



(43) International Publication Date
29 November 2012 (29.11.2012)

- (51) **International Patent Classification:**
E04B 1/70 (2006.01) *E04B 1/64* (2006.01)
- (21) **International Application Number:**
PCT/CN2011/074416
- (22) **International Filing Date:**
20 May 2011 (20.05.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
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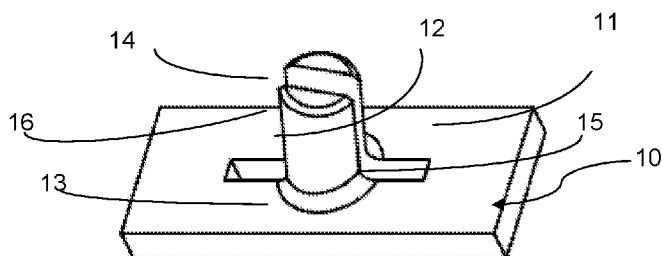
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, 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, PE, PG, PH, PL, PT, RO, RS, RU, 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.
- (84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) **Title:** VENTING APPARATUS FOR EXTERIOR INSULATION AND FINISH SYSTEMS

FIG. 1



(57) **Abstract:** The present invention relates to a venting apparatus for moisture ventilation in exterior thermal insulation systems comprising a pipe (20) having two opposing ends (21a, 21b) and defining a channel (22) extending from one end to the other end, and a support base (10) comprising or defining a first section (11) having a contacting surface defining a slot (15), and a second section (12) defining a space (14) in fluid communication with said slot (15), wherein said second section (12) engages said pipe (20) in a manner such that said pipe (20) is held in a specific position with respect to said support base (10) while said slot (15) of said support base (10) is in fluid communication with said channel (22) of said pipe (20) through said space (14) of said second section (12), and one part of said slot (15) is uncovered after said pipe (20) is engaged.

VENTING APPARATUS FOR EXTERIOR INSULATION AND FINISH SYSTEMS

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to a venting apparatus for moisture ventilation of exterior thermal insulation systems in the construction industry.

Discussion of Background Information

Exterior thermal insulation systems, such as Exterior Insulation and Finishing Systems (EIFS) developed in Europe in the early 1970s, are important for energy savings in building
10 industries. The function of exterior thermal insulation systems is to keep indoor temperature and humidity stable during transitions in climatic conditions, thus comfort in residence is considerably improved. Energy is saved through the application of insulation materials in this system. Normally an exterior thermal insulation system comprises the following components: an insulation board, an adhesive layer adhering the insulation board to a substrate wall, a
15 basecoat mortar layer which is the protective coat of insulation board and the base coat of finish material (also named a facing layer), and a decorative layer (painting, tile, stucco, etc.).

An exterior thermal insulation system could be set up in the form of integrated panels that are prefabricated in a factory and installed at a construction site. The panels are fixed onto a substrate wall normally with adhesive mortar together with mechanical fasteners. Joints
20 between panels are filled with foam rolls or foam bars, and then sealed with sealant. If a system does not have moisture ventilation apparatus, dampness, condensation and mould will occur within the system. In addition, water vapor may erupt through the interface between the insulation board and sealant to cause cracks, which will allow water to penetrate into the system. In order to avoid all these issues, an apparatus for moisture venting is needed in this
25 field.

CN 201406809Y teaches moisture vent caps which are inserted through both the insulation layer and the facing layer to connect the space between a substrate wall and a panel with outside atmosphere, and equally installed into insulated decorative panels. In this way, moisture behind panels can be vented out through a channel along the axial direction within the
30 caps. But the insulation layer is destroyed partially during installation, which affects the appearance of the system. In addition, since the caps need to be hard enough to penetrate the

panel, there are some requirements on the caps, such as a higher mechanical strength, that will increase production costs compared with the apparatus of the present invention.

CN101481932 discloses a moisture vent clamp. A typical clamp includes a main body and four arms, which is cruciate from a front view. There is a venting hole in the center of the main board. The clamp is made from a complicated design and not easy to manufacture. The thickness of the arms should match the joint between panels, which is a requirement normally difficult to meet upon installation. In addition, the volume of the clamp is large, which increases the material cost.

A new venting apparatus is desirable for exterior thermal insulation systems, which overcomes above shortages in the existing designs.

BRIEF SUMMARY OF THE PRESENT INVENTION

The present invention provides a venting apparatus for moisture ventilation in exterior thermal insulation systems. The venting apparatus of the present invention comprises a pipe having two opposing ends and defining a channel extending from one end to the other end, and a support base comprising:

- (i) a first section having a contacting surface defining a slot,
- (ii) a second section which defines a space in fluid communication with the slot,

wherein said second section engages said pipe in a manner such that the pipe is held in a specific position with respect to the support base while the slot of said support base is in fluid communication with the channel of said pipe through the space of said second section, and part of the slot is uncovered after said pipe is engaged.

In a preferred embodiment of the present invention, said second section of said support base is a cylindrical outshoot and said cylindrical outshoot is capable of being inserted into the channel of said pipe through an end of said pipe. Said cylindrical outshoot has two ends, one of them connected to said first section of said support base. Said cylindrical outshoot defines a gap which separates said cylindrical outshoot into two identical parts along its axial direction, and upon inserting into said pipe the slot of said second section of said base communicates with the channel of said pipe through the gap.

BRIEF DESCRIPTION OF DRAWING

Figure(FIG.) 1 illustrates one example of a support base of a venting apparatus of the present invention.

FIG. 2 illustrates the side view of the example of FIG.1.

FIG. 3 illustrates another example of a support base.

FIG. 4 illustrates another example of a support base.

FIG. 5 illustrates one example of a pipe of a venting apparatus.

