 것이다.

냉각 유닛(41)에 있어서, 보드(31)와 공간(F)은 종래의 냉각 유닛(11)과 동일한 제 1 및 제 2 냉각 작용에 따라 냉각되며 그 중복되는 설명은 생략된다.

다음으로, 공간(G)에 대한 제 3 냉각 작용을 설명한다. 냉각 유닛(41)의 팬(22)이 회전되면, 냉각 유닛(41)의 공기 유입구(24) 위 공간(공간 F 를 포함)으로부터의 공기는 우선 공기 유입구(24)를 통하여 냉각 유닛(41)내로 흡입되고, 도 18에서 화살표 A 로 도시되듯이 본체(2)의 공기 유출구(4)와 냉각 유닛(41)의 공기 유출구(25)를 통하여 배출된다.

유동 A 가 발생되면, 통상 공기 유입구(43) 부근에서의 하우징(42)내 압력은 통상 보드(31) 아래의 공간(공간 G를 포함)내의 공기가 공기 유입구(43)로부터 냉각 유닛(41)내로 흡입되도록 베르누이 정리에 기초하여 감압된다. 이렇게 흡입된 공기는 도 18 에 도시된 유동 B 에 의해 도시된 바와같이, 공기 유출구(25)를 통하여 배출된다. 이런 식으로, 공간(G)이 냉각된다.

냉각 유닛(41)에서는, 제 1 및 제 2 냉각 작용에 더하여 제 3 냉각 작용에 의하여, 본체(2)의 내부가 냉각되고 이에 따라 전체 본체(2)의 온도 상승이 충분히 억제된다.

상기 실시예에서, 본 발명은 단지 공기 유출구(4)만 제공되고 일체의 공기 유입구는 제공되지 않은 개인용 컴퓨터(1)에 대해 적용되었으나, 본 발명은 또한 공기 유입구(51)가 본체(52)에 제공되어 있는 도 19 에 도시된 개인용 컴퓨터(53)에도 적용될 수 있다.

도 20 은 개인용 컴퓨터(53)의 본체(52)내에 장착된 냉각 유닛(41)의 단면도이다. 이 경우, 유동 A 및 유동 B 에 더하여, 공기 유입구(51)를 통해 본체(52)에 흡입된 공기가 냉각 유닛(41)의 공기 유입구(24) 및 공기 유출구(25)와 본체(52)의 공기 유출구(4)를 통하여 배출된다.

도 21 에 도시되어 있듯이, 편평 핀이 장착되는 하우징(42)을 구비한 냉각 유닛(41)이 개인용 컴퓨터(1 또는 53)에 장착될 수도 있다.

전술한 내용에서는 공기 유입구(43)가 냉각 유닛(41)의 하우징(42)의 바닥면에 제공되어 있으나, 본 발명은 이에 한정되지 않으며 도 22 에 도시되어 있듯이 공기 유입구(43)는 하우징(42)의 측면에 장착될 수도 있다.

상기 실시예에서, 냉각 유닛(41)은 열 전도체(32)에 장착되어 있지만, 디바이스상에 직접 장착될 수도 있다. 또한, 공기 유출구(4)는 본체(2 또는 52)의 뒷면에만 아니라 본체(2 또는 52)의 우측면이나 좌측면에도 장착될수 있다.

발명의 효과

본 발명의 양호한 실시예들을 특정 용어를 사용하여 기술하였으나, 이러한 기재 내용은 단지 예시적일 뿐이며 청구범위의 취지 및 범주를 벗어나지 않는 범위내에서의 다양한 수정 및 변경이 가능할수 있음에 유의해야 한다.

(57) 청구의 범위

청구항 1

가동 바닥면부를 갖는 본체와 이 본체에 대하여 개폐 가능한 디스플레이 유닛을 구비한 전자 기기의 본체의 내부를 냉각하기 위한 냉각 장치로서,

상기 디스플레이 유닛의 개폐 각도를 전송하기 위한 전송 수단과,

상기 전송 수단에 의해 전송된 디스플레이 유닛의 개폐 각도에 따라 상기 본체의 내부 공간이 확장되도록 상기 가동 바닥면부를 구동하여 상기 본체의 내부를 냉각하는 수단을 포함하는 냉각 장치.

청구항 2

가동 바닥면부를 갖는 본체와 이 본체에 대하여 개폐가능한 디스플레이 유닛을 구비하는 전자 기기의 본

체의 내부를 냉각하기 위한 냉각 방법으로서,

상기 디스플레이 유닛의 개폐 각도를 전송하는 단계와,

상기 전송 단계에서 전송된 디스플레이 유닛의 개폐 각도에 따라 상기 본체의 내부 공간이 확장되도록 상기 가동 바닥면부를 구동하여 본체의 내부를 냉각하는 단계를 포함하는 냉각 방법.

청구항 3

가동 바닥면부를 갖는 본체와 이 본체에 대하여 개폐 가능한 디스플레이 유닛을 구비한 전자 기기로서,

상기 디스플레이 유닛의 개폐 각도를 전송하기 위한 전송 수단과,

상기 전송 수단에 의해 전송된 디스플레이 유닛의 개폐 각도에 따라 상기 본체의 내부 공간이 확장되도록 상기 가동 바닥면부를 구동하여 상기 본체의 내부를 냉각하는 수단을 포함하는 전자 기기.

청구항 4

냉각 장치로서,

제 1 가스를 흡입하기 위한 수단과,

상기 흡입 수단에 의해 흡입된 제 1 가스를 배출하기 위한 배출 수단 및,

상기 배출 수단에 의해 배출된 제 1 가스의 작용에 의해 제 2 가스를 흡입 및 배출하기 위한 수단을 포함하는 냉각 장치.

청구항 5

냉각 방법으로서,

제 1 가스를 흡입하는 단계와,

상기 흡입 단계에서 흡입된 제 1 가스를 배출하는 단계와,

상기 배출 단계에서 배출된 제 1 가스의 작용에 의해 제 2 가스를 흡입 및 배출하는 단계를 포함하는 냉각 방법.

청구항 6

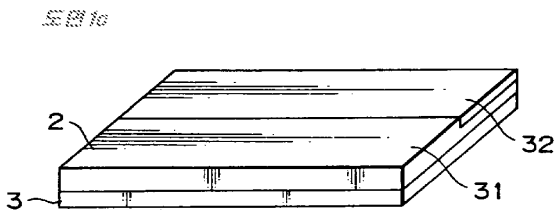
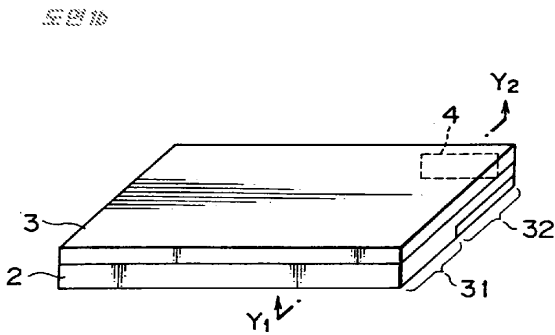
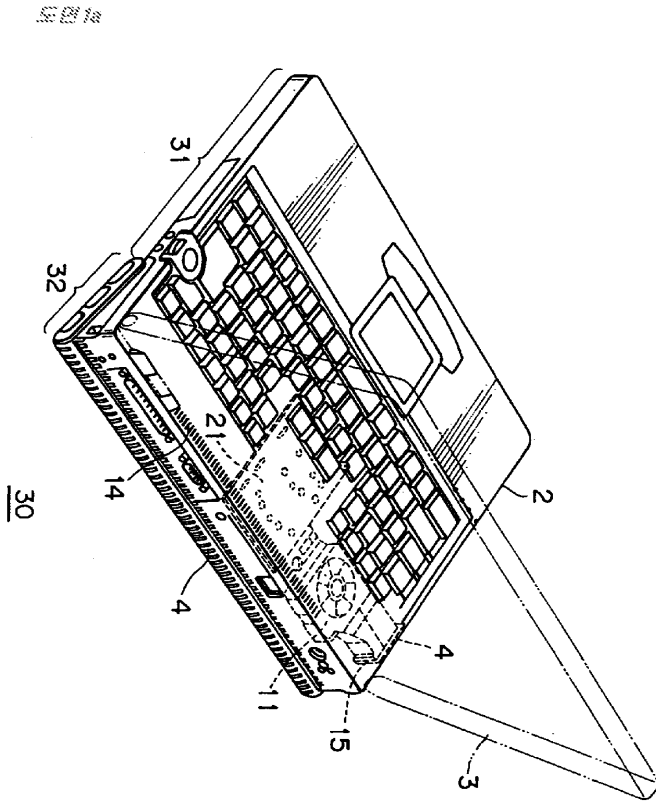
전자 기기로서,

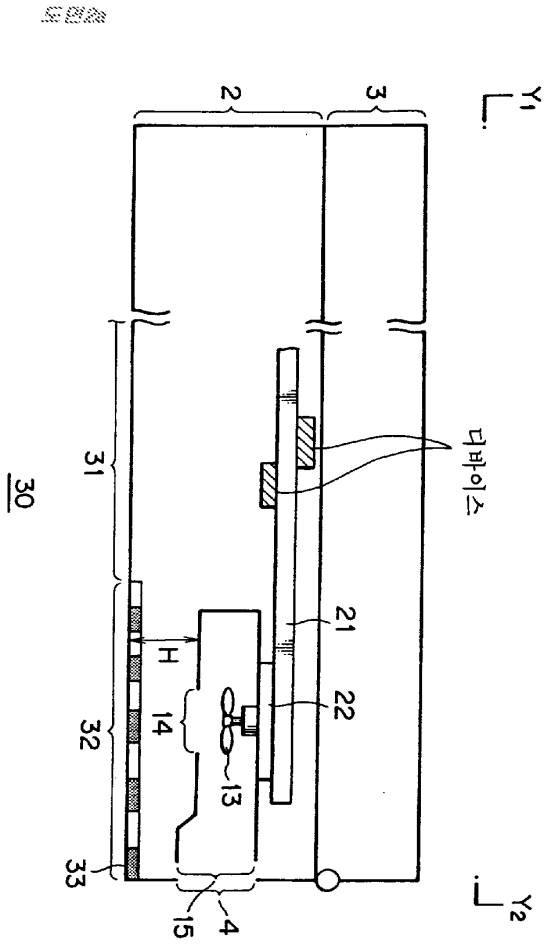
제 1 가스를 흡입하는 수단과,

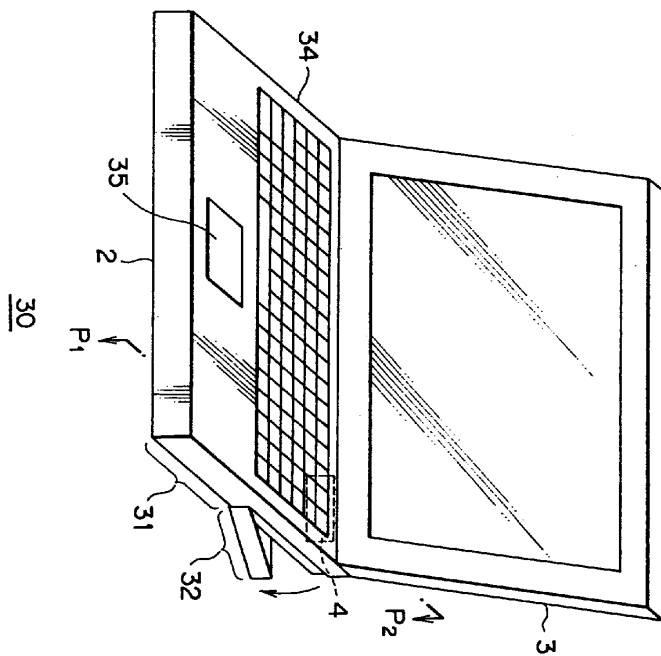
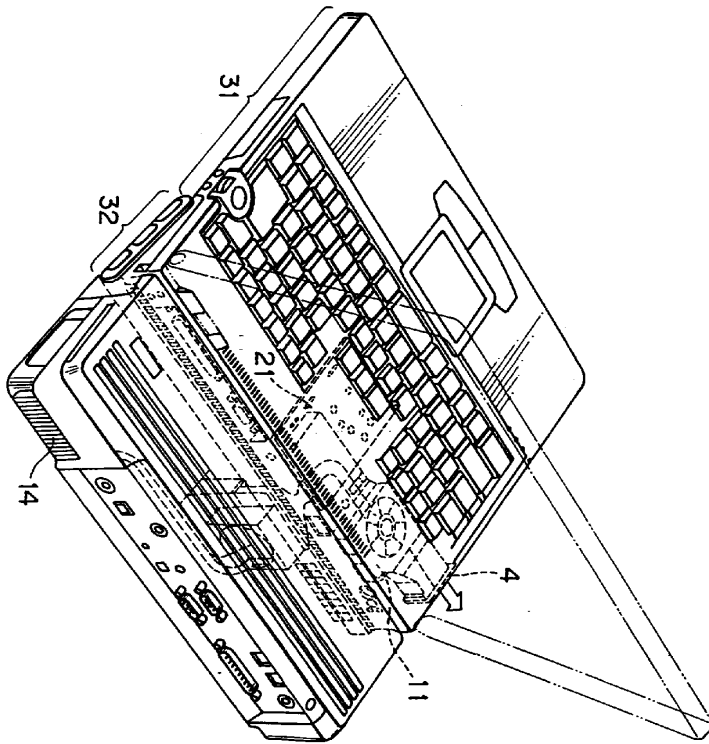
상기 흡입 수단에 의해 흡입된 제 1 가스를 배출하는 수단 및,

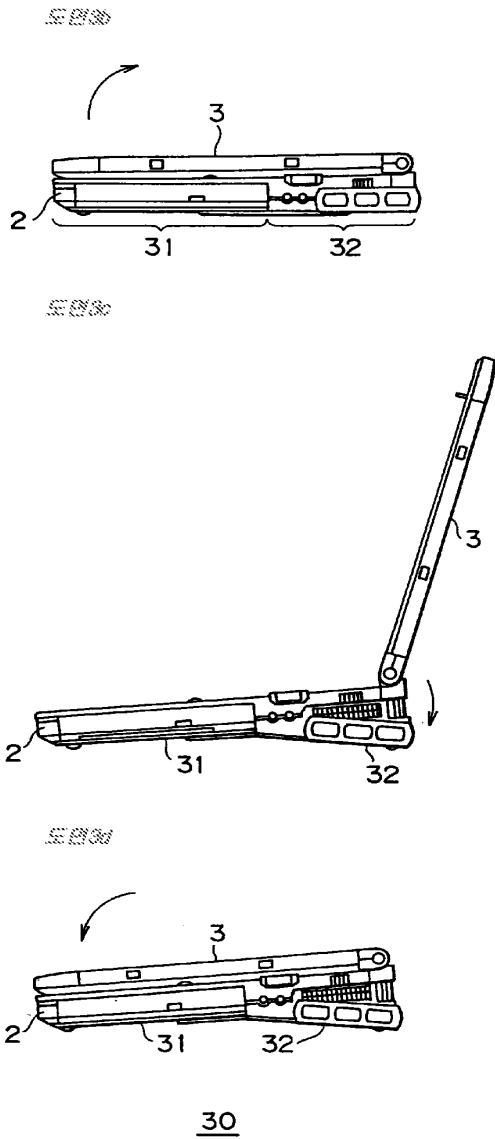
상기 배출 수단에 의해 배출된 제 1 가스의 작용에 의하여 제 2 가스를 흡입 및 배출하기 위한 수단을 포함하는 전자 기기.

