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- (81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,

KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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Declarations under Rule 4.17:

- as to the identity of the inventor (Rule 4.17(i))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

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(54) Title: AN AUTOMATICALLY CONTROLLED AIR CURTAIN DEVICE

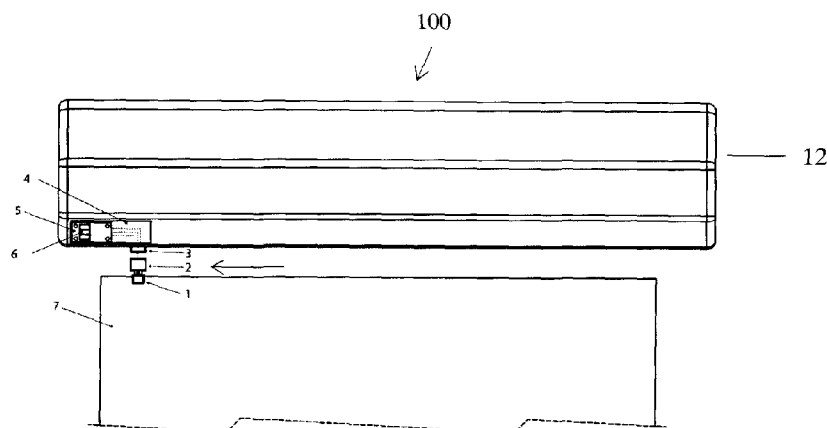


FIG. 1

(57) Abstract: An automatically controlled air curtain device (100), comprising an air curtain housing (12), a fan set (11) locating in the air curtain housing (12), a motor (10) for driving the fan set (11), an electric power source for supplying to drive the motor (10), an electronic circuitry (5), a keypad (6) is in communicating with the electronic circuitry (5), and a set of electronic sensors (102) is in communicating with the electronic circuitry (5) for controlling the electric power source supplying to the motor (10).

TITLE OF THE INVENTION

AN AUTOMATICALLY CONTROLLED AIR CURTAIN DEVICE

TECHNICAL FIELD

The present invention relates generally to an air curtain device and, more particularly,
5 to an automatically controlled air curtain device which provides energy efficiency and
reduction of electric power consumption according to a logarithm set of the automatically
controlled air curtain device.

BACKGROUND ART

The air curtain device has been widely used for years. A conventional air curtain
10 device typically comprises an air curtain housing, a motor located within the air curtain
housing to create rotational motion, a fan locating in the air curtain housing connected to the
motor, electronic circuitry, located within the air curtain housing. The electronic circuitry is
electrically connected to the motor and electric power for controlling the power source
supplying to the motor. In case the user turns the air curtain device on by switching an on-
15 off button of the air curtain device to on-mode, the electronic circuitry will supply electric
power to drive the motor. The motor provides rotational motion to the fan resulting in the
fan spinning and blowing out the air. Once the conventional air curtain device is turned on,
the user must manually turn it off by switching the on-off button to off-mode.

Air curtain devices are mainly placed above opened doors, gates or windows to
20 isolate the air between two chambers. The air blowing out from the air curtain device will
act as an air wall to prevent air from either chamber from getting through. It allows the
maintenance of separate temperature in either chamber, and the exclusion of dirt and other
airborne debris. The conventional electronic circuitry only allows for two modes, i.e., on-
mode and off-mode for supplying the electric power to the motor of the air curtain device.
25 The users always turn the conventional air curtain device on and leave the gates or windows
opened all day long. It means that the air curtain device consumes excessive electrical power
and constantly makes noise until the users manually turn the air curtain device off.

A relatively new device, commonly referred to as Pyroelectric Infrared Sensor,
comprises additional sensors which are utilized to control the switching on and off of
30 electric power. Most of Pyroelectric Infrared Sensor in the market are used in between the
power supply socket and regular electrical devices. The Pyroelectric Infrared Sensor has a
programed sensor to monitor a movement in specified area. Once the sensor detects any

movements, its circuitry will begin supplying electric power to the air curtain device, which is already set to on-mode, for a certain predefined time. After this time period, the Pyroelectric Infrared Sensor circuitry will cease supplying electric power to the air curtain device. The Pyroelectric Infrared Sensor is developed and designed as a universal device to work with many kind of electric devices. However, the given functions of the Pyroelectric Infrared Sensor do not match well with the air curtain device for daily use. For example, when the Pyroelectric Infrared Sensor captures the movements then supplying the electric power to the air curtain device for 10 seconds regardless of whether the users leave the gate closed or opened. As stated, the missing communication is that Pyroelectric Infrared Sensor is unable to recognize the particular "state" of the doors or windows in order to control the air curtain device efficiently.

