

DESCRIPTION

SMART SERVER CABINET

Technical Field

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This invention is related to an environmental monitoring unit integrated on the cabinet door and a system structured on a new generation server cabinet as an enhancement for server cabinets used in data processing centers.

- 10 The invention is a system that monitors the state of the airflow in the server cabinet, the fan speeds, heat/humidity, the cabinet door, flooding in the cabin floor in order to display the same by means of an LCD screen within its body and notify a remote central software via the internet.

15 Prior Art

- Although there are many domestic server cabinet manufacturers today, competition with foreign competitors is mainly based on low pricing. Moreover, adding an environmental monitoring unit to the server cabinet after assembly
- 20 increases costs. Thus, in such a state, possibility of competition with foreign products is slim. For this reason, a server cabinet with a server built-in environmental monitoring system enables costs to be reduced and competitive power to be increased.

- 25 Taiwanese patent document number TW201318543 of the known state of the art describes a server cabinet. The server cabinet consists of support plates, a cooling device and a body.

- United States patent document number US2013155608 of the known state of the
- 30 art describes a rack-mount server cabinet. The invention consists of a fan module, mounting brackets, and a control box to control the power supply to the fans.

Turkish patent document number 2011/08109 of the known state of the art describes a server cabinet that is configured to ensure that the hardware network or server used in computer and telecommunication systems that stores information on enterprises in such a central point, that distributes the said information to its branches and customers from this central point, that carries out this task of storing information at a center, that should be continuously operating, that enables sharing or distribution of information or a program to multiple users over a network that operates trouble-free; that protects the server against external factors; that ensures it operates in a safe manner and at optimum conditions; and ensures it serves multiple users; and is characterized in that it contains (1) a door, a side door (2), a pillar (3), a roof (4), a coupling piece (5), a horizontal regulator (6), rear door (7), face label (8), rear pillar (9), front pillar (10) and floor (11).

With respect to the above mentioned documents, an integrated solution in terms electronic systems of a product and server cabinets that carry out power measurements for each socket has not been developed. The server cabinets are formed of mechanical equipment and smart features are added at a later stage. A server cabinet that can calculate the amount of airflow passing through it, measure fan speeds, measure heat and humidity limits, and notify an authorized/unauthorized opening of the cabinet has not been developed. A server cabinet that provides a smart system that is compatible and integrated with the other mechanical equipment used in the server cabinet has not been developed.

Objectives of the Invention

The primary objective of this invention is to provide a server cabinet that is more functional and equipped with smart features. An electronic unit integrated on the server cabinet door can be found. Sensors for detecting heat and humidity, fan speeds, door switches, airflow, flooding in the floor are found inside the server cabinet. These activities within the server cabinet can be measured and the

measurements can be displayed on the touchscreen LCD monitor. Another objective is to provide a system that enables the transfer of these information displayed on the touchscreen LCD monitor to a remote server over the internet or intranet.

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Another objective of the invention is to provide a system that enables remote notification to prevent the vibrations transmitted to the server cabinet body from also damaging the other servers due to factors such as ageing at the hard disks and server fans of the servers within the cabinet.

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Another objective of the invention is to provide a system that can send out notifications via e-mail and snmp in emergency situations in the event of the abovementioned damaging factors occurring at the server cabinets.

15 **Detailed description of the invention**

The smart server cabinet provided to achieve the objective of the invention is shown in the attached figures for which the details have been provided below:

20 **FIGURE-1** A perspective view of the system of the smart server cabinet.

FIGURE-2 A top view of the main circuit element of the smart server cabinet.