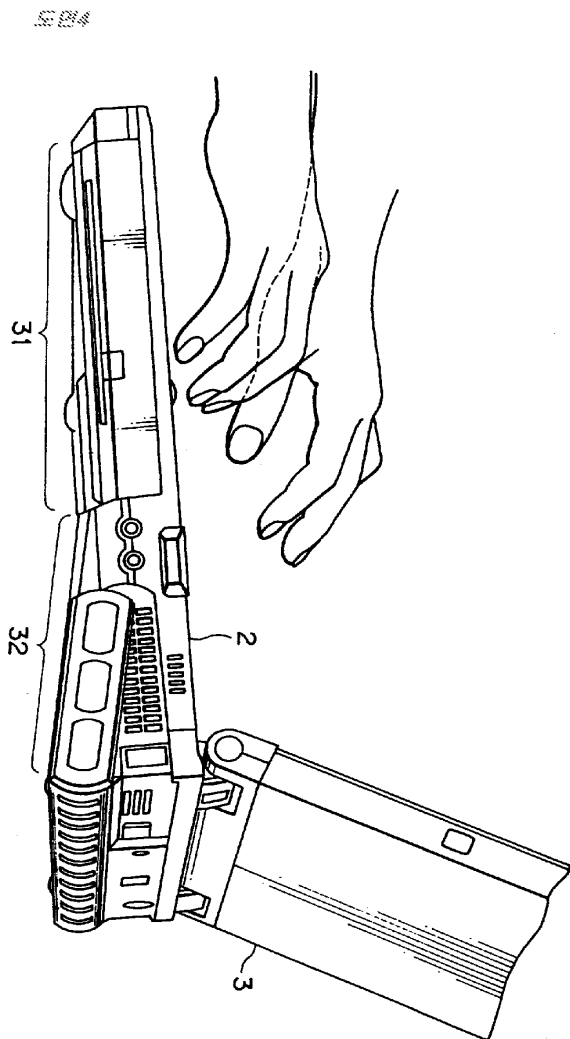
33

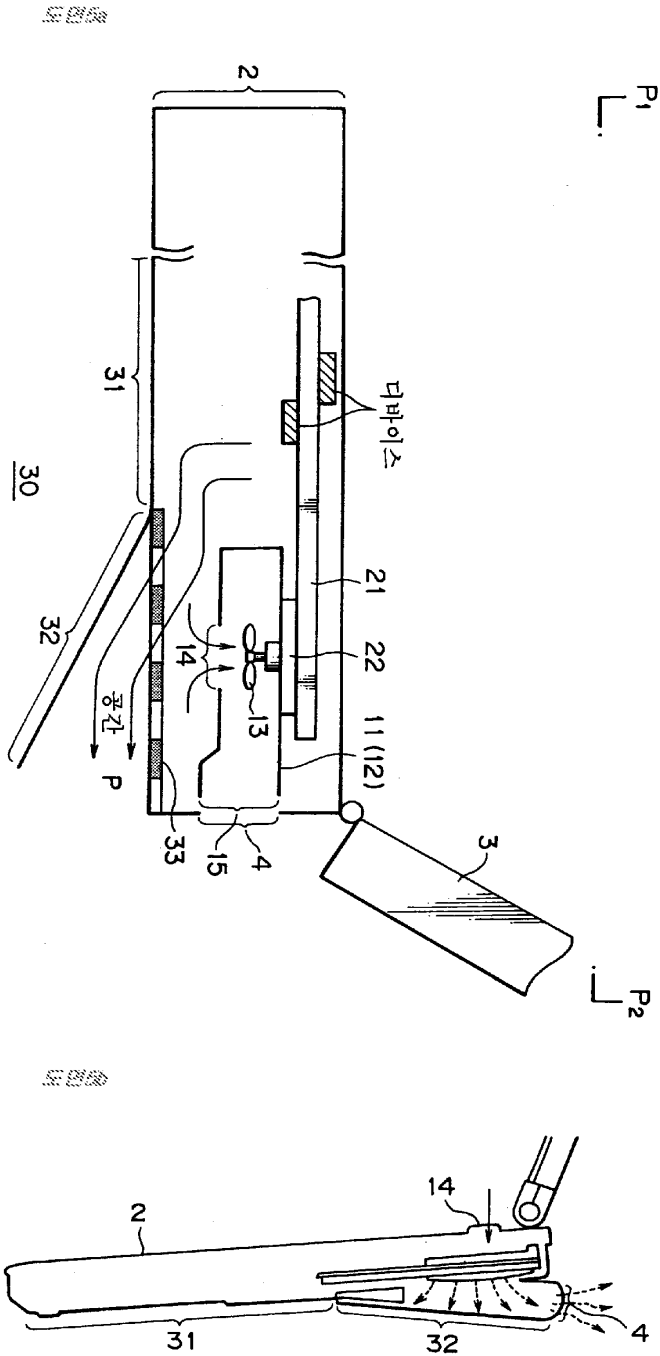


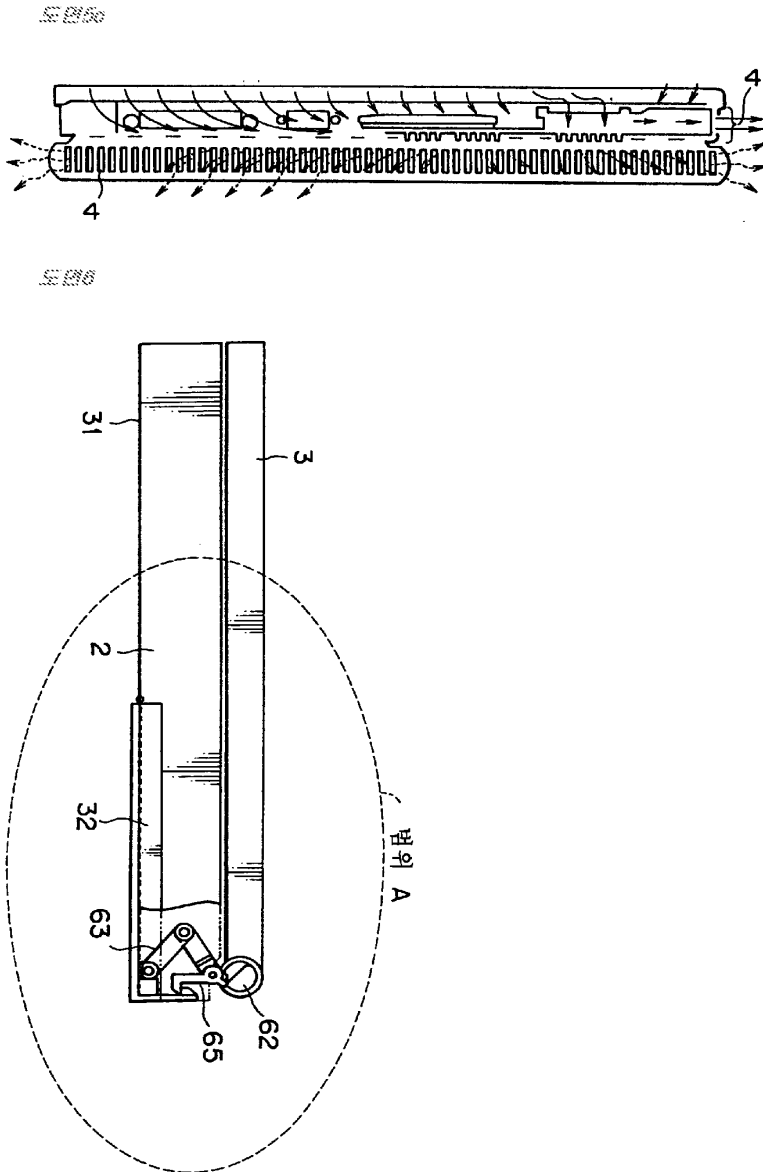


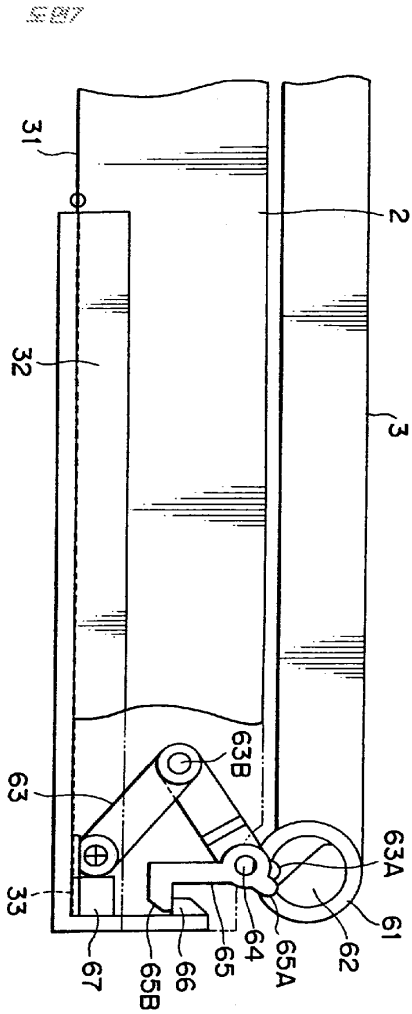


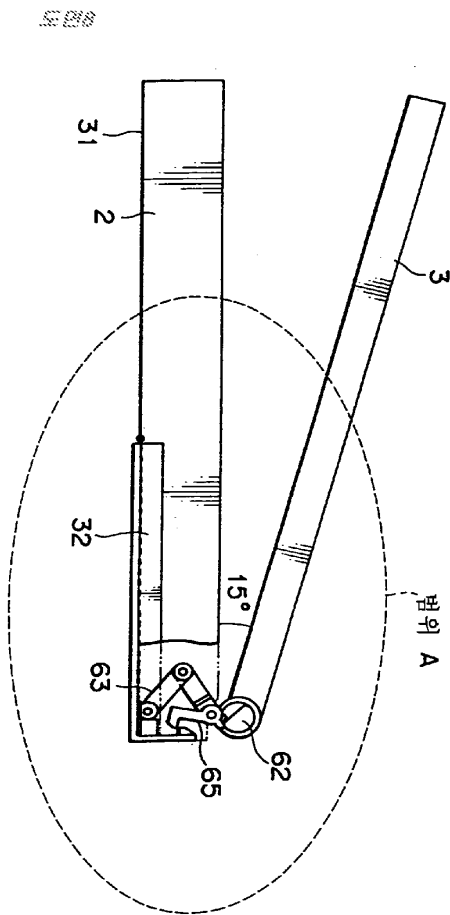


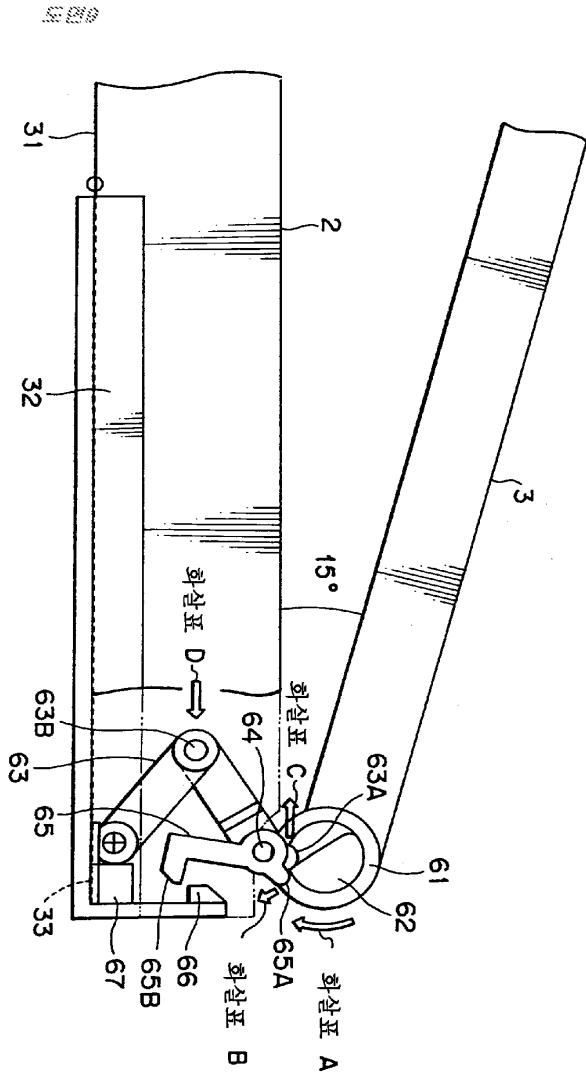


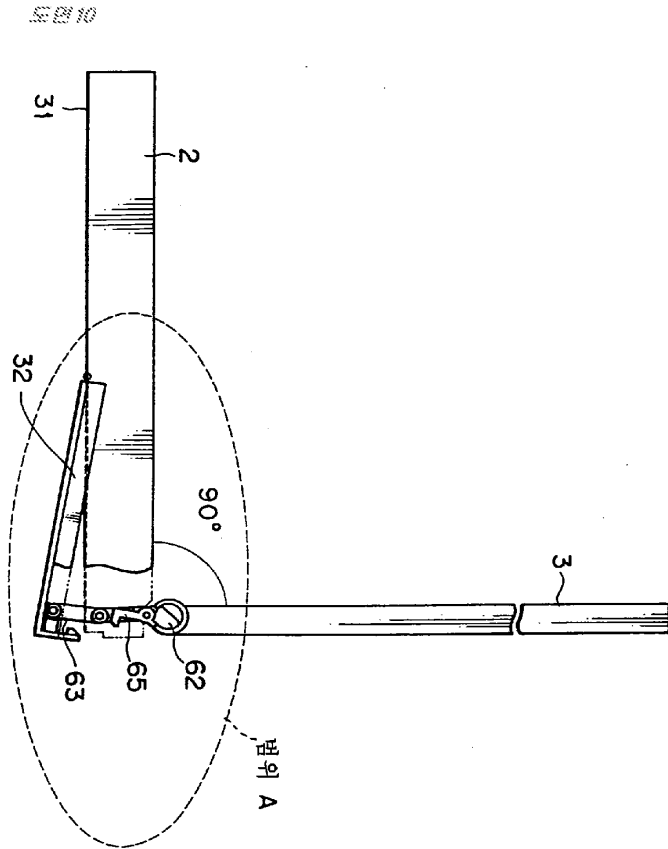


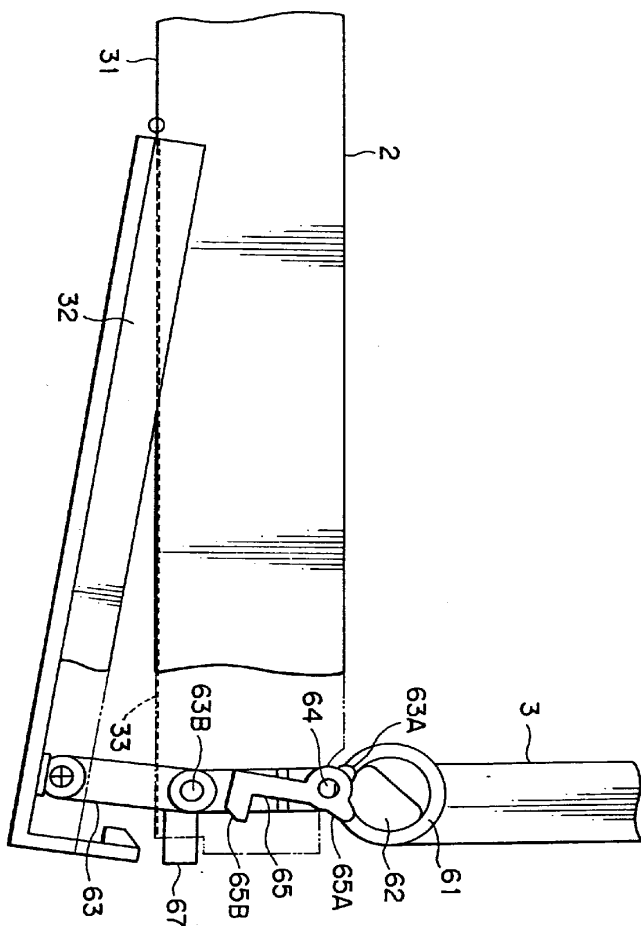


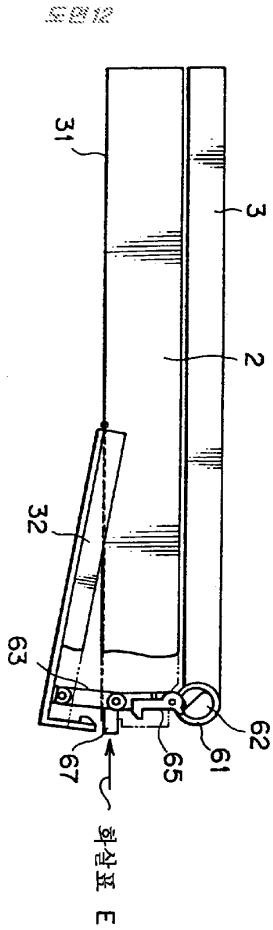


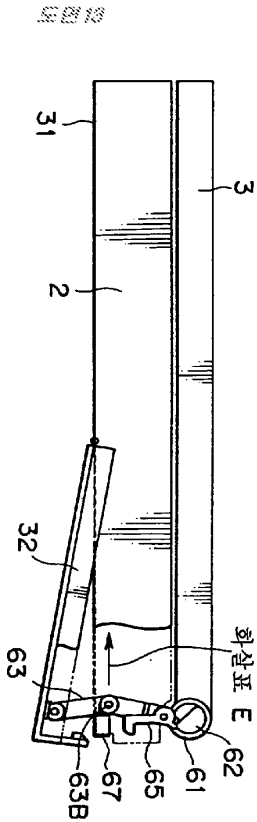


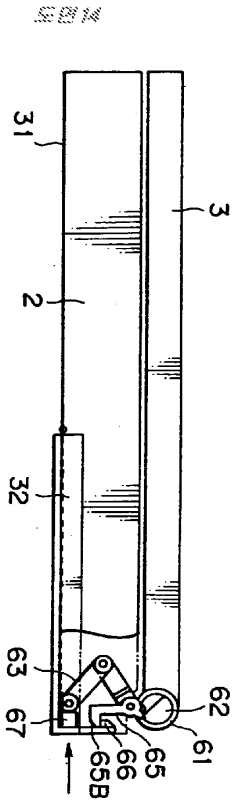


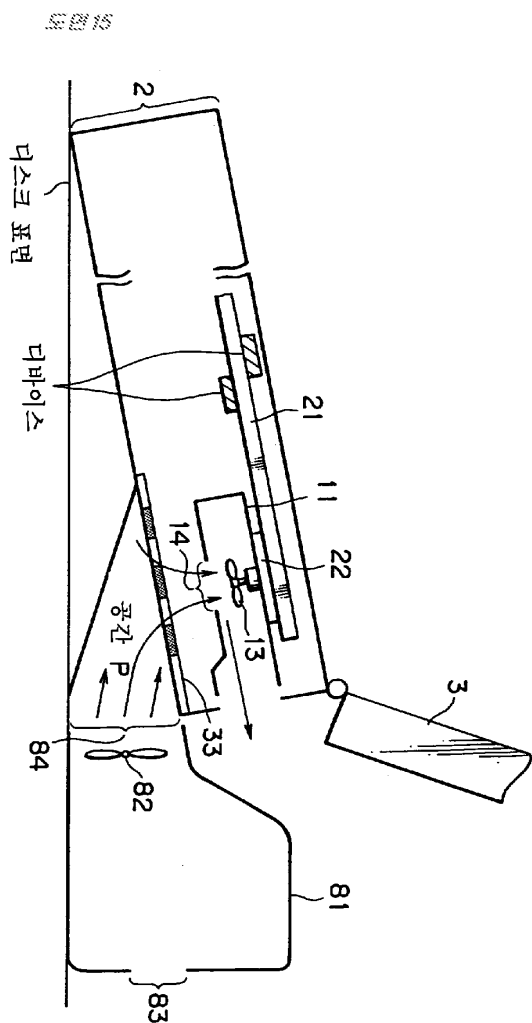


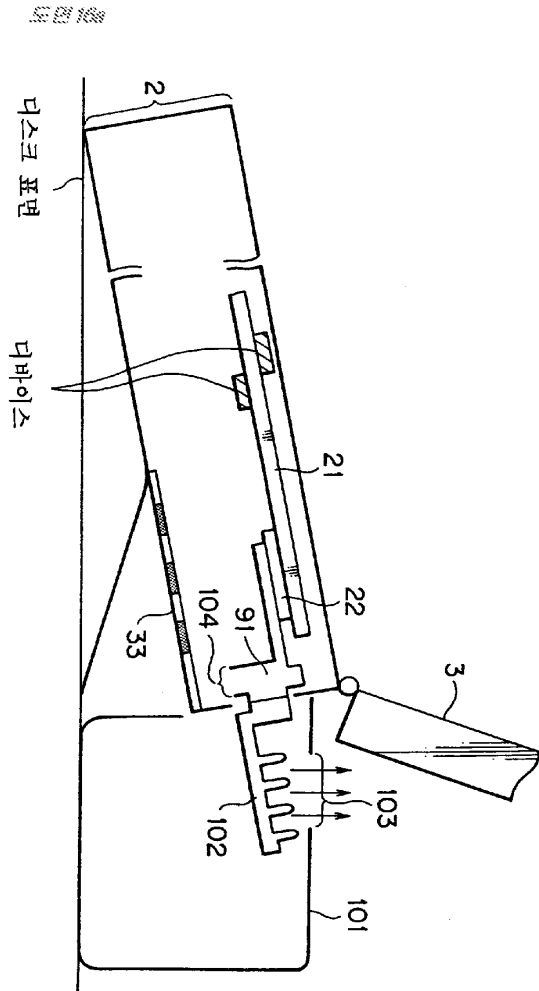


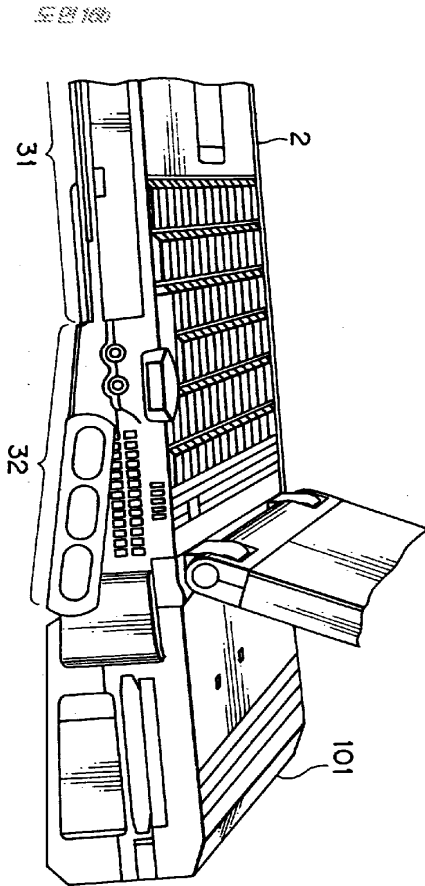


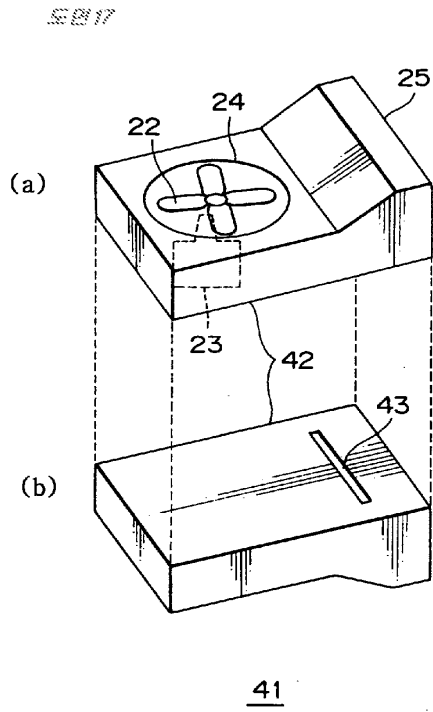


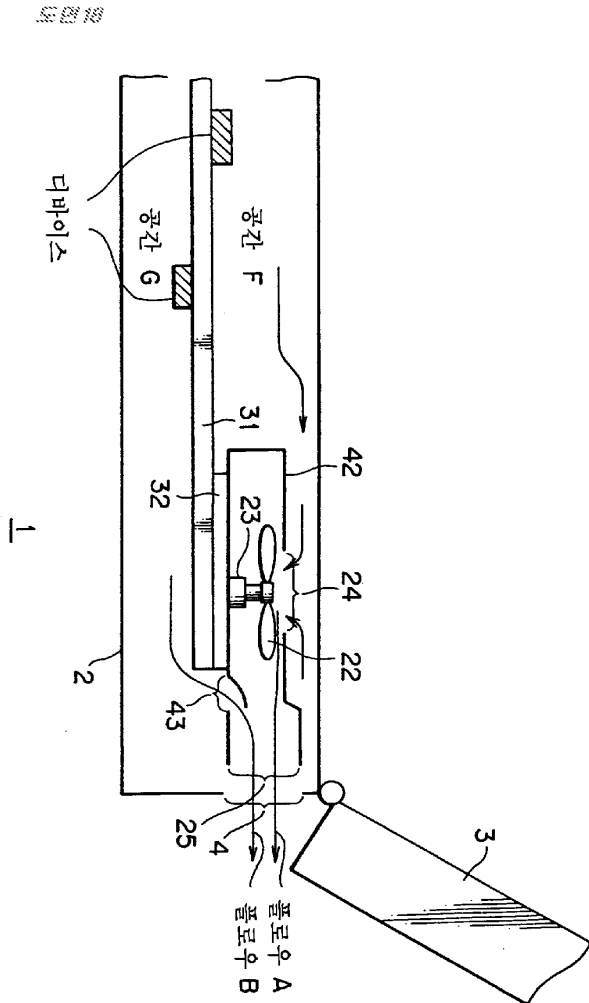


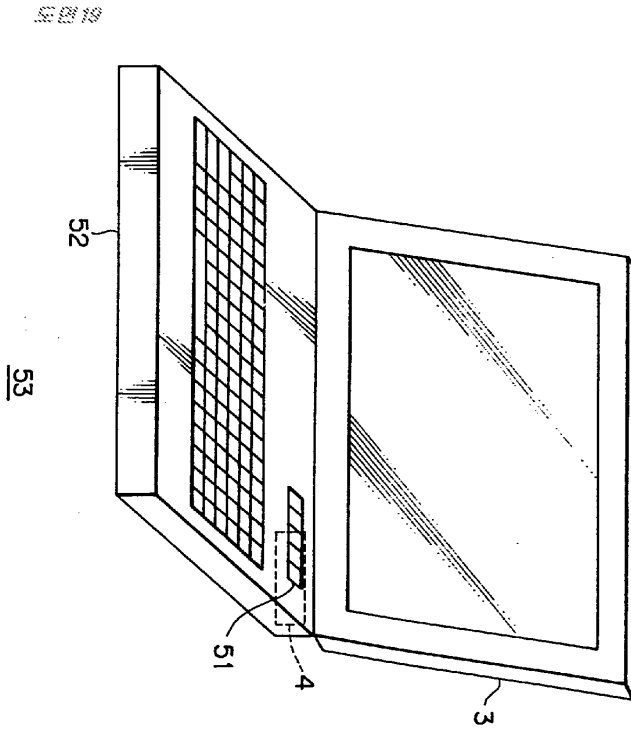


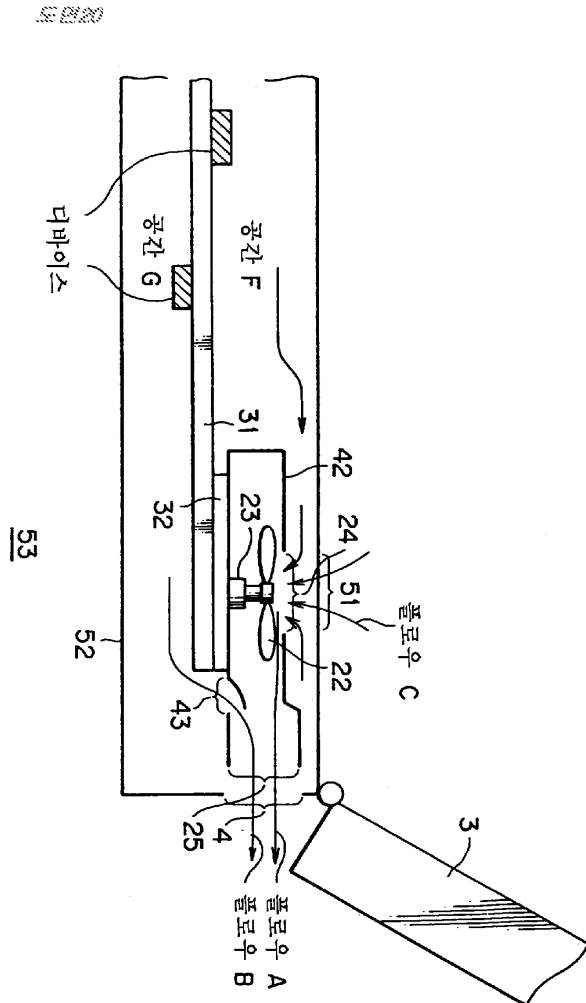


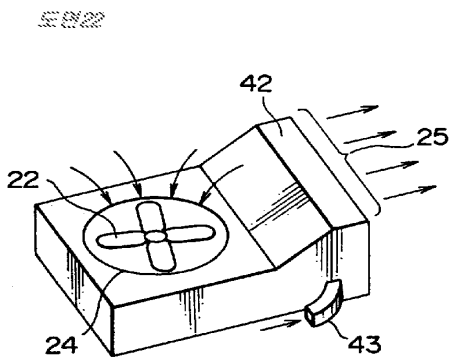
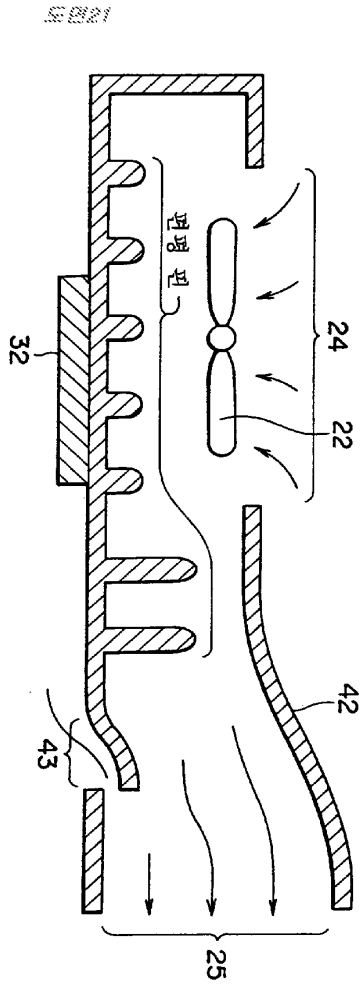


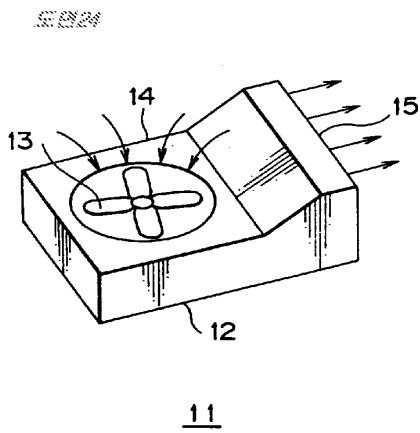
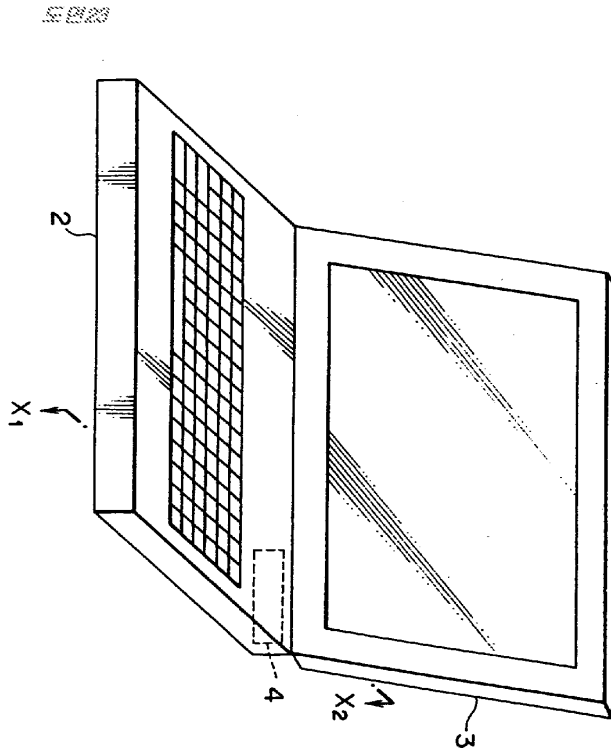


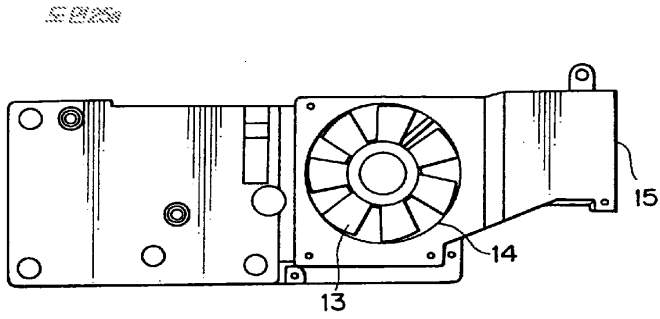




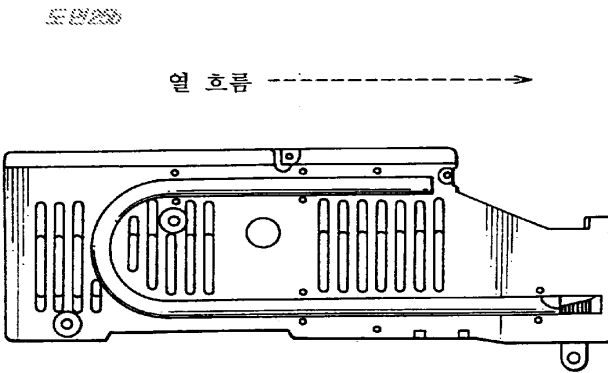






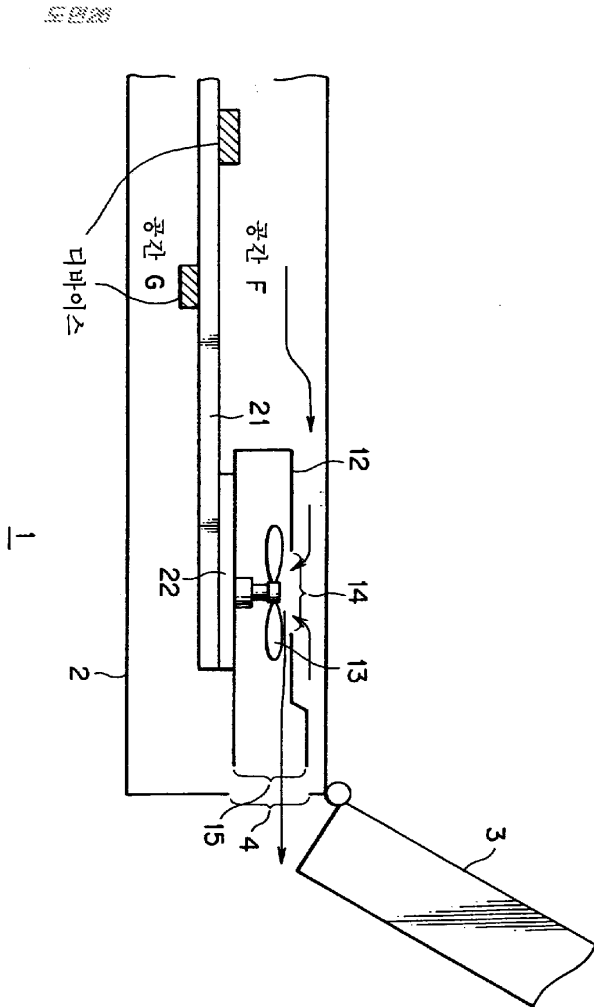


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(71) Applicant	SAMSUNG ELECTRONICS CO., LTD.		
	416, Maetan 3-dong, Paldal-gu, Suwon, Gyeonggi-do		
(72) The inventor	Seo Youngbae		
	Suwon, Gyeonggi-do, Korea		
	Young Jin Jang		
	342-46 Gil-dong, Gangdong-gu, Seoul		
	Kim Young-ho		
	108-4 Gil 2-dong, Gangdong-gu, Seoul		
	Regular meeting		
	Seoul, Korea		
	Ahn Sang Sang		
	41-5, Gumi-dong, Bundang-gu, Seongnam-si,		
(74) Agent	Kim Sung Soo		

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(54) Radiators and heaters for telecommunication equipment enclosures