In these respects, the automatically controlled air curtain device according to the present invention substantially departs from the conventional concepts and design of the prior art, and in so doing provides an apparatus primarily developed for the purpose of providing an efficiently and simply operated power supply for the air curtain device.

Further advantages of the present invention will be apparent in view of the detailed description below.

BRIEF SUMMARY OF THE INVENTION

In view of the foregoing disadvantages inherent in the air curtain device. The present invention provides a new air curtain device wherein it can be utilized for providing efficient and simple operation of the power supply to the air curtain device by integrating communication between the air curtain device and a specified automatic controller. The present invention has many advantages of the air curtain device mentioned heretofore and many novel features that result in an automatically controlled air curtain device which is not anticipated, rendered obvious, suggested, or even implied by any of the prior art air curtain devices, either alone or in any combinations thereof.

The automatically controlled air curtain device according to the present invention generally comprises an air curtain housing, a fan set locating in the air curtain housing, a motor for driving the fan set, an electric power source for supplying to drive the motor, an electronic circuitry, a keypad is in communicating with the electronic circuitry, and a set of electronic sensors is in communicating with the electronic circuitry for controlling the electronic power source supplying to the motor.

The automatically controlled air curtain device comprises the electronic circuitry which is located within the air curtain housing and the set of electronic sensors which is located outside the air curtain housing.

The automatically controlled air curtain device can also comprises the electronic
5 circuitry and the set of electronic sensors which is located outside the air curtain housing.

In addition, the automatically controlled air curtain device can also comprises the electronic circuitry and the set of electronic sensors which is located within the air curtain housing.

There has thus been outlined, rather broadly, some of the features of the invention in
10 order that the detailed description thereof may be better understood, and in order that the present contribution to the art may be better appreciated. There are additional features of the invention that will be described hereinafter and that will form the subject matter of the claims appended hereto.

In this respect, before explaining at least one embodiment of the invention in detail,
15 it is to be understood that the invention is not limited in its application to the details of construction or to the arrangements of the components set forth in the following description or illustrated in the drawing. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also it is to be understood that the phraseology and terminology employed herein are for the purpose of the description and should not be
20 regarded as limiting.

An object is to provide the automatically controlled air curtain device for providing efficient and simple operation of powering of the air curtain device.

A second object is to provide the automatically controlled air curtain device that provides for intuitive operation for plurality of gates or windows.

25 Another object is to provide the automatically controlled air curtain device that consumes less electric power.

An additional object is to provide the automatically controlled air curtain device that is affordable for home users.

Other objects and advantages of the present invention will become obvious to the
30 reader and it is intended that these object and advantages are within the scope of the present invention.

To the accomplishment of the above and related objects, this invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the

fact, however, that the drawing are illustrative only, and that changes may be made in the specific construction illustrated and described within the scope of the appended claim.

BRIEF DESCRIPTION OF THE DRAWINGS

Various other objects, features and attendant advantages of the present invention will become fully appreciated as the same become better understood when considered in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the several views, and wherein:

FIG. 1 is a front view of the automatically controlled air curtain device illustrating an electronic circuitry locating within the air curtain housing and a set of electronic sensors locating outside the air curtain housing;

FIG. 2 is a front view of the automatically controlled air curtain device illustrating the electronic circuitry and the set of electronic sensors locating outside the air curtain housing;

FIG. 3 is a front view of the automatically controlled air curtain device illustrating the electronic circuitry and the set of electronic sensors locating within the air curtain housing;

FIG. 4 is a front view of the automatically controlled air curtain device installing above a gate;

FIG. 5 is a perspective view of the automatically controlled air curtain device in working state in used with the swing gate;

FIG. 6 is a perspective view of the automatically controlled air curtain device in working state in used with a sliding gate; and

FIG. 7 is isometric view of the automatically controlled air curtain device illustrating a motor, a fan set, and air curtain housing.