The parts in the figures have been numbered and these numbers correspond to the below:

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1- Server cabinet

2- Main circuit

3- Cabinet fans

4- Electro mechanic cabinet door lock

30 5- Cabinet floor flooding sensor

6- Vibration sensor

- 7- Heat/humidity sensor
- 8- Cabinet door
- 9- Ethernet unit
- 10- Microprocessor
- 5 11- USB OTG filter unit
- 12- USB mini protection unit
- 13- Op-amp
- 14- Memory
- 15- Touchscreen LCD monitor
- 10 16- Main circuit board
- 17- Supply unit
- 18- Battery
- 19- Ethernet link connector
- 20- USH OTH input connector
- 15 21- USB mini input connector
- 22- Fan speed input connector
- 23- Digital input connector
- 24- Heat/humidity sensor link connector

20 The smart server cabinet (1) of the invention consists of:

- A main circuit (2) consisting of an Ethernet unit(9), a microprocessor (10), a USB OTG filter unit (11), a USB mini protection unit (12), an op-amp (13), a memory (14), a touchscreen LCD monitor (15), a main circuit board (16), a supply unit (17), a battery (18), an Ethernet link connector (20), a USH OTH input connector (21), a USB mini input connector (22), a fan speed input connector (23), a digital input connector (24), a heat/humidity sensor link connector (25),
- A cabinet fan (3) that enables the circulation of air within the cabinet,
- A cabinet door lock (4) that prevents unauthorized opening of the cabinet door,

- A cabinet floor flooding sensor (5) that provides a warning when water is detected on the floor of the cabinet,
- A vibration sensor (6) that is able to detect when the vibration level is higher than a predetermined vibration level and send an emergency warning notification to the remote server via internet/intranet,
- A heat/humidity sensor (7) that is able to detect when the heat/humidity level is higher than a predetermined level and send an emergency warning notification to the remote server via internet/intranet,
- A cabinet door (8) allowing entry to and exit from the cabinet,
- An Ethernet unit (9) that enables the signal received from the Ethernet link connector (20) to be digitized and sent to the microprocessor,
- A microprocessor (10) that enables the speed of the cabinet fans (3) on the main circuit to be measured,
- A USB OTG filter unit (11) that filters the electrical interference from the USB connections,
- A USB mini protection unit (12) that filters the electrical interference from the USB connections,
- An op-amp (13) that amplifies the fan speed signals received from the fan speed input connector (23) and transfers them to the microprocessor element,
- A memory element (14) wherein all setting processes are transferred to the microprocessor,
- A touchscreen LCD monitor (15) wherein data entry is inputted and wherein alarm and sensory information is displayed,
- A main circuit board (16) on which circuits are set onto,
- A supply unit (17) which provides the supply voltage required to operate the main circuit (2),
- A battery (18) that enables the time and date information to be transferred to the microprocessor,
- An Ethernet connector (19) that enables internet and intranet connections to be made,

- A USB OTH input connector (20) that enables external hard disks to be read and for configurations to be copied,
- A USB mini input connector (21) that enables connection with an external computer to be established,
- 5 - A fan speed input connector (22) that enables the fan speed signal to be amplified by means of the op-amp and for it to be transferred to the microprocessor element,
- A digital input connector (23) that is located on the main circuit (2) and which connects the cabinet floor flooding sensor (5) to the main circuit
- 10 (2) and
- A heat/humidity sensor link connector (24) that connects the heat and humidity sensor link connector (7) to the main circuit (2).

The smart server cabinet (1) consists of the below main elements: a main circuit

15 (2), cabinet fans (3), an electro mechanic cabinet door lock (4), a cabinet floor flooding sensor (5), a vibration sensor (6), a heat/humidity sensor (7) and a cabinet door (8).

The main circuit (2) of the smart server cabinet consists of the below main

20 elements: an Ethernet unit (9), microprocessor (10), a USB OTG filter unit (11), a USB mini protection unit (12), an op-amp (13), a memory (14), a touchscreen LCD monitor (15), a main circuit board (16), a supply unit (17), a battery (18), an Ethernet link connector (19), a USB OTH input connector (20), a USB mini input connector (21), a fan speed input connector (22), a digital input connector (23) and

25 a heat/humidity sensor link connector (24).

The supply voltage required for the operation of the 5VDC main circuit (5) received from a USB output on any server on the server cabinet (1) or power distribution panel within the server cabinet (1) is supplied by means of the supply

30 unit (17). The speed of the cabinet fans (3) within the server cabinet (1) is measured by the microprocessor (10) on the main circuit to calculate the air mass

within the cabinet. In accordance with the air mass and measurements obtained from the heat/humidity sensor (7) the fans are either shut down or activated. By this means, energy saving is provided. The connection of the cabinet fans (3) with the main circuit (2) is provided by means of the fan speed input connector (22).