summary

A heat dissipating and heating device for a communication equipment enclosure is disclosed. This heat dissipating device has a plurality of PCBs and devices A communication equipment enclosure comprising: left and right side walls of a three-piece housing; outer air cylinders
An inner air passage formed in each of the right and left side walls, an outer air passage extending from the lower end of the enclosure through an outer air passage, And the air inside the enclosure flows from the top to the bottom of the enclosure through the inner air passage
And a system shelf top fan that only operates to flow. In this heat generating device, the left and right side walls
1. A communication equipment enclosure made of triple and having a plurality of PCBs and devices mounted thereon, the enclosure comprising a system shelf, At the lower end of the heat exchange plate and heat exchange plate which are spaced apart at regular intervals,
And a heat generator.

Representative figure

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Specification

Brief Description of Drawings

- 1 is a front view of a conventional communication equipment enclosure.
- 2 is a right side view of another conventional communication equipment enclosure.
- 3 is a right side view of a conventional large-capacity communication equipment enclosure.
- 4 is a front view of a communication equipment enclosure according to the present invention.
- 5 is a right side view of the communication equipment enclosure according to the present invention.

Description of the Related Art

10: cooling air flow passage

20: air suction part

30:	40: External blower
50: Hull roof	60: Internal blower
70: Top shelf	80: Lower Shelf

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100: Housing roof	110: cooling device
120: blower	130: Heat pipe
140: Back door	150: enclosure
160: Support	170: Front door
180: Lower shelf	190: PCB, device
200: PCB, device	210: suspended shelf
220: Top shelf	230: Top cooling system
240: Hull roof	310: Enclosure lid
320: Rubber for leakage prevention, silicone	330: Blower for shelf exhaust
340: blower for outer outlet	360: Waterproof rubber, silicone
370: Roof enclosure	390: Rubber for leakage prevention, silicone
400: internal air passage	410: Outside air passage
420: Heat exchange plate	430: Heater
440: separating wall	450: enclosure
460: PCB, Device	470: Support
480: Lower shelf	490: System shelf
500: Heat exchange plate	510: Outside air passage
520: internal air passage	530: Rubber for leakage prevention, silicone
540:	550: Chinchilla chin
560: Chin for the room	570:
580: Back door	590: Blower
600: Front door	

Detailed description of the design

Purpose of Design

The technology to which the invention belongs and the prior art in the field

The present invention relates to a heat dissipating and heating device for a communication equipment enclosure. In particular, Using a new heat sink convection structure using only the wall of the enclosure itself and a fan, Concerning a communication equipment enclosure having a triple-wall cooling device capable of stable heat dissipation in a consuming system (system) to be.

