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(54) DEVICE FOR THE VENTILATION OF DOUBLE-LEAF FAÇADES WITH AN INNER AIR CHAMBER

(57) This report describes a device designed to be fitted on the outer skin of a double-skin facade with a cavity in place of one of the bricks of the said outer skin to create a ventilation channel leading to the inner cavity of the facade that can be opened or closed to convenience depending on weather conditions. It comprises a 10casing with openings that lead to the outside (2) at the end of the facade exterior and openings that lead to the interior (3) and the inner cavity; where the openings to the exterior (2) have shutters (9) so that they can be closed off, where the said shutters are opened and closed by a rod (4) operated from the interior of the wall by a control (5) fitted as the only part visible from the interior of the wall.

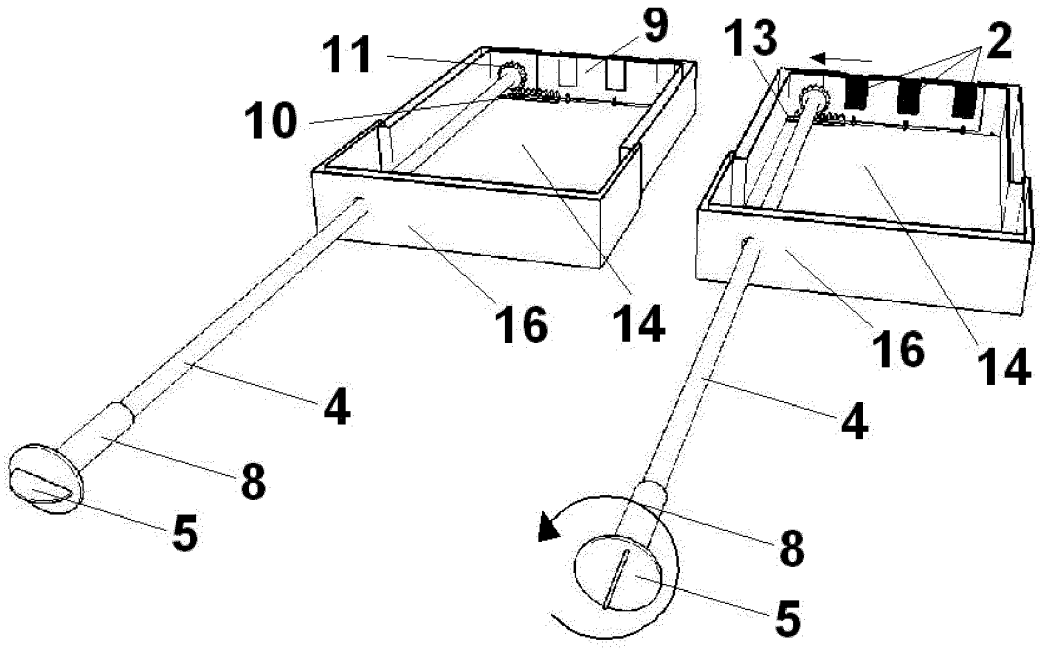


Fig. 3

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Description

OBJECT OF THE INVENTION

[0001] This invention relates to a system designed to be fitted to the outer skin of a double-skin facade in the place that would be occupied by one of the bricks of the outer skin, creating a channel for ventilation to the inner cavity of the facade, which can be opened or closed to convenience depending on weather conditions. This device significantly improves the energy efficiency of the facade by allowing the passage of air in summer to cool the interior while in winter the passage can be closed to shut out the exterior. The device is opened and closed from inside the building.

[0002] More specifically, the device is configured on the basis of a casing with openings for the air that can be opened or closed at will by means of movable shutters operated by a rotating rod. The casing can have different shapes to suit the shape of the facade, depending on the material the skins are made of, their thickness and the intermediate inner cavity.

SCOPE OF APPLICATION OF THE INVENTION

[0003] This invention will apply primarily in the manufacturing industry for construction materials, such as vents and similar.

BACKGROUND OF THE INVENTION

[0004] The facade is the most important element for the energy efficiency of the building. The proper design and implementation of the facade will significantly reduce the energy consumption of the building, saving in climate-control in the inhabitable interior areas.

[0005] One of the most common types of facade, which has been and is still widely used, consists of two skins with insulation and an intermediate air cavity. Within this type, there are many variants adapted to solving particular problems. However they all share the fact that they are made with an outer skin, with or without facing, an intermediate air cavity with insulation and an inner skin to close off the design. On occasions, the intermediate air cavity is completely closed off and on others it is in contact with the exterior through openings provided accordingly.

[0006] Another also common but less applied type because of the higher cost is the ventilated facade, which comprises an open structure fixed to the facade with a bearing capacity that prevents the sun from affecting the enclosure of the building directly while allowing air to circulate between the facing and the facade.

[0007] Facades with an intermediate cavity insulated from the exterior are very suitable in cold climates, since the intermediate air cavity provides insulation from the cold outside. However, in hot climates, as the air in the cavity is not renewed, it reaches high temperatures that are transferred to the inner wall and from there into the building. For facades with air cavities open to the exterior, the situation is reversed: they work well in hot climates, but perform poorly in cold climates because the air cavity offers no insulation.