5 Control of the electro mechanic cabinet door lock (4) is provided by means of password entry using the touchscreen LCD monitor (15) on the main circuit (2) and thus, unauthorized opening of the cabinet door (8) is prevented. The cabinet floor flooding sensor (5) is connected to the main circuit (2) by means of the digital input connector (23) on the main circuit. As a result of flooding being

10 detected by the cabinet floor flooding sensor (5), the microprocessor (10) on the main circuit sends an emergency warning notification to the remote server so that the servers within the server cabinet (1) are not damaged and that appropriate response is carried out as soon as possible. Similarly, the vibration sensor (6) is connected to the main circuit (2) by means of the digital input connector (23) on

15 the main circuit (2).

As a result of the vibration sensor (6) read by the microprocessor (10) on the main circuit (2) detecting that the vibration level is higher than a predetermined vibration level, it sends an emergency warning notification to the remote server

20 via internet/intranet and ensures that an appropriate response is carried out as soon as possible. The heat/humidity sensor (7) is connected to the main circuit (2) by means of the heat/humidity sensor link connector (24) and when the heat/humidity values exceed the predetermined limit, an emergency warning notification is sent to the remote server via internet/intranet and it is ensured that an appropriate

25 response is carried out as soon as possible.

The microprocessor (10) on the main circuit (2) continuously carries out sensory measurements and when limits are exceeded, this is notified to a remote server over the internet/intranet. The internet/intranet connection is provided by means

30 of an Ethernet link connector (19).

The signal received by means of the Ethernet link connector (19) is digitized by means of the Ethernet unit (9) and transmitted to the microprocessor (10). The USB OTG filter unit (11) and the USB mini protection unit (12) filter out the electrical interference from the USB connections. The fan speed signal received
5 by means of the fan speed input connector (22) is amplified by means of the op-amp (13) and transferred to the microprocessor element. All setting related processes are stored on the microprocessor (10) by means of the memory, while the time and date information is stored by means of the battery (18). The touchscreen LCD monitor (15) displays data entries, alarms and sensory
10 information. The main circuit board (16) and circuit (2) hold the other elements. The USH OTH input connector (21) enables external flash disks to be read and for configurations to be copied. The USB mini input connector (21) enables connection with an external computer.

15 The main circuit (2) element within the smart server cabinet enables remote access over the internet/intranet by using all internet protocols. The management of the whole system is carried out by the microprocessor (10).