1 is a front view of a conventional communication equipment enclosure. The enclosure includes a top shelf 70 and a bottom shelf 80, and is provided with a fan 60. PCBs (PCBs) and units are mounted. An internal blower (Fan) 60 for convection of the heated air in the shelf, A cooling air flow passage 10 through which the air for cooling flows, An air intake part (20), a cooling fan for cooling the cooling air, and a cooling fan An air discharge unit 30, an external blower 40 for rapidly moving the warmed air, And an enclosure roof (50) called as a roof.

Referring to FIG. 1, the cooling process of the enclosure will be described with reference to various PCBs mounted on the upper and lower shelves 70 and 80, Air is convected by the internal blower 60 existing inside the enclosure. The convective further The heated air is cooled through the heat exchange plate between the shelves 70, 80 and the airflow passage 10. At this time, Air is supplied from the outside through the air suction unit 20 existing at the lower end of the housing.

When the hot air of the shelf and the cold air of the outside are exchanged through the heat exchange plate, By the convection, the air of the shelf goes down and the outside air goes up. At this time, When blowers 60, 40 are placed on the roof, rapid cooling and convection take place.

FIG. 2 is a right side view of another conventional communication equipment enclosure, and FIG. 3 is a right side view of a large capacity communication equipme

3, a large-capacity enclosure applied to a system having a large power consumption is provided on a roof 240 of a general enclosure

Various communication PCBs and devices 190, 200 are mounted on the cooling device 110; warmed air from the device
A heat radiating pipe 130 constituting a cooling device 110 for cooling the warmed air,
A rear door 140 for drawing cold air outside through the heat radiating pipe 130, a support 160 for supporting the housing,
And a housing roof (100) for protecting the front door (170) and the housing from snow and rain.

3, a large-capacity enclosure applied to a system having a large power consumption is provided on a roof 240 of a general enclosure

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A separate upper cooling device 230 is attached, and the heat dissipation principle of the cooling device is used for a general enclosure
The same as the principle of the cooling device.

Referring to FIG. 2, the enclosure 150 includes a plurality of

There are shelves 220, 210 and 180 where PCBs and devices 190 and 200 are mounted side by side in this shelf,

All. The cooling device 110 is mounted on the rear door 140 of the enclosure to form an air flow inside the enclosure

Heat is transferred to the outside of the enclosure.

The air flow and the heat dissipating structure are formed by a heat dissipating pipe 130 assembled inside the cooling device 110,
Heat generated in each PCB and devices 190 and 200 is transferred to the cooling device 110

The flow blown by the blower 120 and moving in the direction of the arrow proceeds. A room inside the cooling device (110)

The heat passing through the heat pipe 130 is cooled by the external cold air flow and continues to move to the bottom of the enclosure

do. The airflow is continuously blown by the blower 120 inside the cooling device 110,

So that heat exchange with the outside of the housing is made.

However, the enclosure uses a cooling device or an air conditioner or a heat exchanger

Air conditioners have problems with reliability and durability, and the air conditioner itself is likely to be heavy and expensive.

The complexity and complexity of after-service (After-Service) costs a lot. The heat exchanger is reliable and

The configuration is somewhat improved compared to the air conditioner, but it is still heavy, the structure is complicated, and it is expensive.

Technological challenge to be devised

Therefore, in order to solve the above-mentioned problems, the present invention has been made to solve the above-mentioned problems in view of the reliability, d

Equipped with a triple-walled cooling system that enhances the weight of each unit and ease of after-sales service,

And a heat generating device.

Another objective of the present invention is to use only the wall and blower of the enclosure in which the PCB and the device requiring the cooling device are mou

In the system which realizes a new radiating convection structure and consumes a relatively low power, a triple wall

And to provide a communication equipment enclosure having a cooling device.

Other objects and advantages of the present invention will become apparent from the following detailed description of the invention when read in conjunction with t
It will lose.

Composition and action of design

According to another aspect of the present invention, there is provided a heat dissipating device for a communication equipment enclosure,

1. A communication equipment enclosure in which a plurality of PCBs and devices are mounted,

Left and right side walls of the case made of triple;

An outer air passage formed in the left and right side walls, respectively;

An inner air passage formed in the left and right side walls, respectively;

An upper fan operated so that outside air flows only from the lower end to the upper end of the housing through the outer air passage;

And

The air inside the enclosure is operated to flow from the upper end to the lower end of the enclosure through the inner air passage

And a stem shelf upper fan.

In this embodiment, sealing between the housing, the enclosure loop and the outer top plate to prevent air leakage

Lt; / RTI & gt;

The system shelves being spaced apart at regular intervals to cool the air exiting the shelf outlet

Exchange plate;

An outer air passage through which the air for cooling the heat exchange plate flows from bottom to top;

An outer discharge unit for discharging air warmed up through the outer air passage; And

And a roof for discharging the air from the outer outlet,

The heat exchange plate is preferably shielded from the outside in order to protect the PCB and the devices from external environment,

Preferably, the shelf outlet includes a blower for the rapid flow of air,

The outside air is preferably introduced into the outside air passage,

Preferably, the outer outlet includes a blower for rapid air flow,

The roof is provided with front and rear surfaces of the housing so that the air escapes and water can not enter the roof

Lt; / RTI &

The roof is sealed to the right and left sides of the housing with a sealing material such as rubber or silicone to prevent water leakage. Directly,

A bottom shelf that houses PCBs and devices that consume high power and have a strong structure in the outside environment;

An air inflow part for introducing outside air into the lower end shelf; And

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And an air discharge unit for discharging the introduced air to the outside,

The lower shelf has a separating wall at the top of the lower shelf to prevent heat from being transferred to the system shelf

Lt; / RTI & gt;

Preferably, the air inlet includes a blower for the rapid flow of air.

According to another aspect of the present invention, there is provided a heating device for a communication equipment enclosure, In a telecommunication equipment enclosure in which a right side wall is made of triple and a plurality of PCBs and devices are mounted, System shelf;

A heat exchange plate surrounding the system shelves at regular intervals; And

At the lower end of the heat exchange plate, there is provided a heater for protecting the PCB and the devices during a cold weather.

In the present embodiment, the heat radiator has a plate-like shape in order to increase the heating area and minimize the installation height

In the following description, a communication equipment enclosure equipped with a triple-wall cooling device according to a preferred embodiment of the present i Many specific details, such as the structure and function of triple walls, provide a better overall understanding of the proposed design Respectively. However, for those skilled in the art,

It will be apparent that the invention may be practiced without departing from the spirit and scope of the present invention.

In addition, the features and functions of well-known communication equipment enclosures are described in detail to avoid obscuring the present invention , And for the same terms, English initials or Korean language interpretation terms shall be used for convenience of explanation and understanding.

Fig. 4 is a front view of the communication equipment enclosure according to the present invention, and Fig. 5 is a right side view thereof. Referring to the drawing The construction of the present invention will be described. In a communication equipment housing 450 equipped with a three-walled cooling device according to ll

A system shelf (490) for mounting PCBs and devices sensitive to external environments, a system shelf

To the shelf outlet

A blower (Fan) 330 for the shelf discharge unit for blowing air,

In order to cool the hot air in the passages 400 and 520, the system shelf 490 is heat-

Plates 420 and 500, external air passages 410 and 510 through which outside air passes to cool the hot air,

(Plinth: 470) equipped with a passage through which outside air flows, and a heat exchanger

A ventilator (340) for the outer discharge unit for blowing the air on the roof; And discharging the warmed outside air to the outside

An outer case discharging unit 540 and 570, a case cover 310 covering the upper end of the case 450,

A housing roof 370, a lid 370 for preventing intrusion of snow and rain leaking into the housing roof,

Jaws 550 and 560, a sealing material 320, 360, 390, and 530 such as rubber and silicone sealing the jaws for the room,

A heater (430) for protecting the PCB / devices, and a PCB / device (460) resistant to the external environment

A lower end shelf 480, an enclosure for receiving external air for cooling the PCB devices mounted on the lower end shelf

A rear door 580, an air blower 590 for increasing the cooling efficiency by speeding up the flow of the outside air,

The front side door 600 where the air cooled the shelf 480 is discharged, the heat exchange between the lower side shelf 480 and the system shelf

And a separating wall (440) for blocking the separating wall (440).

Referring to FIGS. 4 and 5, the operation of the communication equipment enclosure having the triple wall cooling device according to the present invention will be The enclosure is constructed by three walls of the left and right sides of the housing, and two air flow passages (400, 410, 510, 520)

. Here, the external air passages (410, 510) are arranged such that the external air is blown by the blower (340)

And the inner air passages 400 and 520 pass through only the top of the system shelf 490,

The air inside the enclosure is designed to flow from the upper end of the enclosure to the lower end by the ventilator (330). With this design,

The heat exchange efficiency in the heat exchange plates 420 and 500 at the left and right sides of the housing can be increased.

In addition, a triple-wall structure and a completely enclosed roof 370, a housing 450 and a ceiling 550,

And sealed with a sealing material such as a cone to have external air flow passages 410 and 510 and a sealing structure. In addition,

In order to prevent the water from flowing into the inside of the roof through the outer discharge portions 540,

The jaws 550 and 560 are provided on the front and rear surfaces of the housing and sealed.

In addition, the heat generator 430 is installed below the internal air inflow portion at the lower end of the system shelf 490,

In case you need heat. At this time, the heating unit has a large heating area and minimizes installation height

A plate-like heat generator 430 is used.

5, the external air introduced from the base of the housing is guided along the left and right passages 410 and 510,

And is discharged through the outer discharge units 540 and 570.

In addition, a partition wall 440 is provided under the plate-type heat generator 430 so that heat is transferred to the lower shelf under the housing, I will.

Here, the PCB device mounted on the lower shelf consumes high power and has a strong structure in the external environment

The outside air is directly blown from the rear door 580 to the front door 600 through the blower installed in the lower shelf,

Devices 460 are directly cooled.

While the present invention has been described and illustrated by way of example and with reference to the drawings, Various changes and modifications can be made within the scope of the technical idea of the present invention. This will be obvious. For example, instead of using a flat surface as a heat exchange plate, It is also possible to increase the rate.

Therefore, it should be understood that the present invention is not limited to the particular form set forth in the specification, The claimed invention is intended to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the present invention defined by the .

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It is to be understood that the invention includes equivalents and alternatives.

Effect of design

The present invention operates as described above, in which the air flow in the inside and the outside is opposite to each other in the left and right sides of the housing. The heat exchange efficiency is high in the heat exchange plate because the heat exchange is performed in the thin heat exchange plate.

Another effect of the present invention is that only the internal and external blowers are used to cool the enclosure, The reliability of the cooling of the furnace is enhanced, the after-service is easy, and a separate heat exchanger is not attached, The cost of the apparatus can be reduced, and the cooling apparatus can be lightened.

Another effect of the present invention is that the air flow passage in the inside and the outside is sealed by a triple wall structure, It is possible to maximize the efficiency of use of the machine, and even if snow or rain, it is possible to perform excellent rain.

Another effect according to the present invention is that a plate heater is adopted for keeping the system warm, Less resistance to airflow, and less risk of fire or burns than coil-type heaters.

(57) Claims

Claim 1

1. A communication equipment enclosure in which a plurality of PCBs and devices are mounted,

Left and right side walls of the case made of triple;

An outer air passage formed in the left and right side walls, respectively;

An inner air passage formed in the left and right side walls, respectively;

An upper fan operated so that outside air flows only from the lower end to the upper end of the housing through the outer air passage; And

The air inside the enclosure is operated to flow from the upper end to the lower end of the enclosure through the inner air passage And a stem shelf upper fan.

Claim 2

2. The airbag device according to claim 1, wherein the airbag is sealed between the enclosure, the enclosure loop, Heat dissipation device for enclosure.

Claim 3

The method according to claim 1,

A shelf outlet for discharging hot air of the system shelves upward;

The system shelves being spaced apart at regular intervals to cool the air exiting the shelf outlet Exchange plate;

An outer air passage through which the air for cooling the heat exchange plate flows from bottom to top;

An outer discharge unit for discharging air warmed up through the outer air passage; And

Further comprising a roof through which the air of the outer outlet portion escapes.

Claim 4

The heat exchanger according to claim 3, wherein the heat exchange plate is made of a material that is shielded from the outside to protect the PCB and the devices Heat dissipation device for communication equipment enclosure.

Claim 5

4. The apparatus of claim 3, wherein the shelf ejector comprises a blower for rapid airflow, Heat sink.

Claim 6

The heat dissipating device for a communication equipment enclosure according to claim 1, wherein the outside air flows into the outside air passage.

Claim 7

[5] The apparatus as claimed in claim 3, wherein the outer casing has a blower for rapid air flow,
Heat sink for communication equipment enclosure.

Claim 8

[4] The air conditioner according to claim 3, wherein the roof is provided with an air conditioner jaw so that air can escape and water can not enter,
Installed heat sink for communication equipment enclosure.

Claim 9

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The roof according to claim 8, wherein the roof is formed of a sealing material such as rubber or silicone on the right and left sides of the housing for preventing wa  
Heat sink for communication equipment enclosure.

Claim 10

The method according to claim 1,

A bottom shelf that houses PCBs and devices that consume high power and have a strong structure in the outside environment;

An air inflow part for introducing outside air into the lower end shelf; And

And an air discharging portion for discharging the introduced air to the outside.

Chi.

Claim 11

11. The system of claim 10, wherein the lower shelf comprises a lower shelf to prevent heat from being transferred to the system shelf,  
A heat dissipation device for a communication equipment enclosure, provided at the top of the shelf.

Claim 12

11. The apparatus of claim 10, wherein the air inlet comprises a triple-walled cooling device with an air blower for rapid airflow,  
. Heat dissipation device for communication equipment enclosure.

Claim 13

1. A communication equipment enclosure in which right and left side walls are made of triple and in which a plurality of PCBs and devices are mounted,  
System shelf;

A heat exchange plate surrounding the system shelves at regular intervals; And

And a heater for protecting the PCB and the devices at the time of the cold in the lower end of the heat exchange plate.  
Thermal device.