[0008] Therefore, the appearance of a device that makes it possible to modify the intermediate air cavity of a double-skin facade is both desirable and useful, remaining closed in winter and with the option for being opened in summer to renew the air inside.

[0009] It would also be desirable for the device to be valid for use not only on newly constructed facades, but also on existing facades by means of a simple operation consisting of drilling a hole and then sealing the joints.

[0010] Ventilated facades with motorized mechanisms that move part of it to close the unit in winter and obtain the necessary insulation against the cold are known in this field. However, it is not considered that the said mechanical system has similarities with the proposed device beyond their similar purpose.

[0011] The author of this report is also aware of the existence of the following documents:

ES2364168 (MONTURIOL JALÓN, ANTONIO) *Horizontally drilled enclosure block:This* consists of an enclosure block drilled horizontally with a body differentiated in two parts: one to be installed facing the building interior and the other facing the exterior, where the interior has the same shape and size as any enclosure block such that it consists of the resistant core of the block, which may have cavities and structural cells with any other feature typical of a block, and where the exterior is defined by one or more horizontal ventilation air cavities with the capacity for fully or partially draining rainwater filtering through the interior of the cavities.However, this type of brick does not solve the problem of changing the air cavity according to exterior conditions.

[0012] ES2202048 (SCHLOSSBAUER, PAUL; SPROTOFSKI, HELMUT); *Adjustable facade facing with support frame for a building.This* consists of an adjustable facade facing for a building with an outer facing formed by panels arranged one after and/or above the other, regulated by an adjustment device between closed and open positions, characterized in that it comprises an inner facing attached at a distance from the outer facing and consists of one or more wall parts, because the adjustment device is positioned on a support frame that can be fixed to the building, composed of vertical and horizontal support parts and rotation devices to adjust the panels because, in their rotated position and during the rotation process, they are on the outer side of the support frame and because the inner facing is attached by the support parts to the outer facing for support.This invention comprises a system for building facades that has little to do with the device proposed herein, except for its purpose of making it possible to change the structure of

the facade as required, although this is solved by a complex construction that is considerably more expensive than the simple installation of the device described herein.

[0013] GB 2338497 (MOLYNEUX PROD LTD) *Cavity ventilation and drainage weep vent for fitting between bricks in a mortar joint.* This describes a device formed by two parts fitted together and sliding on each another, intended to be incorporated in a double-skin facade.Its main function is ventilation, but it can also be used for drainage.Although it has similarities with a part of the device described herein, it cannot be opened or closed to allow or prevent the passage of air from outside to inside the cavity and acts as a permanent opening that does not solve the aforementioned problem of adapting to the different weather conditions of each season.

[0014] US 3062278 (INDORANTE, SAM) describes a device for the passage of air between the exterior and interior of a home through the wall. The device has inner and outer walls with the corresponding regulated enclosures. This device provides ventilation for the interior of the home from the exterior, with the option for closing the passage of air from inside the home. However, it does not solve the problem of ventilating the inner cavity of a double-skin facade since it cannot be operated if installed only on the outer wall of this type of facade.

[0015] ES 2364008 (INNOVACIONES CERAMICAS EDIAM, S.L.) *Ventilated facade system.* This is a facade building system using two types of parts: some to create continuous air cavities inside the enclosure; and others to provide air inlets and outlets to and from the cavities.This construction system lacks the option for opening and closing the inner cavity at will and is also limited to newly built facades since it cannot be fitted to existing facades. Similarly, the invention described in US 848917 (MCELLIOT EDWARD JAMES, CIMMERY EDVARDO A) describes a very similar block system, where the continuous cavity has a fan that blows air through it.

[0016] ES 0201018 U (01.11.1975) (ANDRE SLADE, DONALD) *A ventilation duct device intended to be fitted between the corresponding bricks of successive rows of them.This* consists of a hollow rectangular sleeve fitted to the joints between the bricks of the facade to form an opening to allow the passage of air from the exterior to the inner cavity of a double-skin facade, where said sleeves contain a device that prevents the passage of water.Furthermore, it is not possible to open or close them from inside the home and they are configured solely as a means to provide ventilation to a facade instead of traditional facade-ventilation bricks.

[0017] ES 1038011 U (23.05.1997) (RUANO JIMÉNEZ, TOMÁS) *Gas vent based on concrete blocks.This* consists of a block configuration for air vents, where the said configuration facilitates the assembly and maintenance of the said vents by means of external ribs that provide information about the internal geometry of the block itself.This invention does not solve any of the problems cited in this application and cannot be used to ventilate the inner cavity of a double-skin facade.

[0018] The existence of other documents describing devices related in some way to the invention proposed herein is also known, for example, documents WO2008006572, GB2397592 and JPH09189081. They all describe various devices that in some way provide ventilation to the inner cavity of a double-skin facade. However, none of them have the option for opening or closing the air passage at will from inside the building and therefore do not solve the aforementioned problem.

[0019] Several building material companies that offer various ventilation solutions for double-skin facades are also known, such as Timloc Building Products and Manthorpe Building Products. However, none of the products offered solve the aforementioned problem by installing some kind of means for opening or closing the air inlet and/or outlet channels from the exterior to the inner cavity of the facade.

[0020] For all the above and as the owner of the invention considers it is a novelty, we submit this report to apply for the protection granted to this type of invention.