DETAILED DESCRIPTION OF THE INVENTION

An automatically controlled air curtain device (100) comprises an air curtain housing (12), a fan set (11) locating in the air curtain housing (12), a motor (10) for driving the fan set (11), an electric power source for supplying to drive the motor (10), as shown in Fig. 1,2,3 and 9.

The automatically controlled air curtain device (100) further comprises an electronic circuitry (5), a keypad (6) is in communicating with the electronic circuitry (5), and a set of

electronic sensors (102) is in communicating with the electronic circuitry (5) for controlling the electric power source supplying to the motor (10) as shown in Fig. 1, 2 and 3.

Fig. 1 shows one embodiment of the automatically controlled air curtain device (100), in which the electronic circuitry (5) is locating within the air curtain housing (12) and the set of electronic sensors (8) is locating outside the air curtain housing (12).

The automatically controlled air curtain device (100) comprises the air curtain housing (12), the fan set (11) locating in the air curtain housing (12), the motor (10) for driving the fan set (11), the electric power source for supplying to drive the motor (10), the electronic circuitry (5), the keypad (6) is in communicating with the electronic circuitry (5), and the set of electronic sensors (102) is in communicating with the electronic circuitry (5) for controlling the electric power source supplying to the motor (8).

As shown in Fig. 1, the electronic circuitry (5) is located within the air curtain housing (12) in communication with the outsource power supply and the set of electronic sensors (102) through a set of electrical cables (4) for controlling electric power supplying to the motor (10) by determining the stage of electrical signal physically changed to the set of electronic sensors (102). The keypad (6) is in communicating with the electronic circuitry (5). The keypad (6) comprises three operating modes, including On-mode, Off-mode, and Auto-mode.

If the keypad (6) is in On-mode, the electronic circuitry (5) supplies electric power to the motor (10) continuously until the user selects different mode on the keypad (6).

If the keypad (6) is in Off-mode, the electronic circuitry (5) stops supplying electric power to the motor (10).

If the keypad (6) is in Auto-mode, the electronic circuitry (5) and the set of electronic sensors (102) are communicating accordingly to control electric power supplied to the motor (10).

The electronic circuitry (5) constantly monitors the operating mode of the keypad (6) selected by a user to determine the stage of the air curtain device (100) to be controlled. The set of electronic sensors (102) is located outside the air curtain housing (12). The set of electronic sensors (102) comprising an electrical transmitter/ activator (1) and a receiver (2) that electronically communicating with the electronic circuitry (5) based upon the current state. The electrical transmitter/ activator (1) and the receiver (2) are in contact together. When there is physical movement impacting on the electrical transmitter/ activator (1) or the

receiver (2), the electronic circuitry (5) will automatically detect electrical changes generated by the set of electronic sensors (102) from the current state and will generate a resulting action of the motor (10) according to conditions set forward by logarithmic circuit on electronic circuitry (5).

5 Fig. 2 shows another embodiment of the automatically controlled air curtain device (100) in which the electronic circuitry (5) and the set of electronic sensors (102) are locating outside the air curtain housing (12).

The automatically controlled air curtain device (100) comprises the air curtain housing (12), the fan set (11) locating in the air curtain housing (12), the motor (10) for
10 driving the fan set (11), the electric power source for supplying to drive the motor (10), the electronic circuitry (5), the keypad (6) is in communicating with the electronic circuitry (5), and the set of electronic sensors (102) is in communicating with the electronic circuitry (5) for controlling the electric power source supplying to the motor (8).

As shown in Fig. 2, the electronic circuitry (5) is located outside the air curtain
15 housing (12) in communication with the outsource power supply and the set of electronic sensors (102) through set of electrical cables (4) for controlling electric power supplying to the motor (10) by determining the stage of electrical signal physically changed to the set of electronic sensors. The keypad (6) is in communicating with the electronic circuitry (5). The keypad (6) comprises three operating modes, including On-mode, Off-mode, and Auto-
20 mode.

If the keypad (6) is in On-mode, the electronic circuitry (5) supplies electric power to the motor (10) continuously until the user selects different mode on the keypad (6).