CLAIMS

1. The invention is a smart server cabinet (1) characterized in that it comprises:
- A main circuit (2), positioned on the smart server cabinet (1), consisting of the below main elements: an Ethernet unit(9), a microprocessor (10), a
5 USB OTG filter unit (11), a USB mini protection unit (12), an op-amp (13), a memory (14), a touchscreen LCD monitor (15), a main circuit board (16), a supply unit (17), a battery (18), an Ethernet link connector (20), a USH OTH input connector (21), a USB mini input connector (22), a fan speed input connector (23), a digital input connector (24), a
10 heat/humidity sensor link connector (25),
 - A cabinet fan (3) that enables the circulation of air within the cabinet,
 - A cabinet door lock (4) that prevents unauthorized opening of the cabinet door,
 - A cabinet floor flooding sensor (5) that provides a warning when water is
15 detected on the floor of the cabinet,
 - A vibration sensor (6) that is able to detect when the vibration level is higher than a predetermined vibration level and send an emergency warning notification to the remote server via internet/intranet,
 - A heat/humidity sensor (7) that is able to detect when heat/humidity level
20 is higher than a predetermined level and send an emergency warning notification to the remote server via internet/intranet,
 - An Ethernet unit (9) that enables the signal received from the Ethernet link connector (20) to be digitized and sent to the microprocessor,
 - A microprocessor (10) that enables the speed of the cabinet fans (3) on the
25 main circuit to be measured,
 - A touchscreen LCD monitor (15) wherein data entry is inputted and wherein alarm and sensory information is displayed,
 - A USB OTH input connector (20) that enables external hard disks to be read and for configurations to be copied.
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2. A smart server cabinet (1) according to Claim 1, wherein the main circuit (2) of the smart cabinet comprises:
- An Ethernet unit (9) that enables the signal received from the Ethernet link connector (20) to be digitized and sent to the microprocessor,
 - 5 - A microprocessor (10) that enables the speed of the cabinet fans (3) on the main circuit to be measured,
 - A USB OTG filter unit (11) that filters the electrical interference from the USB connections,
 - 10 - A USB mini protection unit (12) that filters the electrical interference from the USB connections,
 - An op-amp (13) that amplifies the fan speed signals received from the fan speed input connector (23) and transfers them to the microprocessor element,
 - 15 - A memory element (14) wherein all setting processes are transferred to the microprocessor,
 - A touchscreen LCD monitor (15) wherein data entry is inputted and wherein alarm and sensory information is displayed,
 - A main circuit board (16) on which circuits are set onto,
 - A supply unit (17) which provides the supply voltage required to operate the main circuit (2),
 - 20 - A battery (18) that enables the time and date information to be transferred to the microprocessor,
 - An Ethernet connector (19) that enables internet and intranet connections to be made,
 - 25 - A USB OTH input connector (20) that enables external hard disks to be read and for configurations to be copied,
 - A USB mini input connector (21) that enables connection with an external computer to be established,
 - 30 - A fan speed input connector (22) that enables the fan speed signal to be amplified by means of the op-amp and for it to be transferred to the microprocessor element,

- A digital input connector (23) that is located on the main circuit (2) and which connects the cabinet floor flooding sensor (5) to the main circuit (2) and
 - A heat/humidity sensor link connector (24) that connects the heat and
- 5 humidity sensor link connector (7) to the main circuit (2).