DESCRIPTION OF THE INVENTION

[0021] The proposed ventilation device for double-skin facades comprises a casing with air passages at one end leading to the exterior and at the other end for the air to enter the air cavity of the facade. The said casing can have very different shapes depending on the geometry of the facade. It can be of the same size as one of the bricks in the wall (the most common case) and can be used on facades where the outer wall is made using prefabricated concrete panels, where the casing would be cylindrical to fit a bushing hole, which would be equally suitable for installing the device on an existing facade. At the outer end of the device casing, the air inlet openings will have filtration traps to prevent the entry of insects and birds, etc.

[0022] The air inlets from the outside will have a shutter mechanism to close and seal the said inlet, operated by means of a rod that will cross the inner skin of the facade such that, inside the building, there will be a visible device for controlling the rod.

[0023] The mechanism for closing the shutters may have many different shapes and may consist of a rack-and-pinion to operate the shutters by moving them laterally, a threaded shaft that moves the shutters longitudinally along the device or any other method valid for the aforementioned function. The shutter drive mechanism will therefore not influence the essence of the invention.

[0024] The rotating rod may have a telescopic section to adapt to possible changes in the width of the wall due to changes to the facing or other circumstances. It will also be covered by a sleeve to ensure that it is protected and safe from jamming caused by the penetration of foreign material when turning the device to open or close the shutters.

[0025] The configuration of this invention can be

changed so that the shutters are opened and closed using methods other than a rotating rod, such as a rod which, when moving longitudinally or radially in relation to the axis of the rod itself, acts directly on the shutters to open or close them. Any system for opening or closing shutters that uses a rod to operate the shutters from inside the building is considered merely a design choice and does not alter the essence of the invention

[0026] Similarly, the casing may be built in two separate parts, with one fitting on the other to adapt the length of the casing to the thickness of the skins of the wall to which it is fitted.

[0027] The inside of the casing will slope slightly at the bottom to avoid the accumulation of rain or condensation water. Water drainage holes are fitted at the bottom on the outer end of the casing.

[0028] According to the described characteristics of the device, its use for ventilating the interior of a facade is simple: to increase air circulation by convection as the warmer air inside comes into contact with the cool air outside, one of these devices has to be fitted at the bottom of the wall and another at the top.

DESCRIPTION OF THE DRAWINGS

[0029] To complement the description that is being made and in order to facilitate better understanding of the specifications of the invention, illustrative, non-restrictive drawings are included as an integral part of this memorandum, described as follows:

Fig. 1. View in perspective of the device.

Fig. 2. View in perspective of the same device as the previous figure in horizontal section, showing its inner parts.

Fig. 3. View showing a cross-section of a pair of devices, with arrows indicating on the device on the left the movement between the control and the shutters by rotating the rack-and-pinion mechanism.

Fig. 4. View of a pair of such devices as they would be fitted on a wall (not shown), showing the route the air will follow through the inner air cavity as a result of the two devices.

Fig. 5. Three views of the installation of the device on a double-skin facade with load-bearing walls, where each figure shows the outer skin, the inner cavity and the inner skin.

Fig. 6. View of an alternative embodiment of the device, where the casing is cylindrical to fit a bushing hole in a prefabricated concrete slab or fitted to an existing facade. Figure 6a shows the device in closed position (left) and open position (right), whereas Figure 6b shows the device from the rear.

Fig. 7. The device is shown in two cross-sections to highlight the existing symmetry of the area in which the casing is fitted with its telescopic section on a horizontal plane. The figure shows how both parts fit together with the hole in the telescopic section positioned upwards and downwards, respectively.

DESCRIPTION OF THE PREFERRED REALISATION

[0030] In view of the aforementioned figures and according to the numbering system that is adopted, they show a preferred realisation of the invention, which comprises the parts and elements indicated and described in detail below, where this example does not aim to limit the scope thereof in any way.

[0031] The invention is configured on the basis of a casing (1) that acts as the main support of the device and, on brick facades, takes the form of one of the bricks (15). The said casing (1) will have openings to the exterior (2) at the end on the outer skin of the facade and an opening to the interior (3) leading to the inner cavity between the two skins. The casing (1) will also have a movable part (16) with the aforementioned opening to the interior (3).

[0032] The openings that lead to the exterior (2) of the casing have a shutter (9) to close them off. The said shutter (9) is moved by a rod (4) which, when rotated, operates a rack (10) and pinion (11) unit connected to the shutter. The rack (10) moves on a guide (13) positioned inside the casing (1) and has several bearings (12) to help it move.

[0033] On the outermost part of the openings to the exterior (2), there are traps (7) to filter the air passing through them.

[0034] The lower internal plane of the casing (14) has a slope downwards towards the exterior to drain any water entering into the device. The water will be drained through drainage holes (6).

[0035] The rod (4) will have a telescopic section (8) to modify its length to accommodate any possible change in the final thickness of the wall on which it is installed. The rod (4) will be set in a sleeve to prevent it from jamming when turned. The rod (4) is rotated from the interior of the wall by means of a control (5), which is the only visible part from inside the building.