If the keypad (6) is in Off-mode, the electronic circuitry (5) stops supplying electric power to the motor (10).

25 If the keypad (6) is in Auto-mode, the electronic circuitry (5) and the set of electronic sensors (102) are communicating accordingly to control electric power supplied to the motor (10).

The electronic circuitry (5) constantly monitors the operating mode of the keypad (6) selected by the user to determine the stage of the air curtain device (100) to be controlled.
30 The set of electronic sensors (102) is located outside the air curtain housing (12). The set of electronic sensors (102) comprising the electrical transmitter/ activator (1) and the receiver (2) that electronically communicating with the electronic circuitry (5) based upon the current

state. The electrical transmitter/ activator (1) and the receiver (2) are in contact together. When there is physical movement impacting on the electrical transmitter/ activator (1) or the receiver (2), the electronic circuitry (5) will automatically detect electrical changes generated by the set of electronic sensors (102) from the current state and will generate a
5 resulting action of the motor (10) according to conditions set forward by logarithmic circuit on electronic circuitry (5).

FIG. 3 shows another embodiment of the automatically controlled air curtain device (100) in which the electronic circuitry (5) and the set of electronic sensors (102) are locating inside the air curtain housing (12).

10 The automatically controlled air curtain device (100) comprises the air curtain housing (12), the fan set (11) locating in the air curtain housing (12), the motor (10) for driving the fan set (11), the electric power source for supplying to drive the motor (10), the electronic circuitry (5), the keypad (6) is in communicating with the electronic circuitry (5), and the set of electronic sensors (102) is in communicating with the electronic circuitry (5)
15 for controlling the electronic power source supplying to the motor (8).

As shown in Fig. 3, the electronic circuitry (5) is located inside the air curtain housing (12) in communication with the outsource power supply and the set of electronic sensors (102) through set of electrical cables (4) for controlling electric power supplying to the motor (10) by determining the stage of electrical signal physically changed to the set of
20 electronic sensors. The keypad (6) is in communicating with the electronic circuitry (5). The keypad (6) comprises three operating modes, including On-mode, Off-mode, and Auto-mode.

If the keypad (6) is in On-mode, the electronic circuitry (5) supplies electric power to the motor (10) continuously until the user selects different mode on the keypad (6).

25 If the keypad (6) is in Off-mode, the electronic circuitry (5) stops supplying electric power to the motor (10).

If the keypad (6) is in Auto-mode, the electronic circuitry (5) and the set of electronic sensors (102) are communicating accordingly to control electric power supplied to the motor (10).

30 The electronic circuitry (5) constantly monitors the operating mode of the keypad (6) selected by a user to determine the stage of the air curtain device (100) to be controlled. The set of electronic sensors (102) is located inside the air curtain housing (12). The set of

electronic sensors (102) comprising a Pyro Electric Infrared sensor (8) for measuring infrared light radiating from objects in its field of view and electronic decoder to determine the actions required when Pyro Electric Infrared sensor (8) detects radiating from objects in its working area and electrically communicates to the electronic circuitry (5), the electronic circuitry (5) will automatically detect electrical changes generated by the set of electronic sensors (102) from the current state and will produce a resulting action of the motor (10) according to conditions set forward by logarithmic circuit on electronic circuitry (5).

In use, the user starts operating the automatically controlled air curtain device (100) by connecting the power cord to a power outlet, then selecting operating mode on the keypad (6) as On-mode. The electronic circuitry (5) will turns the motor (10) on by supplying electrical power to drive the motor (10), therefore, the fan set (11) will be driven resulting in the blowing out of air through the gates or windows (7). To stop its operation, the user require to select Off-mode on the keypad (6), the electronic circuitry (5) will stop supplying electrical power to the motor 10 resulting in the motor stopping.

The user starts using Auto-mode by selecting Auto-mode on the keypad (6). The electronic circuitry (5) will keep monitoring electrical changes generated by the set of electronic sensors (102) based on current state. When the set of electronic sensors (102) is activated either physical changes of electrical transmitter/ activator (1) and receiver (2) movement or electrical changes of radiating infrared light of the object, the electronic circuitry (5) will turn the motor (10) on by supplying electrical power to drive the motor (10), herein the fan set (11) connected to the motor (10) will be driven resulting in blowing out the air through the gates or windows (7) until the set of electronic sensors is inactivated or the user selects Off-mode on the keypad (6), the electronic circuitry 5 will stop supplying electric power to the motor (10) resulting in the motor 10 stopping.