Claim 14

[14] The apparatus of claim 13, wherein the heat radiator has a plate-like shape to widen the heating area and minimize the installation height  
A heating device for a communication equipment enclosure.

drawing

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(19) 대한민국특허청(KR)  
(12) 공개실용신안공보(U)

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| (71) 출원인<br>삼성전자 주식회사 윤종용               |                                            |
| (72) 고안자<br>경기도 수원시 팔달구 매탄3동 416<br>서영배 |                                            |
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|                                         | 서울특별시 강동구 길동 342-46 송림파크빌라 102호<br>김영후     |
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| (74) 대리인<br>김성수                         | 경기도 성남시 분당구 구미동 41-5                       |

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(54) 통신장비 함체용 방열 및 발열 장치

요약

통신 장비 함체용 방열 및 발열장치에 대해 개시한다. 본 방열 장치는, 다수의 PCB와 장치가 장착되는 통신 장비 함체에 있어서, 3중으로 제작된 함체의 좌우측벽, 좌우측벽내에 각각 형성된 바깥쪽 공기통로, 좌우측벽내에 각각 형성된 안쪽 공기통로, 외부공기가 바깥쪽 공기통로를 통해 함체 하단에서 상단으로만 흐르도록 작동하는 상단부판 및 함체 내부공기가 안쪽 공기통로를 통해 함체 상단에서 하단으로만 흐르도록 작동하는 시스템 쉘프 상단부판을 구비하여 이루어진다. 그리고 본 발열장치는, 좌우측벽이 3중으로 제작되고, 다수의 PCB와 장치가 장착되는 통신 장비 함체에 있어서, 시스템 쉘프, 시스템 쉘프를 일정한 간격을 두고 둘러싼 열교환 판 및 열교환 판 하단에, 흡하기때 PCB와 장치들을 보호하기 위한 발열기를 구비하여 이루어진다.

도면

도1

도2

도면의 간단한 설명

도 1 은 종래의 통신 장비 함체 정면도이다.

도 2 는 종래의 다른 통신 장비 함체 우측면도이다.

도 3 은 종래의 대용량 통신 장비 함체 우측면도이다.

도 4 는 본 고안에 의한 통신 장비 함체의 정면도이다.

도 5 는 본 고안에 의한 통신 장비 함체의 우측면도이다.

<도면의 주요 부분에 대한 부호의 설명>

- |                   |             |
|-------------------|-------------|
| 10 : 냉각용 공기 흐름 통로 | 20 : 공기 흡입부 |
| 30 : 공기 배출부       | 40 : 외부 송풍기 |
| 50 : 함체 지붕        | 60 : 내부 송풍기 |
| 70 : 상단 쉘프        | 80 : 하단 쉘프  |

|                      |                      |
|----------------------|----------------------|
| 100 : 함체 지붕          | 110 : 냉각 장치          |
| 120 : 송풍기            | 130 : 방열 파이프         |
| 140 : 뒤틀문            | 150 : 함체             |
| 160 : 받침             | 170 : 앞 문            |
| 180 : 하단 쉘프          | 190 : PCB, 장치        |
| 200 : PCB, 장치        | 210 : 중단 쉘프          |
| 220 : 상단 쉘프          | 230 : 상단 냉각 장치       |
| 240 : 함체 지붕          | 310 : 함체 뚜껑          |
| 320 : 누수 방지용 고무, 실리콘 | 330 : 쉘프 배출부용 송풍기    |
| 340 : 외곽 배출부용 송풍기    | 360 : 누수 방지용 고무, 실리콘 |
| 370 : 함체 지붕          | 390 : 누수 방지용 고무, 실리콘 |
| 400 : 내부 공기 통로       | 410 : 외부 공기 통로       |
| 420 : 열교환 판          | 430 : 발열기            |
| 440 : 분리벽            | 450 : 함체             |
| 460 : PCB, 장치        | 470 : 받침             |
| 480 : 하단부 쉘프         | 490 : 시스템 쉘프         |
| 500 : 열교환 판          | 510 : 외부 공기 통로       |
| 520 : 내부 공기 통로       | 530 : 누수 방지용 고무, 실리콘 |
| 540 : 외곽 배출부         | 550 : 방우용 턱          |
| 560 : 방우용 턱          | 570 : 외곽 배출부         |
| 580 : 뒤틀문            | 590 : 송풍기            |
| 600 : 앞문             |                      |

#### 고안의 상세한 설명

##### 고안의 목적

##### 고안이 속하는 기술 및 그 분야의 종래기술

본 고안은 통신 장비 함체용 방열 및 발열장치에 관한 것이다. 특히 냉각 장치가 필요한 회로소자가 실장 되는 함체 자체의 벽과 송풍기(Fan)만을 이용한 새로운 방열 대류 구조를 사용하여 비교적 저전력을 소모하는 시스템(System)에서 안정적인 방열을 하는 3중벽 냉각 장치를 갖춘 통신 장비 함체에 관한 것이다.

도 1 은 종래의 통신 장비 함체의 정면도이다. 이를 참고로 종래의 통신 장비 함체를 설명하면, 종래의 함체는 각종 PCB(Printed Circuit Board), 장치(Unit)들이 실장 되는 상단 쉘프(70)와 하단 쉘프(80), 상기 쉘프에서 가열된 공기를 대류 시키기 위한 내부 송풍기(Fan : 60), 상기 가열된 공기를 냉각시키기 위한 공기가 흐르는 냉각용 공기 흐름 통로(10), 상기 냉각용 공기가 들어가는 함체 받침 쪽에 위치한 공기 흡입부(20), 상기 냉각용 공기가 냉각한 후 더워진 공기를 외부로 배출하기 위한 함체 지붕에 위치한 공기 배출부(30), 상기 더워진 공기를 신속히 움직이게 하는 외부 송풍기(40)와 함체를 비로부터 보호하는 함체 지붕(50)을 구비하여 이루어진다.

상기 함체의 냉각 과정을 도 1 을 참고로 설명하면, 상단·하단 쉘프(70, 80)에 실장된 각종 PCB와 장치들에 의해 더워진 공기는 함체 내부에 존재하는 내부 송풍기(60)에 의해 대류 한다. 상기 대류 하는 더워진 공기는 쉘프(70, 80)와 공기 흐름 통로(10) 사이의 열교환 판을 통해 냉각된다. 이때 더워진 공기를 냉각시키는 공기는 함체 하단에 존재하는 공기 흡입부(20)를 통해 외부에서 공급된다.

이처럼 쉘프의 더운 공기와 외부의 찬 공기가 열교환 판을 통해 열교환이 이루어지면, 송풍기로 인한 강제 대류 현상에 의해 쉘프의 공기는 아래로 내려가고, 외부 공기는 위로 올라간다. 이때, 쉘프와 함체 지붕에 송풍기(60, 40)를 달면, 빠른 냉각과 대류가 일어난다.

도 2 는 다른 종래의 통신 장비 함체 우측면도이고, 도 3 은 대용량 통신 장비 함체의 우측면도이다. 이를 참고로 종래의 다른 함체의 구성을 설명하면, 종래 함체(150)는, 상·중·하단 쉘프(200, 210, 180)에 실장되는 각종 통신용 PCB·장치(190,200), 상기 장치에서 나오는 더워진 공기를 냉각 장치(110)로 끌어들이는 송풍기(120), 상기 더워진 공기를 냉각하는 냉각 장치(110)를 구성하는 방열 파이프(130), 상기 방열 파이프(130)로 외부의 찬 공기를 끌어들이는 뒤틀문(140), 상기 함체를 받치는 받침(160), 앞문(170)과 함체를 눈·비로부터 보호하는 함체 지붕(100)을 구비하여 이루어진다.

그리고, 도 3 의 경우처럼 전력 소모가 큰 시스템에 적용하는 대용량 함체는 일반 함체의 지붕(240)에

별도의 상단 냉각 장치(230)를 하나 더 부착한 것으로, 냉각 장치의 방열 원리는 일반 함체에 사용되는 냉각 장치의 원리와 동일하다.

상기 함체를 도 2를 참고로 설명하면, 밀폐된 함체(150) 내부에는 상하로 연속적으로 실장되는 다수의 쉘프(220, 210, 180)가 있는데 PCB 및 장치(190, 200)들은 이 쉘프 속에 좌우로 나란히 다수개가 실장된다. 그리고 냉각 장치(110)는 함체의 뒷문(140)에 장착되어 도 2에 나타난 공기 흐름처럼 함체 내부의 열이 함체 외부로 전달되게 된다.

상기 공기 흐름과 방열 구조는 냉각 장치(110) 내부에 조립된 방열 파이프(130)에 의하여 함체 내·외부의 열교환이 이루어지는데 각 PCB와 장치(190, 200)에서 발생한 열은 냉각 장치(110)에 부착된 송풍기(120)에 의하여 송풍되어 화살표 방향으로 이동하는 흐름이 진행된다. 냉각 장치(110) 내부의 방열 파이프(130)를 통과하는 열은 외부의 저온 공기 흐름에 의해 냉각되고 함체 하단부로 계속 이동하게 된다. 그리고 이와 같은 공기 흐름은 냉각 장치(110) 내부의 송풍기(120)에 의해 송풍이 계속되면서 순환하게 되고 따라서 함체 외부와 열교환이 이루어지게 되는 것이다.

그러나, 상기 함체는 냉각 장치를 보통 에어컨디셔너(Air conditioner)나 열교환기를 사용하게 되는데 에어컨디셔너의 경우 신뢰성과 내구성에 문제가 있고, 에어컨디셔너 자체가 무겁고 고가가 되기 쉬우며 구조가 복잡하고 애프터서비스(After-Service) 측면에서도 많은 비용이 발생한다. 열교환기는 신뢰성과 내구성은 에어컨디셔너에 비해 다소 향상되나 여전히 무겁고 구조가 복잡하며 고가가 되는 문제점이 있다.

#### 고안이 이루고자하는 기술적 과제

따라서 본 고안은 상기와 같은 문제점을 해결하기 위하여, 냉각 장치의 신뢰성, 내구성, 제조 비용, 냉각 장치의 자체 무게, 애프터서비스의 용이성을 높인 3중벽 냉각 장치를 갖춘, 통신 장비 함체용 방열 및 발열장치를 제공하는 것을 목적으로 한다.

본 고안의 다른 목적은 냉각 장치가 필요한 PCB와 장치가 실장되는 함체 자체의 벽과 송풍기만을 이용한 새로운 방열 대류 구조를 실현하여 비교적 저전력을 소모하는 시스템에서 안정적인 방열을 하는 3중벽 냉각 장치를 갖춘 통신 장비 함체를 제공하는 것이다.

본 고안의 다른 목적과 장점은 아래의 고안의 상세한 설명을 읽고 아래의 도면을 참조하면 보다 명백해질 것이다.

#### 고안의 구성 및 작용

상기와 같은 목적을 달성하기 위하여 본 고안에 따른 통신 장비 함체용 방열장치의 바람직한 실시예는, 다수의 PCB와 장치가 장착되는 통신 장비 함체에 있어서,

3중으로 제작된 상기 함체의 좌우측벽;

상기 좌우측벽내에 각각 형성된 바깥쪽 공기통로;

상기 좌우측벽내에 각각 형성된 안쪽 공기통로;

외부공기가 상기 바깥쪽 공기통로를 통해 상기 함체 하단에서 상단으로만 흐르도록 작동하는 상단부팬; 및

상기 함체 내부공기가 상기 안쪽 공기통로를 통해 상기 함체 상단에서 하단으로만 흐르도록 작동하는 시스템 쉘프 상단부팬을 구비하여 이루어진다.

본 실시예에 있어서, 공기 누수를 막기위해 상기 함체, 함체 루프 및 외부상판 사이를 밀봉처리하는 것이 바람직하며,

상기 쉘프 배출부를 통해 나온 공기를 냉각하기 위해 상기 시스템 쉘프를 일정한 간격을 두고 둘러싼 열교환 판;

상기 열교환 판을 냉각하기 위한 공기가 아래로부터 위로 흐르는, 외곽 공기 통로;

상기 외곽 공기 통로를 통해 더워진 공기를 위로 배출하는 외곽 배출부; 및

상기 외곽 배출부의 공기가 빠져나가는 지붕을 더 구비하는 것이 바람직하며,

상기 열교환 판은, PCB와 장치들을 외부 환경으로부터 보호하기 위해 외부와 차단되는 것이 바람직하며,

상기 쉘프 배출부는, 공기의 신속한 흐름을 위해 송풍기를 구비하는 것이 바람직하며,

외부공기는 상기 바깥쪽 공기 통로로 유입되는 것이 바람직하며,

상기 외곽 배출부는 공기의 신속한 흐름을 위해 송풍기를 구비하는 것이 바람직하며,

상기 지붕에는 공기는 빠져나가고 물은 들어올 수 없도록 방우용 턱이 함체의 전후면에 설치되는 것이 바람직하며,

상기 지붕은 누수 방지를 위해 함체 좌우측에 고무나 실리콘 등의 밀봉재로 밀봉처리가 되는 것이 바람직하며,

고전력을 소모하면서 외부환경에는 강한 구조를 가지고 있는 PCB와 장치들을 장착하는 하단부 쉘프;

상기 하단부 쉘프로 외부의 공기를 유입하는 공기 유입부; 및

상기 유입된 공기를 외부로 배출하는 공기 배출부를 더 구비하는 것이 바람직하며,

상기 하단부 쉘프는, 시스템 쉘프로 열이 전달되는 것을 막기 위해 분리벽을 하단부 쉘프의 상단에 구비하는 것이 바람직하며,

상기 공기 유입부는, 공기의 신속한 흐름을 위해 송풍기를 구비하는 것이 바람직하다.