[0036] Figure 4 shows a different configuration of the device, where the casing (1) has a cylindrical shape to fit a bushing hole made in a prefabricated concrete panel or, in the case of an existing facade, where a through-hole would be made to install the device. In this case, the rod (4) also runs through the interior of the casing (1). However, here it is directly attached to the shutters (9) so that they all rotate at the same time and open or close the openings to the exterior (2). In this case, the openings that lead to the interior (3) are regularly distributed over the surface of the casing (1).

[0037] In any case, the shape of the casing (1) can be changed simply to adapt it to the type of facade on which

it is to be fitted and does not alter the essence of the invention in any way.

[0038] For proper ventilation of the inner skin of a facade, an air current must be created, providing the inner cavity with an air inlet and outlet by fitting the device. As indicated and shown in Figure 4, one device must be fitted at the bottom of the wall with the opening towards the interior (3) facing upwards. At the top, the opening towards the interior (3) must be facing downwards to create a circuit for the passage of air from the exterior to the interior and vice versa.

[0039] The manufacture of the casing (1) in two parts to configure a telescopic casing means that, depending on whether the device is to be fitted at the top or bottom of the wall, the opening towards the interior (3) of the cavity can be positioned facing upwards or downwards simply by extending and turning the telescopic section (16) of the device. Accordingly, the shape of the area in which the casing is fitted (1) in relation to the telescopic section (16) will be symmetrical to a horizontal plane located at the midpoint of the height of the casing (1).

[0040] Having sufficiently described the nature of this invention, together with its realisation, further explanation is not considered necessary for an expert in the art to understand its scope and the benefits it provides, stating that, in its essence, it may be realised in other ways that differ in detail from that given by way of example, and which will also offer the indicated protection as long as its fundamental principle is not altered, changed or modified.

Claims

1. VENTILATION DEVICE FOR DOUBLE-SKIN FACADES WITH INNER AIR CAVITY formed by a casing (1) with openings (2, 3 and 6), a rotating rod (4), a control (5) coupled to the rod (4) and a shutter (9) running on a rail (13), intended to be fitted to the outer skin of the facade, **characterized in that** the casing (1) has openings that lead to the exterior (2) at the end on the outer skin of the facade, together with one (or more) openings that lead to the interior (3) to the inner cavity between the two skins; where the openings leading to the exterior (2) are fitted with shutters (9) so that they can be closed, moved by a rod (4) operated from the interior of the wall by means of a control (5), fitted as the only part visible from inside the building to which the facade belongs.

2. VENTILATION DEVICE FOR DOUBLE-SKIN FACADES WITH INNER AIR CAVITY according to claim 1, **characterized in that** the rod (4) is operated longitudinally or radially in relation to the axis of the said rod (4), acting directly on the shutters (9) to open or close them.

3. VENTILATION DEVICE FOR DOUBLE-SKIN FACADES WITH INNER AIR CAVITY according to claim 1, **characterized in that** the rod (4) will have a telescopic section (8) to modify its length.

4. VENTILATION DEVICE FOR DOUBLE-SKIN FACADES WITH INNER AIR CAVITY according to claim 1, **characterized in that** the casing (1) has a telescopic section (16), where the shape of the area in which the casing is fitted (1) relative to the telescopic section (16) is symmetrical to a horizontal plane located at the midpoint of the height of the casing (1).

5. VENTILATION DEVICE FOR DOUBLE-SKIN FACADES WITH INNER AIR CAVITY according to claims 1 and 3, **characterized in that** when the rod (4) is rotated, it operates a rack (10) and pinion (11) and is attached to the shutters (9) by a device (12) that slides on a rail (13) located inside the casing (1).

6. VENTILATION DEVICE FOR DOUBLE-SKIN FACADES WITH INNER AIR CAVITY according to claim 1, **characterized in that** the internal bottom plane of the casing (14) has a downward slope towards the exterior and drainage holes (6) at the bottom of the external face of the device.

7. VENTILATION DEVICE FOR DOUBLE-SKIN FACADES WITH INNER AIR CAVITY according to claims 1 to 3, **characterized in that** the rod (4) runs through the inside of the casing (1) and is directly connected to the shutter (9) such that it rotates entirely to open or close the openings that lead to the exterior (2), where the openings that lead to the interior (3) are distributed over the surface of the casing (1).