The Off-mode is to permanently stop all tasks. The user selects Off-mode, the electronic circuitry (5) will stop powering the motor (10) until the other modes are reselected.

CLAIMS

1. An automatically controlled air curtain device (100), comprising:

- an air curtain housing (12);
- a fan set (11) locating in the air curtain housing (12);
- 5 - a motor (10) for driving the fan set (11);
- an electric power source for supplying to drive the motor (10);
- an electronic circuitry (5);
- a keypad (6) is in communicating with the electronic circuitry (5); and
- a set of electronic sensors (102) is in communicating with the electronic circuitry
- 10 (5) for controlling the electric power source supplying to the motor (10).

2. The air curtain device (100) according to claim 1, wherein the electronic circuitry (5) is located within the air curtain housing (12) and the set of electronic sensors (102) is located outside the air curtain housing (12).

3. The air curtain device (100) according to claim 1, wherein the electronic circuitry (5) and the set of electronic sensors (102) is located outside the air curtain housing (12).

4. The air curtain device (100) according to claim 2 or 3, wherein the electronic circuitry (5) is in communicating with the set of electronic sensors (102) through a set of electric cables (4).

5. The air curtain device (100) according to claim 2 or 3, wherein the set of electronic sensors (102) comprising an electrical transmitter/activator (1) and a receiver (2) that electronically communicating with the electronic circuitry (5).

6. The air curtain device (100) according to claim 1, wherein the electronic circuitry (5) and the set of electronic sensors (102) is located within the air curtain housing (12).

7. The air curtain device (100) according to claim 6, wherein the set of electronic sensors (102) comprising a Pyro Electric Infrared.

8. The air curtain device (100) according to claim 1, wherein the key pad (6) comprising three operating modes including On-mode, Off-mode, and Auto-mode.

9. The air curtain device (100) according to claim 1, wherein the set of electronic sensors (102) comprising Pyro Electric Infrared (PIR) sensor, Magnetic switch, Contact switch, and Infrared switch.

AMENDED CLAIMS

received by the International Bureau on 22 January 2015 (22.01.2015)

CLAIMS

1. An automatically controlled air curtain device (100), comprising:
 - an air curtain housing (12);
 - a fan set (11) locating in the air curtain housing (12);
 - a motor (10) for driving the fan set (11);
 - an electric power source for supplying to drive the motor (10);
 - an electronic circuitry (5);
 - a keypad (6) is in communicating with the electronic circuitry (5); and
 - a set of electronic sensors (102) is in communicating with the electronic circuitry (5) for controlling the electric power source supplying to the motor (10);wherein the electronic circuitry (5) is located within the air curtain housing (12) and the set of electronic sensors (102) is located outside the air curtain housing (12).
2. The air curtain device (100) according to claim 1, wherein the electronic circuitry (5) is in communicating with the set of electronic sensors (102) through a set of electric cables (4).
3. The air curtain device (100) according to claim 1, wherein the set of electronic sensors (102) comprising an electrical transmitter/activator (1) and a receiver (2) that electronically communicating with the electronic circuitry (5).
4. The air curtain device (100) according to claim 1, wherein the key pad (6) comprising three operating modes including On-mode, Off-mode, and Auto-mode.
5. The air curtain device (100) according to claim 1, wherein the set of electronic sensors (102) comprising Pyro Electric Infrared (PIR) sensor, Magnetic switch, Contact switch, and Infrared switch.
6. An automatically controlled air curtain device (100), comprising:
 - an air curtain housing (12);
 - a fan set (11) locating in the air curtain housing (12);
 - a motor (10) for driving the fan set (11);
 - an electric power source for supplying to drive the motor (10);
 - an electronic circuitry (5);
 - a keypad (6) is in communicating with the electronic circuitry (5); and
 - a set of electronic sensors (102) is in communicating with the electronic circuitry (5) for controlling the electric power source supplying to the motor (10);

wherein the electronic circuitry (5) and the set of electronic sensors (102) is located within the air curtain housing (12).