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FIGURE 1

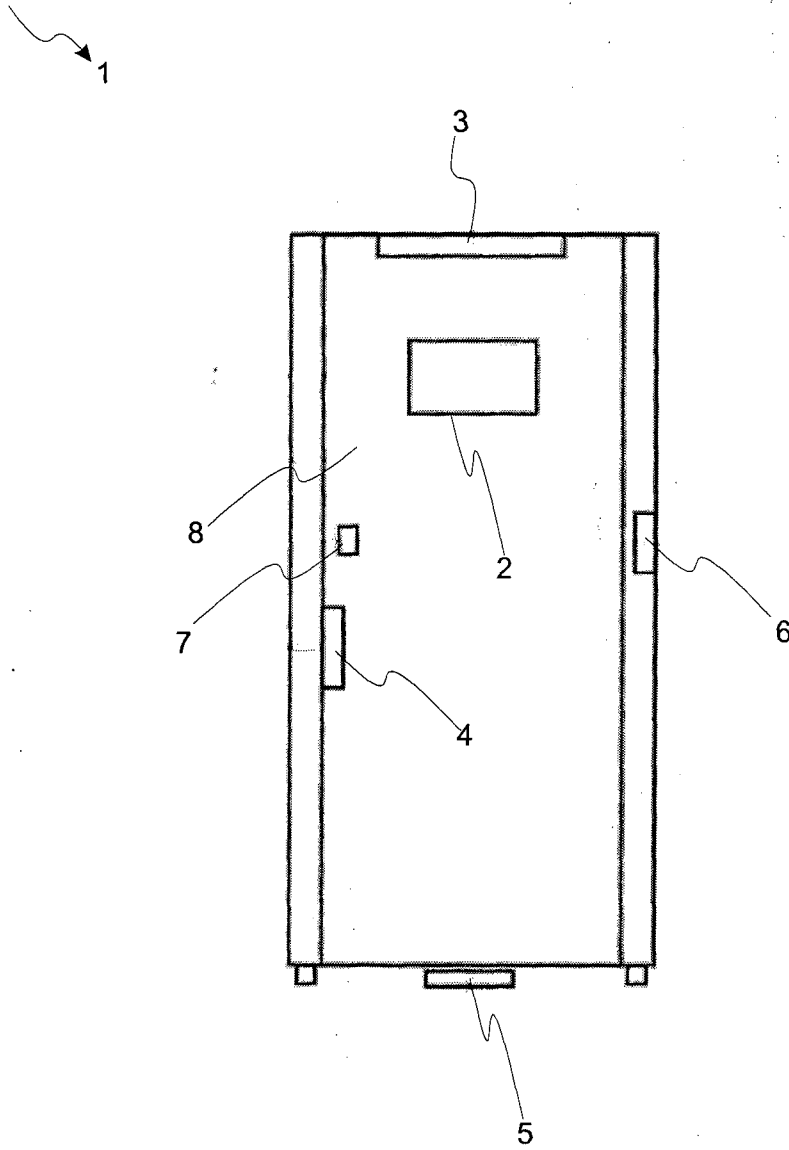
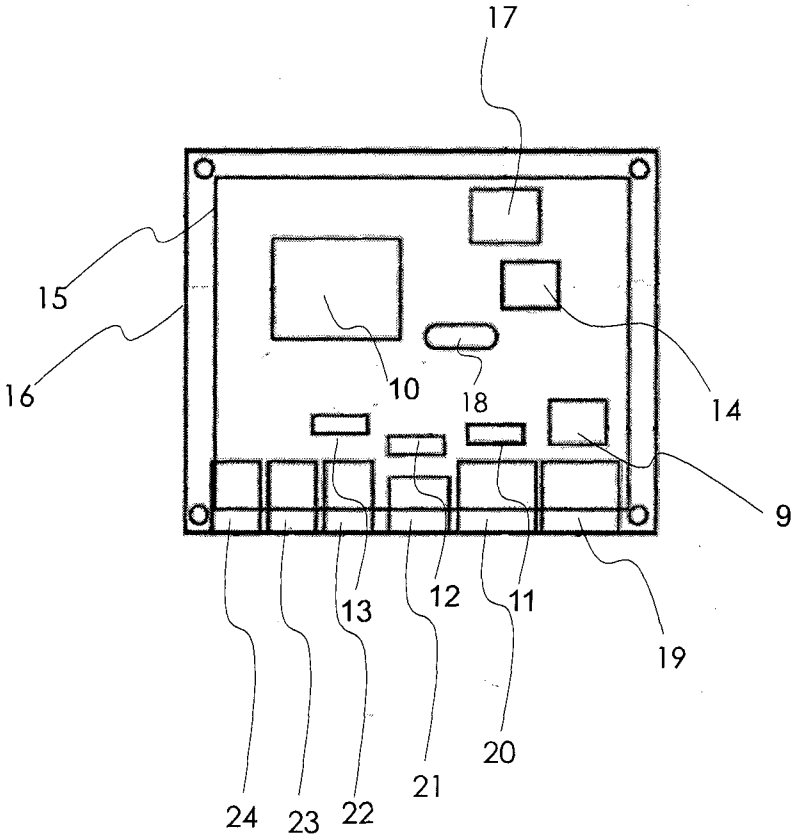


FIGURE 2



INTERNATIONAL SEARCH REPORT

International application No

PCT/TR2014/000368

A. CLASSIFICATION OF SUBJECT MATTER
INV. H05K7/14 H05K7/20
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/005344 A1 (KOLIN BENJAMIN TREVOR [US] ET AL) 5 January 2012 (2012-01-05) paragraphs [0029] - [0039]; figures 1,2,4 -----	1,2
X	CN 102 999 071 A (NINGHAI COUNTY POWER SUPPLY BUREAU; STATE GRID CORP CHINA) 27 March 2013 (2013-03-27) abstract; figure 1 -----	1,2
X	US 2013/190899 A1 (SLESSMAN GEORGE [US] ET AL) 25 July 2013 (2013-07-25) paragraph [0039] - paragraph [0115]; figures 3,4 -----	1,2
X	US 7 878 008 B1 (MATESKI CHRISTOPHER JOSEPH [US] ET AL) 1 February 2011 (2011-02-01) the whole document ----- -/-	1,2

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/TR2014/000368

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