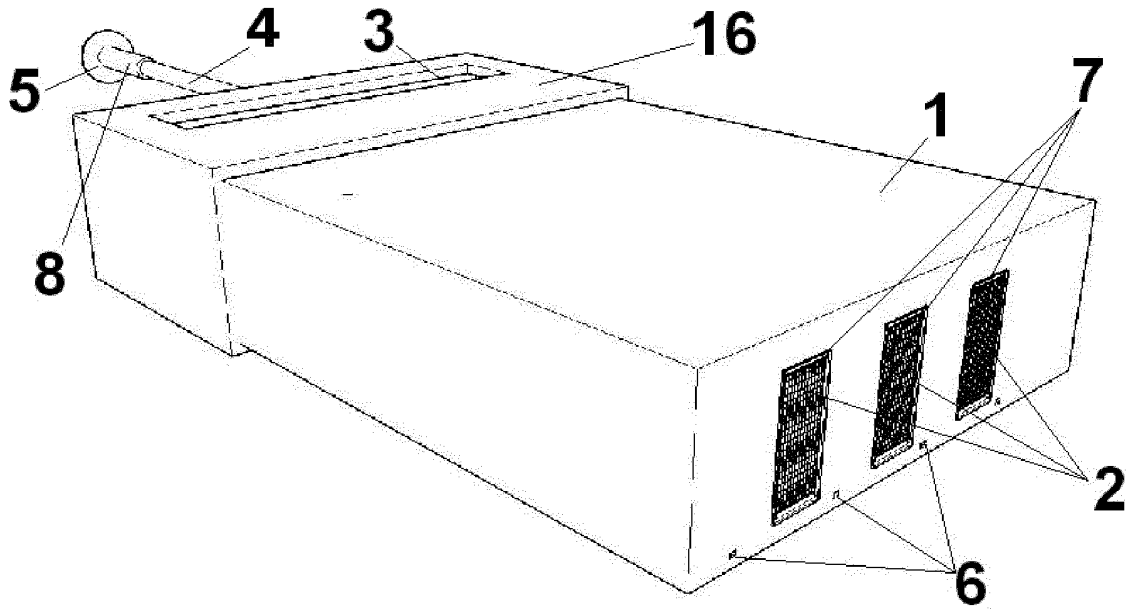


Fig. 1

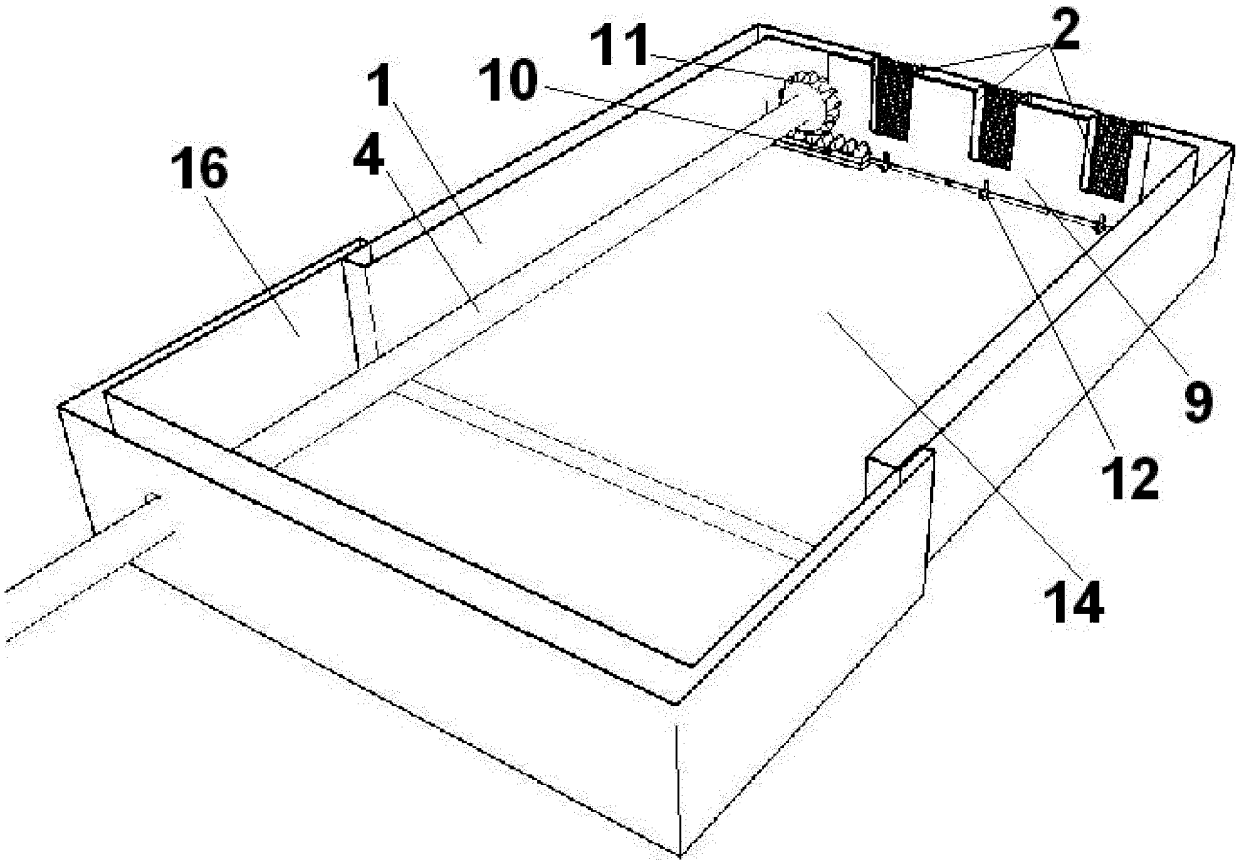


Fig. 2

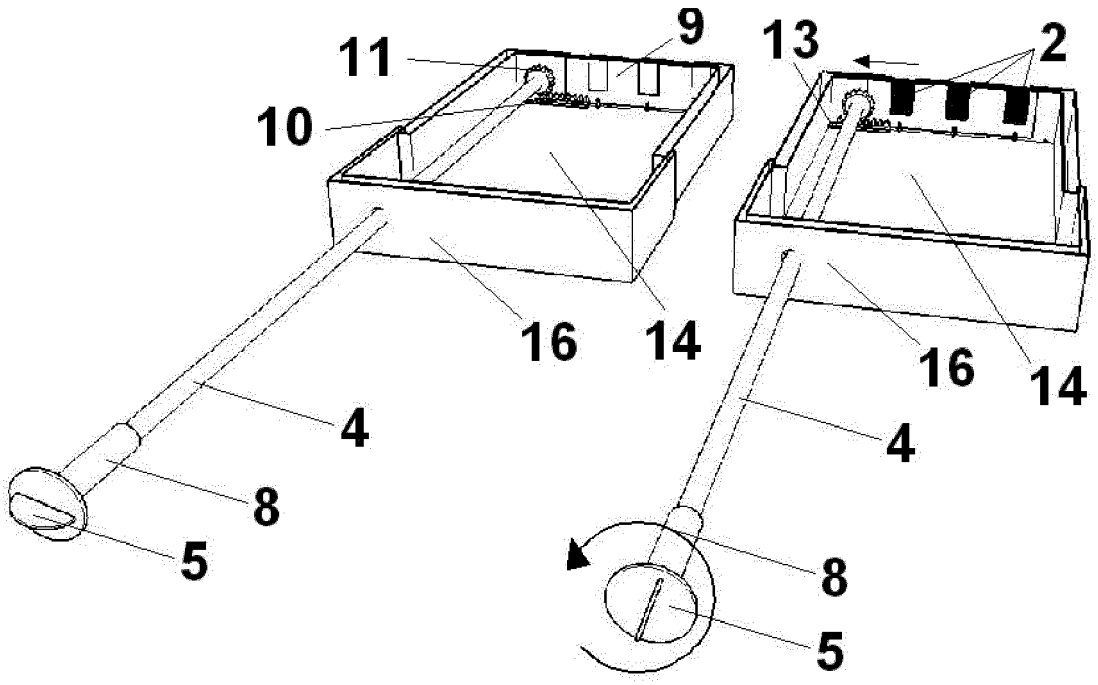


Fig. 3

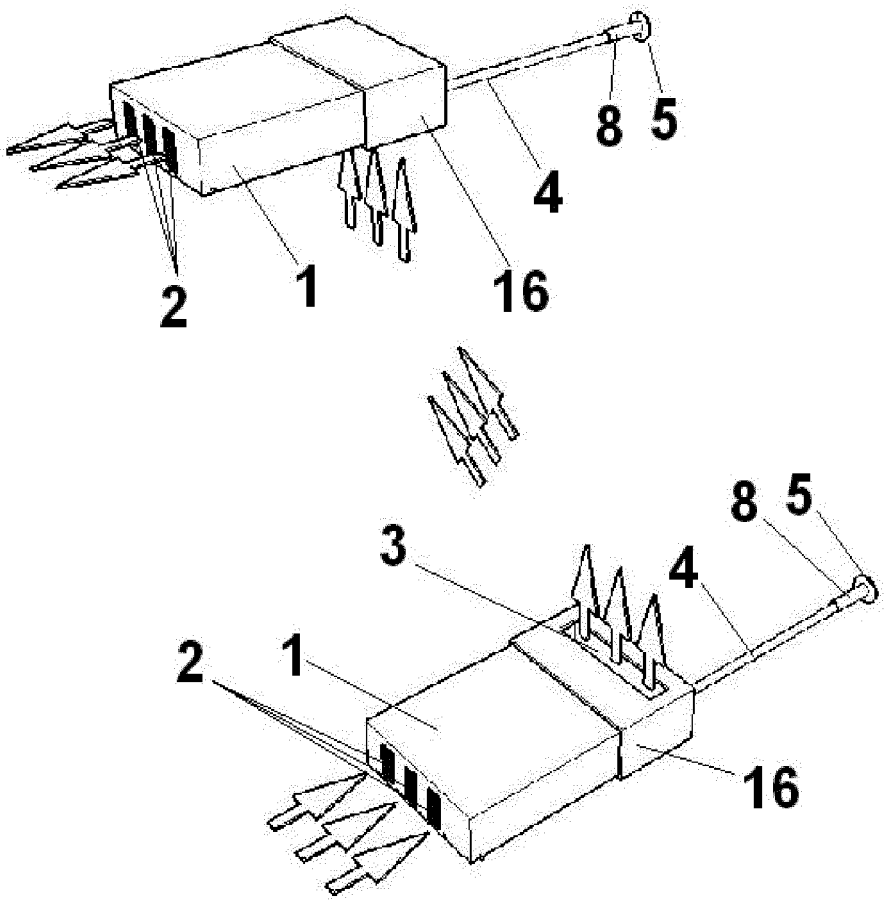


Fig. 4

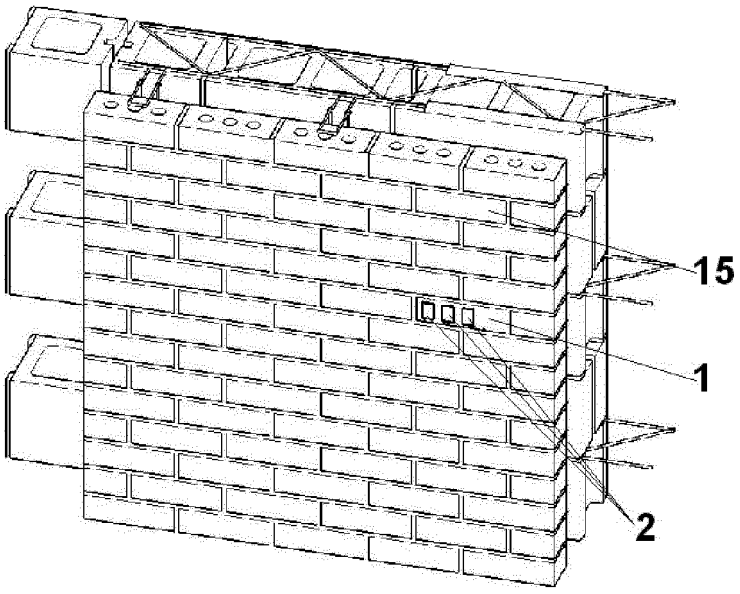


Fig. 5a

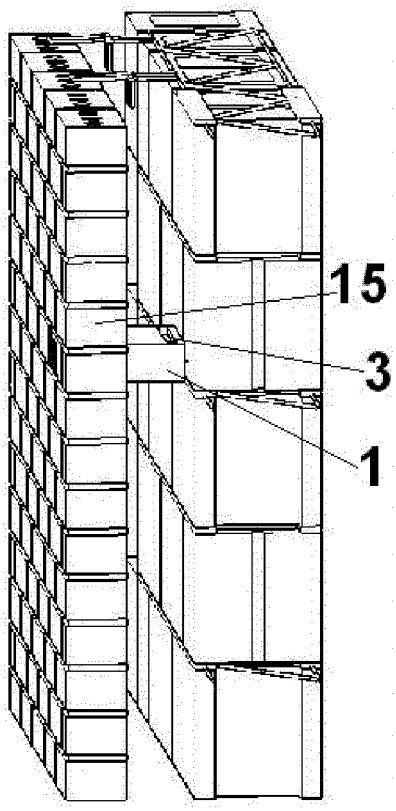


Fig. 5b

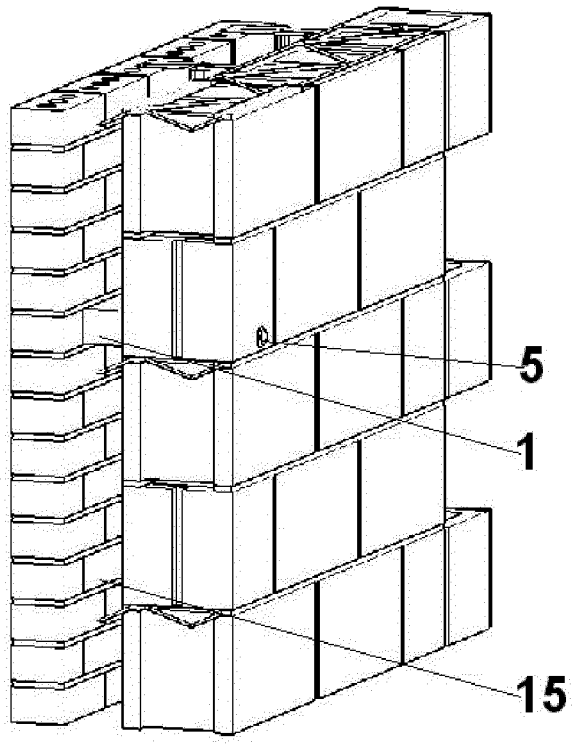


Fig. 5c

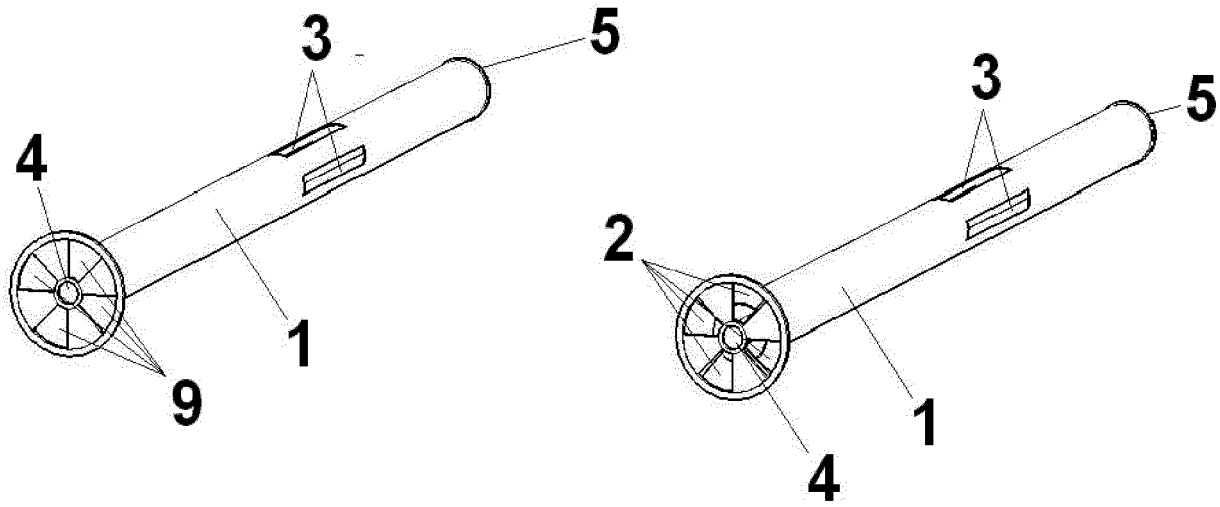


Fig. 6a

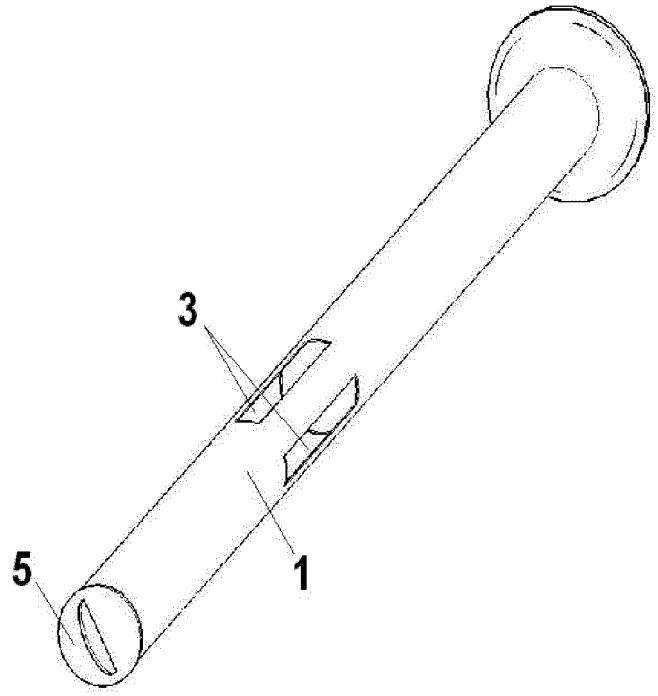


Fig. 6b

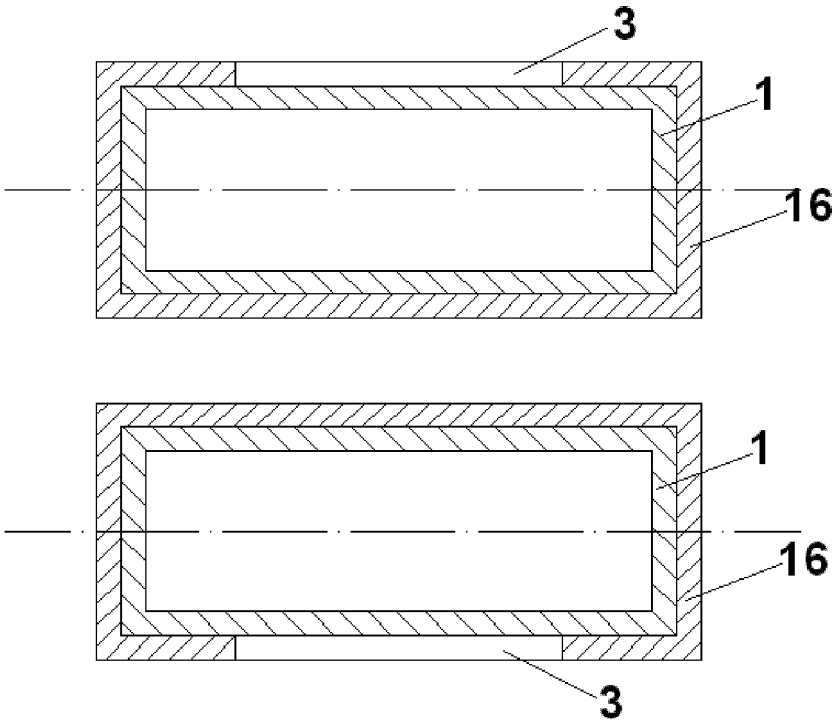