7. The air curtain device (100) according to claim 6, wherein the set of electronic sensors (102) comprising a Pyro Electric Infrared.

8. The air curtain device (100) according to claim 6, wherein the key pad (6) comprising three operating modes including On-mode, Off-mode, and Auto-mode.

9. The air curtain device (100) according to claim 6, wherein the set of electronic sensors (102) comprising Pyro Electric Infrared (PIR) sensor, Magnetic switch, Contact switch, and Infrared switch.

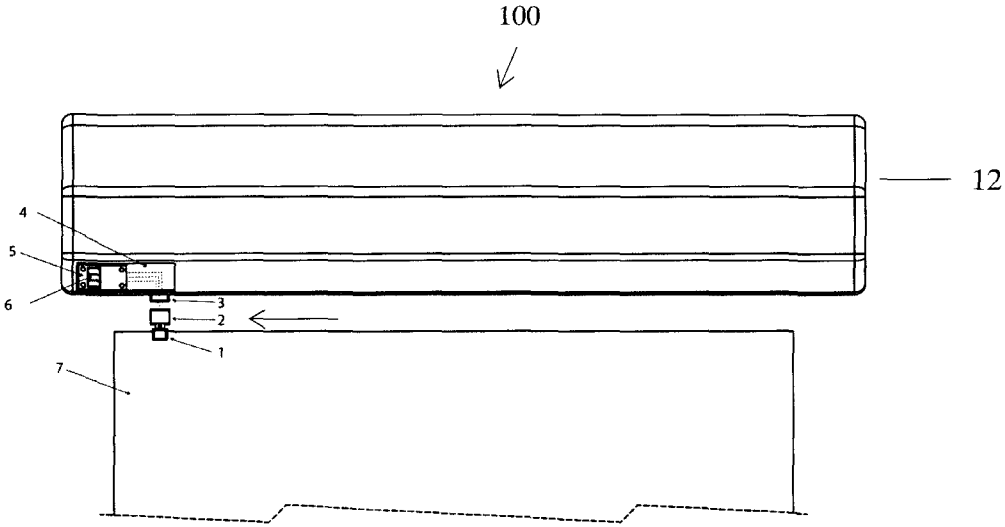


FIG. 1

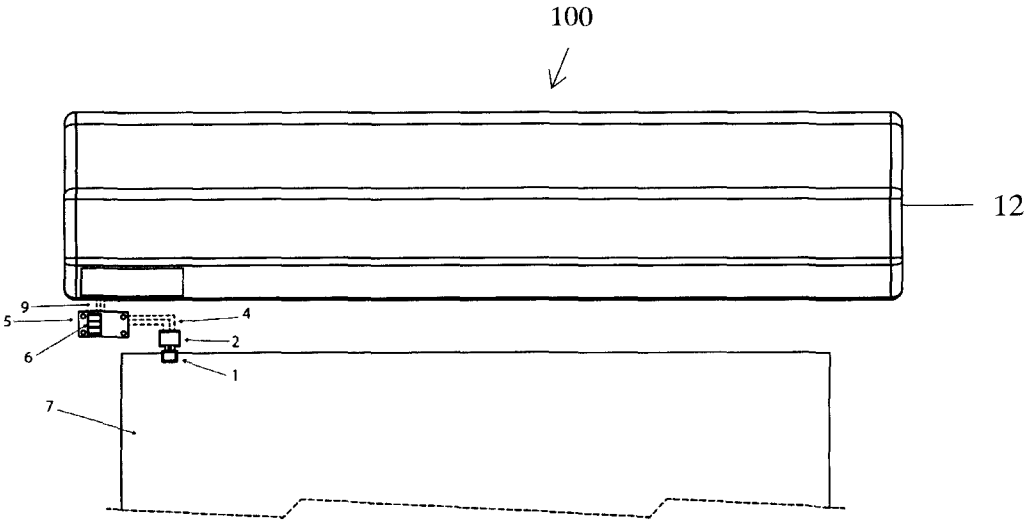


FIG. 2

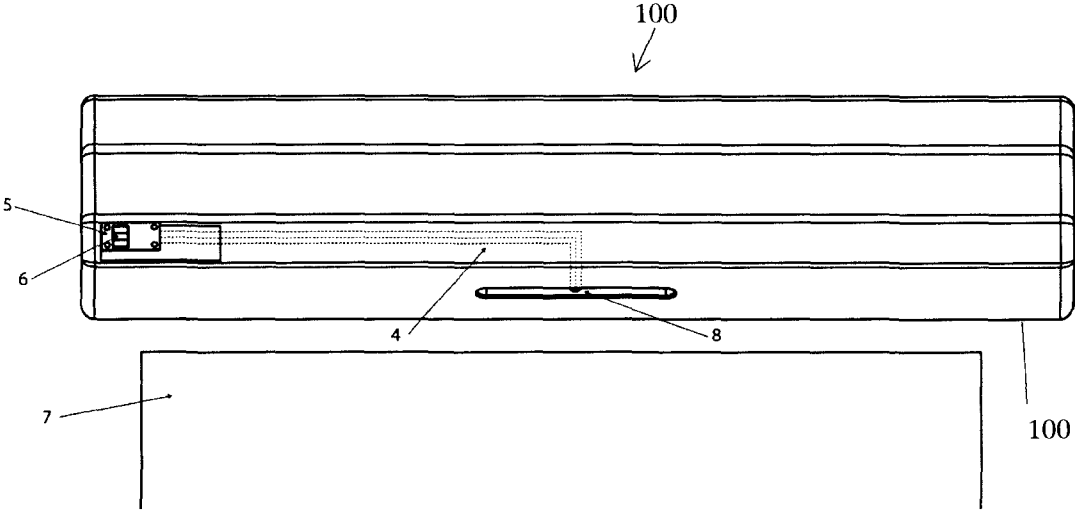


FIG. 3

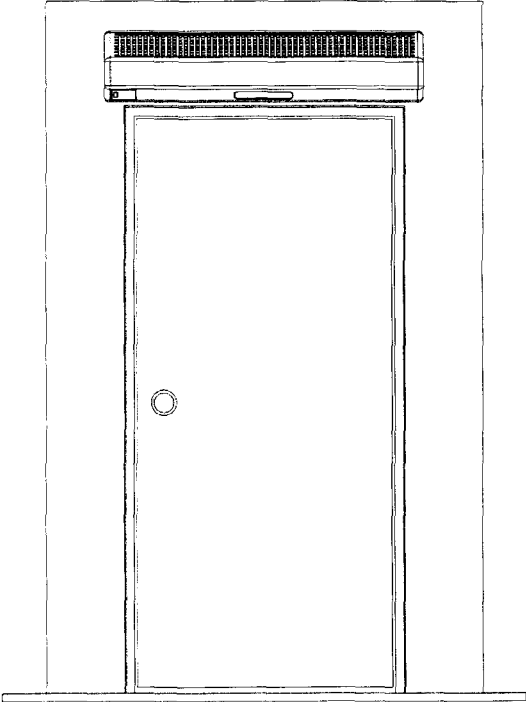


FIG. 4

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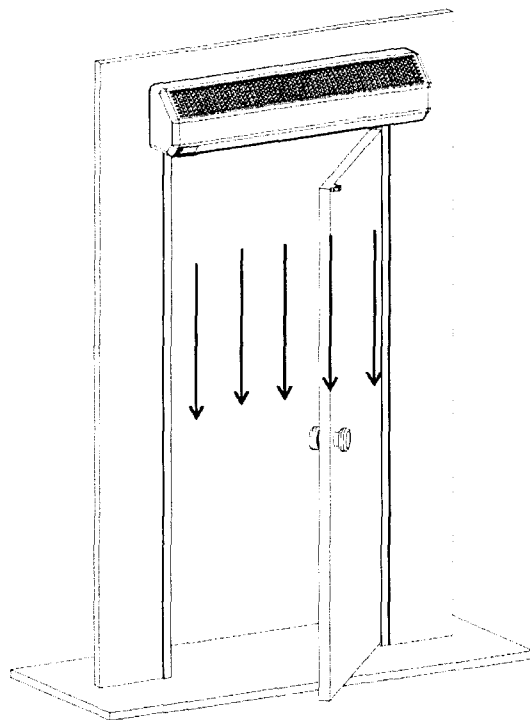