상기한 다른 목적을 달성하기 위한 본 고안에 따른 통신 장비 합체용 발열장치의 바람직한 실시예는, 좌우측벽이 3층으로 제작되고, 다수의 PCB와 장치가 장착되는 통신 장비 합체에 있어서,

시스템 쉘프;

상기 시스템 쉘프를 일정한 간격을 두고 둘러싼 열교환 판; 및

상기 열교환 판 하단에, 축전기때 PCB와 장치들을 보호하기 위한 발열기를 구비한다.

본 실시예에 있어서, 상기 발열기는, 발열 면적을 넓게 하고 설치 높이를 최소화하기 위해 판 모양으로 이루어지는 것이 바람직하다.

하기 설명에서 본 고안의 바람직한 실시예에 따른 3중벽 냉각 장치를 갖춘 통신 장비 합체가 첨부된 도면을 참조로, 3중벽의 구조와 기능 등과 같은 많은 특정 상세들이 본 고안의 보다 전반적인 이해를 제공하기 위해 나타나 있다. 그러나, 당해 기술분야에 숙련된 자들에게 있어서는 본 고안이 이러한 상세한 항목들이 없어도 상기한 본 고안의 기술적 사상에 의해 충분히 실시될 수 있다는 것이 명백할 것이다.

또한, 잘 알려진 통신 장비 합체의 특징 및 기능들은 본 고안을 모호하지 않게 하기 위해 상세히 설명하지 않으며, 동일 용어에 대해서는 설명 및 이해의 편의상 영문 이니셜 또는 국어 해석용어를 병용한다.

도 4 는 본 고안에 의한 통신 장비 합체의 정면도이고, 도 5 는 그 우측면도이다. 상기 도면을 참고로 본 고안의 구성을 설명하면, 본 고안에 의한 3중벽 냉각 장치를 갖춘 통신 장비 합체(450)는,

외부 환경에 민감한 PCB와 장치들을 실장하는 시스템 쉘프(System Shelf : 490), 상기 시스템 쉘프에서 나오는 더운 공기를 쉘프 배출부로 송풍시키는 쉘프 배출부용 송풍기(Fan : 330), 상기 내부 공기 통로(400, 520)의 더운 공기를 냉각시키기 위해 시스템 쉘프(490)를 일정한 간격을 두고 둘러싼 열교환 판(420, 500), 상기 더운 공기를 냉각시키기 위한 외부 공기가 지나가는 외부 공기 통로(410, 510), 상기 외부 공기가 유입되는 통로가 구비된 합체 받침(Plinth : 470), 내부 공기와의 열교환으로 더워진 외부 공기를 지붕위로 송풍시키는 외곽 배출부용 환풍기(340); 상기 더워진 외부 공기를 외부로 배출하는 외곽 배출부(540, 570), 합체(450)의 상단을 덮는 합체 뚜껑(310), 상기 합체를 눈·비로부터 보호하는 합체 지붕(370), 상기 합체 지붕으로 누수 되는 눈·비의 침입을 막는 뚜껑(370)내에 존재하는 방우용 턱(550, 560), 상기 방우용 턱을 밀봉하는 고무·실리콘 등의 밀봉재(320, 360, 390, 530), 축전기 때의 PCB·장치들을 보호하기 위한 발열기(430), 외부 환경에 대한 내성이 강한 PCB·장치(460)들을 실장하는 하단부 쉘프(480), 상기 하단부 쉘프에 실장된 PCB·장치들을 냉각하기 위한 외부 공기가 들어오는 합체 뒷문(580), 상기 외부 공기의 흐름을 빨리 하여 냉각 효율을 높이는 송풍기(590), 상기 하단부 쉘프(480)를 냉각시킨 공기가 나가는 합체 앞 문(600)과 상기 하단부 쉘프(480)와 시스템 쉘프의 열교환을 막는 분리벽(440)을 구비하여 이루어진다.

본 고안에 의한 3중벽 냉각 장치를 갖춘 통신 장비 합체의 동작을 도 4 와 도 5 를 참고로 설명하면, 본 합체는 합체 좌우측의 벽을 3층으로 제작하여 공기 흐름 통로 2개(400, 410, 510, 520)를 좌우측에 각각 형성한다. 여기서 외부 공기 통로(410, 510)는 외부공기가 외곽 배출부용 송풍기(340)에 의해 합체 하단에서 상단으로만 흐르며 내부 공기 통로(400, 520)는 시스템 쉘프(490) 바로 위에 장착된 쉘프 배출부용 환풍기(330)에 의해 합체 내부 공기가 합체 상단에서 하단 방향으로 흐르게 설계된다. 이처럼 설계하면, 합체 좌우측의 열교환 판(420, 500)에서의 열교환 효율을 크게 할 수 있다.

또한 3중벽 구조이면서도 완벽하게 합체 지붕(370)과 합체(450) 및 방우용 턱(550, 560)을 고무나 실리콘 등의 밀봉재로 밀봉 처리하여 외부 공기 흐름 통로(410, 510)와 밀봉 구조를 갖춘다. 또한 방우 기능을 강화하기 위하여 외곽 배출부(540, 570)를 통해 물이 지붕 안쪽으로 유입되는 것을 막기 위해 방우용 턱(550, 560)을 합체의 전후면에 설치하고 밀봉한다.

그리고, 발열기(430)를 시스템 쉘프(490) 하단부의 내부 공기 유입부 아래에 설치하여 축전시에 시스템에 열이 필요한 경우를 대비한다. 이때의 발열기는 발열 면적을 넓게 하고, 설치높이는 최소화하기 위해 판 모양의 발열기(430)를 사용한다.

도 5 에 나타난 바와 같이 합체의 받침에서 유입된 외부 공기는 좌우통로(410, 510)를 따라 지붕(370)의 외곽 배출부(540, 570)를 거쳐 배출된다.

또한 판형 발열기(430) 아래에는 분리벽(440)이 있어 합체 아래의 하단부 쉘프에 열이 전달되는 것을 차단한다.

여기서 하단부 쉘프에 실장되는 PCB·장치는 고전력을 소모하면서 외부 환경에는 강한 구조를 가진 것으로 하단부 쉘프에 장착된 송풍기를 통해 뒷문(580)에서 앞 문(600)으로 외부 공기를 직접 송풍하여 발열 장치(460)들이 직접 냉각한다.

상기의 설명에서 본 고안을 도면을 중심으로 예를 들어 설명하고 한정하였지만, 본 분야의 통상의 지식을 가진 자에게는 본 고안의 기술적 사상을 벗어나지 않는 범위 내에서 여러 가지 변화와 변형이 가능함이 명백할 것이다. 예를 들어 열교환 판을 평평한 면으로 하지 않고 주름을 주어 접촉면을 높여 냉각 효율을 높이는 것도 가능할 것이다.

따라서, 본 고안은 명세서에서 언급된 특별한 형태로 한정되는 것이 아닌 것으로 이해되어야 하며, 오히려 본 고안은 첨부된 청구범위에 의해 정의된, 본 고안의 기술적 사상과 범위 내에 있는 모든 변형물,

균등을 및 대체물을 포함하는 것으로 이해되어야 한다.

#### 고안의 효과

상기와 바와 같이 동작하는 본 고안은, 내·외부의 공기 흐름이 함체 좌·우측에서 서로 반대 방향으로 흐르면서 두께가 얇은 열교환 판에서 열교환이 이루어지므로 열교환 판에서의 열교환 효율이 높다.

본 고안에 의한 다른 효과는, 내·외부 송풍기만을 사용하여 함체를 냉각시키므로 단순한 냉각 장치 구조로 냉각의 신뢰성이 높아지고, 애프터서비스가 용이하고, 별도의 열교환 장치를 부착하지 않아 냉각 장치 원가가 절감되고, 냉각 장치의 경량화가 가능하다.

본 고안에 의한 또 다른 효과는, 3중벽 구조이면서도 내·외부의 공기 흐름 통로를 밀봉 처리하여 송풍기의 사용효율을 극대화할 수 있고, 눈·비가 오더라도 우수한 방수가 가능하다.

본 고안에 의한 또 다른 효과는, 시스템 보온을 위하여 판형 발열기를 채택하여 함체 높이를 크게 높이지 않아도 되고, 공기 흐름상의 저항이 적고, 코일형 발열기에 비해 화재나 화상의 위험이 적다.

#### (57) 청구의 범위

##### 청구항 1

다수의 PCB와 장치가 장착되는 통신 장비 함체에 있어서,

3중으로 제작된 상기 함체의 좌우측벽;

상기 좌우측벽내에 각각 형성된 바깥쪽 공기통로;

상기 좌우측벽내에 각각 형성된 안쪽 공기통로;

외부공기가 상기 바깥쪽 공기통로를 통해 상기 함체 하단에서 상단으로만 흐로도록 작동하는 상단부팬; 및

상기 함체 내부공기가 상기 안쪽 공기통로를 통해 상기 함체 상단에서 하단으로만 흐로도록 작동하는 시스템 쉘프 상단부팬을 구비하는, 통신 장비 함체용 방열장치.

##### 청구항 2

제 1 항에 있어서, 공기 누수를 막기위해 상기 함체, 함체 루프 및 외부상판 사이를 밀봉처리한, 통신 장비 함체용 방열장치.

##### 청구항 3

제 1 항에 있어서,

상기 시스템 쉘프의 더운 공기를 위로 배출하는 쉘프 배출부;

상기 쉘프 배출부를 통해 나온 공기를 냉각하기 위해 상기 시스템 쉘프를 일정한 간격을 두고 둘러싼 열교환 판;

상기 열교환 판을 냉각하기 위한 공기가 아래로부터 위로 흐르는, 외곽 공기 통로;

상기 외곽 공기 통로를 통해 더워진 공기를 위로 배출하는 외곽 배출부; 및

상기 외곽 배출부의 공기가 빠져나가는 지붕을 더 구비하는, 통신 장비 함체용 방열장치.

##### 청구항 4

제 3 항에 있어서, 상기 열교환 판은, PCB와 장치들을 외부 환경으로부터 보호하기 위해 외부와 차단된, 통신 장비 함체용 방열장치.

##### 청구항 5

제 3 항에 있어서, 상기 쉘프 배출부는, 공기의 신속한 흐름을 위해 송풍기를 구비한, 통신 장비 함체용 방열장치.

##### 청구항 6

제 1 항에 있어서, 외부공기는 상기 바깥쪽 공기 통로로 유입되는, 통신 장비 함체용 방열장치.

##### 청구항 7

제 3 항에 있어서, 상기 외곽 배출부는 공기의 신속한 흐름을 위해 송풍기를 구비한, 통신 장비 함체용 방열장치.

##### 청구항 8

제 3 항에 있어서, 상기 지붕에는 공기는 빠져나가고 물은 들어올 수 없도록 방우용 턱이 함체 전후면에 설치된, 통신 장비 함체용 방열장치.

##### 청구항 9

제 8 항에 있어서, 상기 지붕은 누수 방지를 위해 함체의 좌우측에 고무나 실리콘 등의 밀봉재로 밀봉처리가 된, 통신 장비 함체용 방열장치.

**청구항 10**

제 1 항에 있어서,

고전력을 소모하면서 외부환경에는 강한 구조를 가지고 있는 PCB와 장치들을 장착하는 하단부 셸프;

상기 하단부 셸프로 외부의 공기를 유입하는 공기 유입부; 및

상기 유입된 공기를 외부로 배출하는 공기 배출부를 더 구비하여 이루어지는, 통신 장비 함체용 방열장치.

**청구항 11**

제 10 항에 있어서, 상기 하단부 셸프는, 시스템 셸프로 열이 전달되는 것을 막기 위해 분리벽을 하단부 셸프의 상단에 구비한, 통신 장비 함체용 방열장치.

**청구항 12**

제 10 항에 있어서, 상기 공기 유입부는, 공기의 신속한 흐름을 위해 송풍기를 구비한, 3중벽 냉각 장치를 갖춘 통신 장비 함체. 통신 장비 함체용 방열장치.

**청구항 13**

좌우측벽이 3중으로 제작되고, 다수의 PCB와 장치가 장착되는 통신 장비 함체에 있어서,

시스템 셸프;

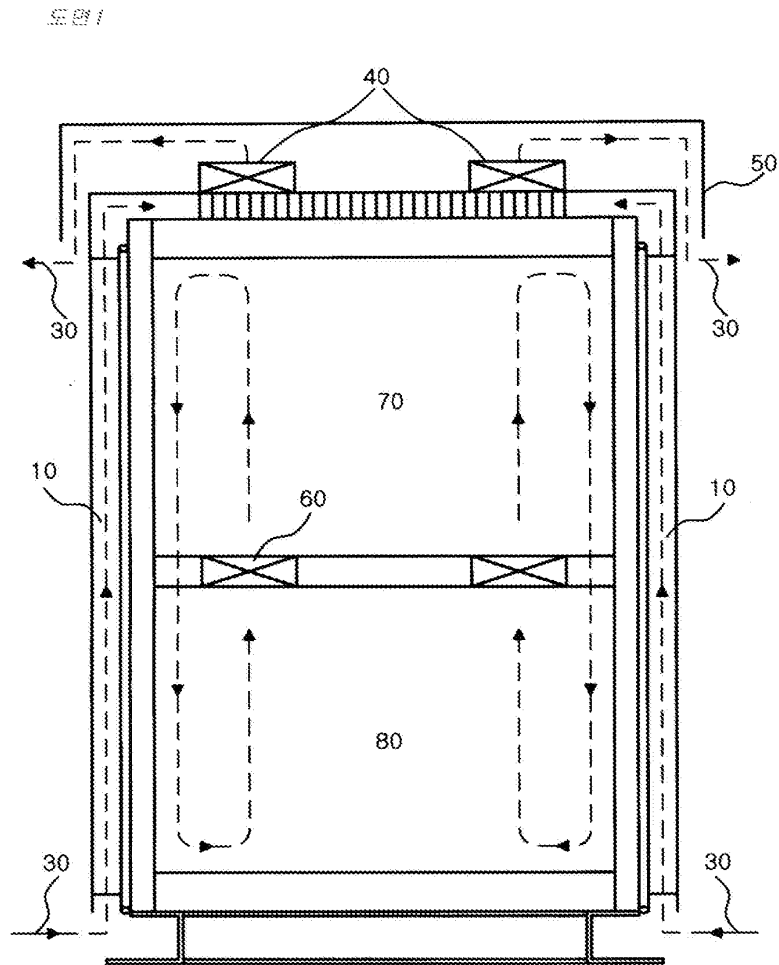
상기 시스템 셸프를 일정한 간격을 두고 둘러싼 열교환 판; 및

상기 열교환 판 하단에, 축한기때 PCB와 장치들을 보호하기 위한 발열기를 구비한, 통신 장비 함체용 방열장치.