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2015/000015

A. CLASSIFICATION OF SUBJECT MATTER

E04B1/70 (2006.01)
F24F13/12 (2006.01)
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)
E04B, F24F

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)

EPODOC, INVENES

C. 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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A	GB 2338497 A (MOLYNEUX G MOLYNEUX G ET AL.) 22/12/1999, page 10, line 18 - page 17, line 17; figures 1 - 12.	1,4
A	US 848917 A (MCELLIGOTT EDWARD JAMES ET AL.) 02/04/1907, page 1, line 60 - page 2, line 21; figures 1 - 3.	1,2,4
A	DE 10135866 C1 (ZLT LUEFTUNGS UND BRANDSCHUTZT) 28/11/2002, (abstract) [on line][retrieved the 04/07/2014]. Retrieved from EPODOC/EPO Database.	1,5

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
04/03/2015	**(05/03/2015)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer M. Sánchez Robles Telephone No. 91 3495431

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2015/000015

C (continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of documents, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005266791 A1 (BELIVEAU JOHN A ET AL.) 01/12/2005, abstract; paragraphs[0007],[0009],[0026]; claims 1-2; figure 1, 1b,2.	1,6
A	US 2664809 A (MORELL JOSEPH J) 05/01/1954, figures 1 - 7.	1
A	US 4587891 A (KRUSE WILBUR F) 13/05/1986, figures 1 - 4.	1

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/ES2015/000015

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Form PCT/ISA/210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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