FIG. 5

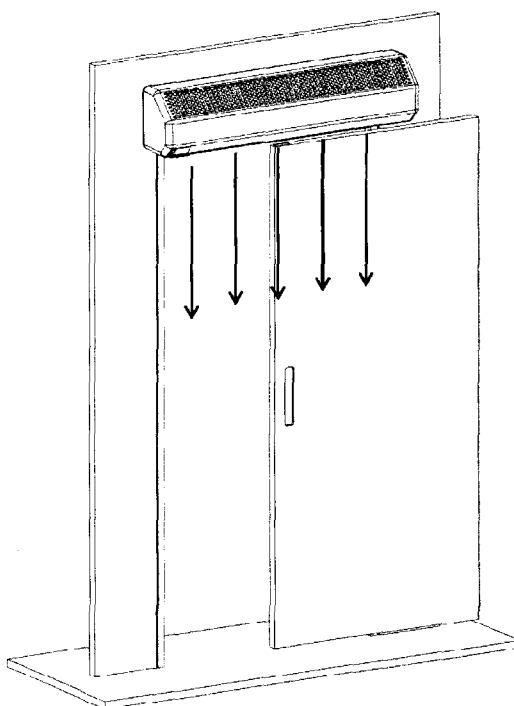


FIG. 6

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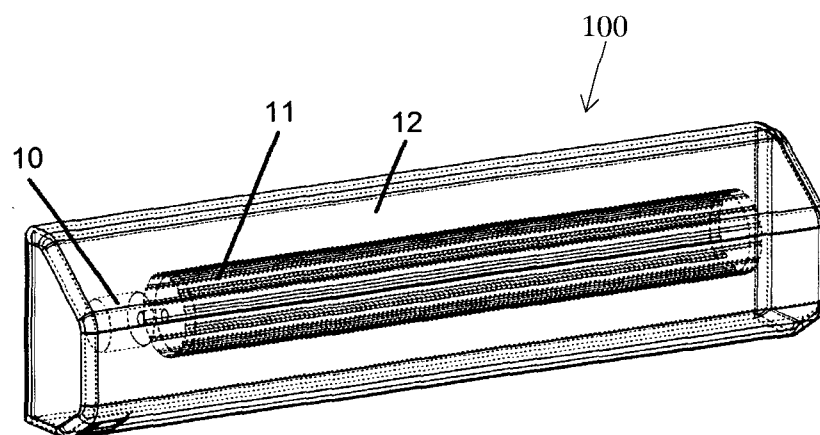


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/TH2014/000038

A. CLASSIFICATION OF SUBJECT MATTER		
Int.Cl. F24F9/00 (2006.01) i		
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)		
Int.Cl. F24F9/00		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2014 Registered utility model specifications of Japan 1996-2014 Published registered utility model applications of Japan 1994-2014		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2009-243830 A (ASAHIKASEI CO. LTD.) 2009.10.22, paragraphs [0012] to [0026], figures 1 to 6 (Family: none)	1, 3-5, 8 2, 6-7, 9
X Y	JP 60-223937 A (MATSUSHITASEIKO CO. LTD.) 1985.11.08, the whole document, figures 4 to 7 (Family: none)	1, 3-5 2, 6-7, 9
Y	JP 2008-020131 A (MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD.) 2008.01.31, paragraphs [0066] to [0067], figures 1 to 2 (Family: none)	2, 6-7, 9
Y	JP 02-146440 A (MITSUBISHI ELECTRIC CO. LTD.) 1990.06.05, the whole document, figures 1 to 7 (Family: none)	9
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "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 13.11.2014		Date of mailing of the international search report 02.12.2014
Name and mailing address of the ISA/JP Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan		Authorized officer WATANABE, Satoshi Telephone No. +81-3-3581-1101 Ext. 3377

INTERNATIONAL SEARCH REPORT

International application No.

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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.
Y	JP 05-321883 A (SANYO ELECTRIC CO. LTD.) 1993.12.07, paragraphs [0010] to [0018], figures 1 to 2 (Family: none)	9