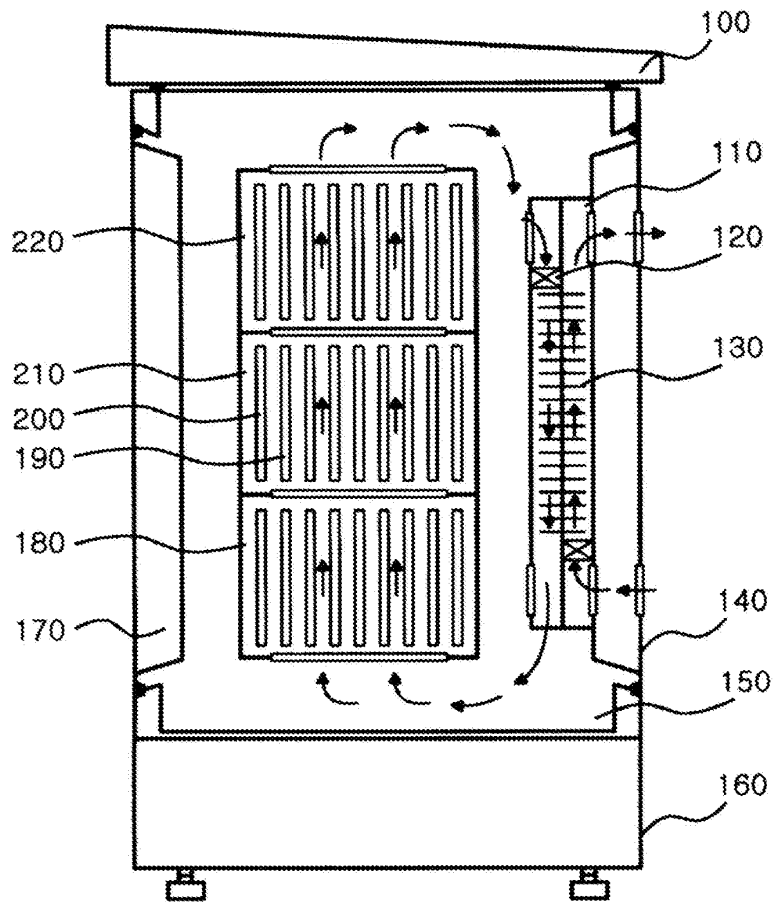
**청구항 14**

제 13 항에 있어서, 상기 발열기는, 발열 면적을 넓게 하고 설치 높이를 최소화하기 위해 판 모양으로 이루어진, 통신 장비 함체용 방열장치.

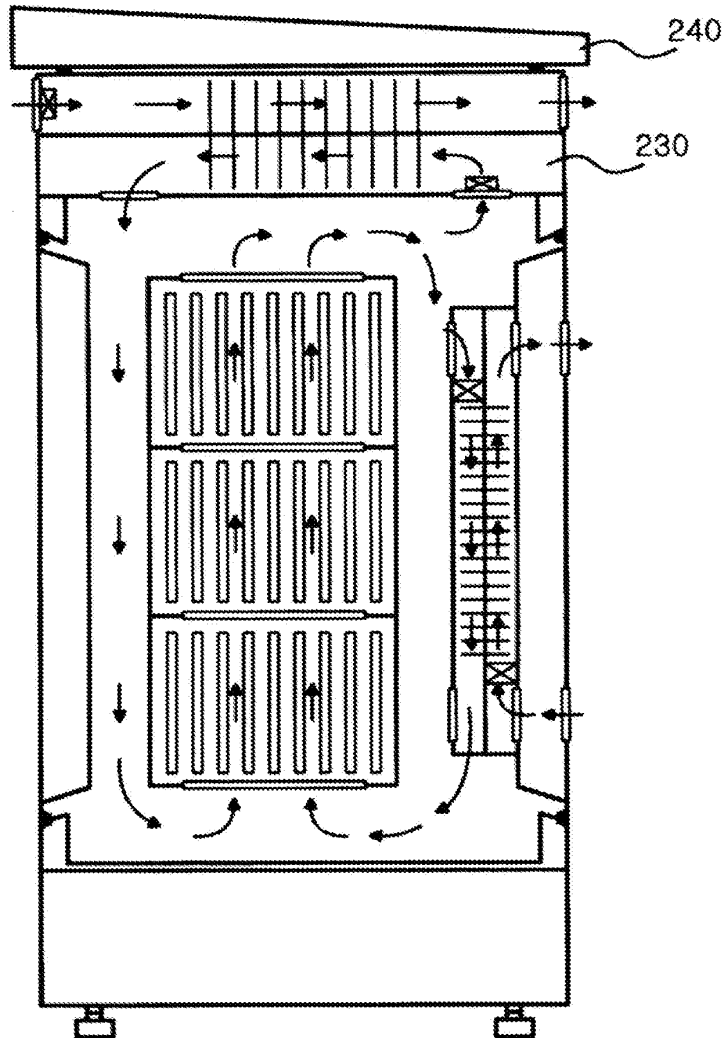
END



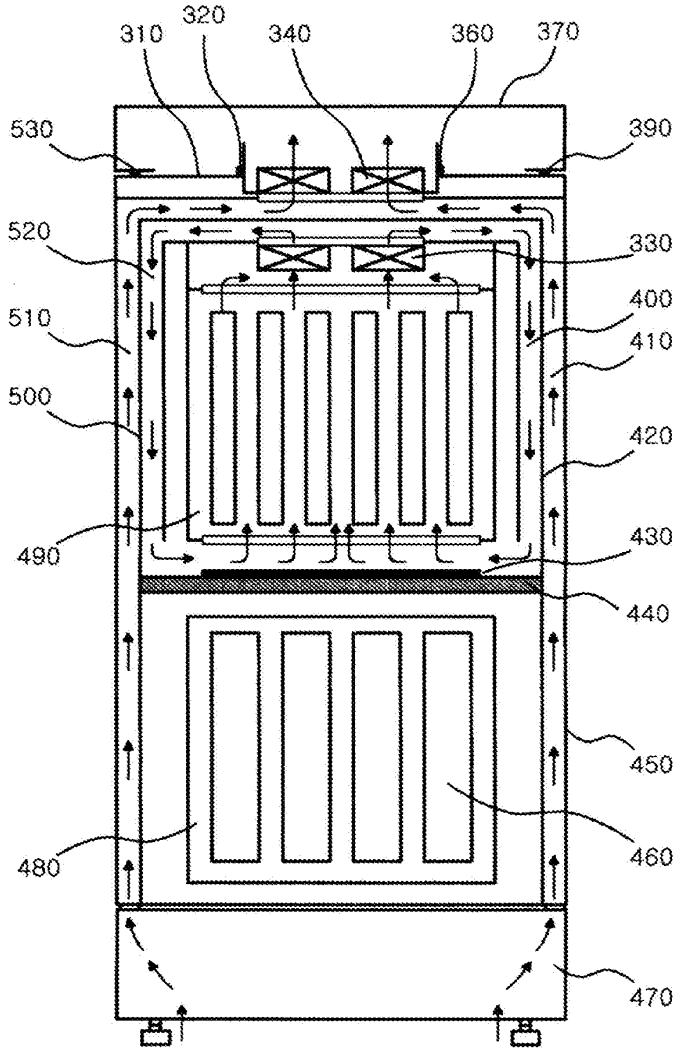
도 82

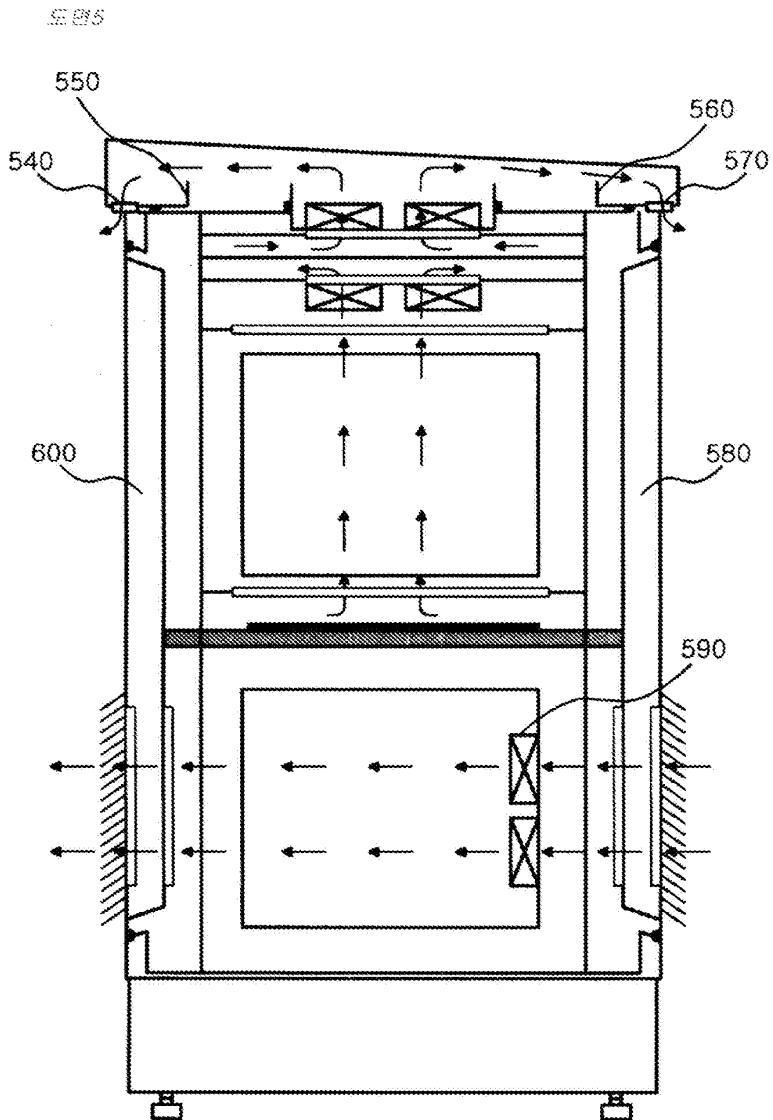


도 80



도 84





| Electronic Patent Application Fee Transmittal |          |                                 |        |                      |
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| Extension-of-Time:                            |          |                                 |        |                      |

| Description                             | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|-----------------------------------------|----------|----------|--------|----------------------|
| <b>Miscellaneous:</b>                   |          |          |        |                      |
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| <b>Application Number:</b>                  | 15789331                        |
| <b>International Application Number:</b>    |                                 |
| <b>Confirmation Number:</b>                 | 2408                            |
| <b>Title of Invention:</b>                  | ELECTRONIC DISPLAY WITH COOLING |
| <b>First Named Inventor/Applicant Name:</b> | William Dunn                    |
| <b>Customer Number:</b>                     | 8698                            |
| <b>Filer:</b>                               | Eric Michael Gayan/Brianna Lacy |
| <b>Filer Authorized By:</b>                 | Eric Michael Gayan              |
| <b>Attorney Docket Number:</b>              | MAN2241-045P                    |
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| <b>Time Stamp:</b>                          | 11:04:59                        |
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### Payment information:

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| Payment was successfully received in RAM                                                                                                                                                                                                                                       | \$ 240                      |
| RAM confirmation Number                                                                                                                                                                                                                                                        | 050219INTEFSW00010719194076 |
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| Authorized User                                                                                                                                                                                                                                                                | Brianna Lacy                |
| <p>The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:</p> <p>37 CFR 1.16 (National application filing, search, and examination fees)</p> <p>37 CFR 1.17 (Patent application and reexamination processing fees)</p> |                             |

**File Listing:**

| Document Number              | Document Description                               | File Name                        | File Size(Bytes)/<br>Message Digest      | Multi Part /.zip | Pages (if appl.) |
|------------------------------|----------------------------------------------------|----------------------------------|------------------------------------------|------------------|------------------|
| 1                            | Information Disclosure Statement (IDS) Form (SB08) | MAN2241_045P_Supp_IDS_5-2-19.pdf | 612344                                   | no               | 4                |
|                              |                                                    |                                  | d0b8c94e4e0b45ae787d64b8523c1b3fec6f05b2 |                  |                  |
| Warnings:                    |                                                    |                                  |                                          |                  |                  |
| Information:                 |                                                    |                                  |                                          |                  |                  |
| 2                            | Foreign Reference                                  | KR1020000047899A.pdf             | 587377                                   | no               | 35               |
|                              |                                                    |                                  | 8a5dea68cfa908e2839cb4473809b9cbdfce0700 |                  |                  |
| Warnings:                    |                                                    |                                  |                                          |                  |                  |
| Information:                 |                                                    |                                  |                                          |                  |                  |
| 3                            | Foreign Reference                                  | KR2020000000118U.pdf             | 1527869                                  | no               | 18               |
|                              |                                                    |                                  | 788656c1f90bad847948ac7d0413fe2aef0f43ae |                  |                  |
| Warnings:                    |                                                    |                                  |                                          |                  |                  |
| Information:                 |                                                    |                                  |                                          |                  |                  |
| 4                            | Fee Worksheet (SB06)                               | fee-info.pdf                     | 30528                                    | no               | 2                |
|                              |                                                    |                                  | ed063e2810a7f7b9f2013391233cc8100b1e4357 |                  |                  |
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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.

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