FIG. 6 illustrates a venting apparatus after engagement of the support base of FIG. 1 with
5 the pipe of FIG. 5.

FIG. 7 illustrates the front view of the venting apparatus of FIG. 6.

FIG. 8 illustrates another example of a support base.

FIG. 9 illustrates the side view of the support bases of FIG. 8.

FIG. 10 illustrates a venting apparatus after engagement of the support base of FIG. 8
10 with a pipe.

FIG. 11 illustrates installation of the venting apparatus of FIG. 6 on a wall.

FIG. 12 provides a photo showing the venting apparatus positioned at the intersection
of two joints among panels.

15 DETAILED DESCRIPTION OF THE PRESENT INVENTION

In the present invention, the first section of a support base of a venting apparatus could be in any form as long as it is capable of attaching the support base to a substrate wall. A “contacting surface” is a surface of the first section, through which the support base is attached to the substrate wall. The contacting surface could be rectangle, round, triangle, etc. The
20 contacting surface could be smooth, as well as rough or grooved to increase the adhesiveness when preferably the support base is adhered to the substrate wall.

In a preferred embodiment, the first section of the support base is cuboid and thus the contacting surface is rectangular. A cuboid has three mutually perpendicular dimensions: length, width and thickness. “Length” corresponds to the dimension of greatest magnitude.
25 “Width” has a magnitude that is equal to or smaller than the length and equal to or greater than the thickness. “Thickness” has a magnitude equal to or less than the width dimension, and is normally much less than the length and the width in the support base. A “contacting surface” is defined by the sides representing the length and the width and is in parallel with the substrate wall on which the support base is applied. An “opposing surface” is the surface opposite to and
30 in parallel with the contacting surface. The opposing surface is also defined by the sides representing the length and the width. The thickness is also the distance between the two paralleled surfaces. When the first section of the support base is not a cuboid but has the opposing surface and the contacting surface, the thickness of the first section is the distance

between the two paralleled surfaces. Preferably the first section has a thickness of 2 to 15 millimeter (mm).

In the present invention, the first section of the support base of the venting apparatus defines a slot. Moisture can enter into the pipe and eventually is discharged into the atmosphere out of thermal insulation panels through the slot. When the first section of the support base is cuboid, preferably the slot is defined in an opposing surface of the support base, which opposite to the contacting surface, or the slot is a through-hole running through the two opposite surfaces.

A pipe can be a hollow tube having two ends and a channel running through from one end to the other. The pipe can have a cross-section which could be any form, such as round, triangle, square, etc., as long as it can engage the support base. "Engage" in reference to the pipe and the support base refers to connecting in such a manner so as to hold the pipe in place relative to the support base. In a preferred embodiment, the pipe is a cylinder and has a round cross-section. The round cross-section of the pipe is a ring form consisting of two homocentric rounds. "Outer diameter" means the diameter of the larger round. Accordingly, "inner diameter" means the diameter of the smaller round, which in fact is the diameter of the round cross-section of the channel.

The profile of the slot defined by the first section can be of any size and shape as long as the slot is not completely covered when the pipe is engaged with the support base, and thus the moisture could enter into the pipe through the slot. In a preferred embodiment, the slot is rectangular or is cross-shaped, and its length is larger than the outer diameter of the pipe. Thus the moisture could enter into the channel of the pipe through the slot.

In the present invention, the second section of the support base of the venting apparatus is used to engage the pipe that defines a channel therethrough. The second section of the support base defines a space. When the pipe is engaged with the second section, the space provides fluid communication from outside the pipe to inside the channel of the pipe. Such a space could be in any form, such as a gap or a groove, as long as it does not affect the engagement with the pipe and could provide the fluid communication with the slot of the first section and the pipe.

In a preferred embodiment, the second section is an outshoot that could be inserted into the channel of a pipe and therefore the pipe can be engaged with the support base. In a further preferred embodiment, the second section is a cylindrical outshoot having a round cross-section and the pipe defines a channel having a round cross-section too. The cylindrical outshoot has two opposing ends and is separated into two parts, preferably identical, along its axial direction by a gap (the space of the second section). In an even further preferred

embodiment, the gap extends in a radial direction parallel to the slot of said first section, and the gap has a width same as the slot such that a die for manufacturing the support base could be manufactured more easily than a slot having a width different from a gap. In another even further preferred embodiment, the gap can extend in different direction than the slot, for example perpendicular to each other. In this form, the slot communicates with the gap at the end of the cylindrical outshoot connecting with the first section.

In a further preferred embodiment the outshoot has a round cross-section and two opposing ends with one end that connects to the first section of the support base and extends from the support base in a tapered manner to form a circular truncated cone. In another further preferred embodiment, the outshoot is cylindrical and has two opposing ends with one end connecting to the first section of the support base and the other end forming a circular truncated cone. Such a shape facilitates insertion of the cylindrical outshoot into one end of the pipe.

In another further preferred embodiment, the second section is a cylindrical outshoot that has two opposing ends and defines a through-hole running through from one end to the other. Upon engagement with the pipe, the through-hole provides fluid communication between the slot and channel through the pipe.

In another preferred embodiment, the second section of the support base is defined in the first section as two sockets having different areas. The smaller socket is defined within the bigger socket. The two sockets independently can be any profile, such as triangle, square, trapezoidal, rectangular, round or irregularly shaped, as long as the pipe can be received into the bigger socket and therefore engaged with the support base, and at the same time the channel of the pipe is in fluid communication with the smaller socket.

In a further preferred embodiment, the two sockets are round and have different diameters, which form a circular zone. In an even further preferred embodiment, the two round sockets are homocentric. The bigger socket having the larger diameter is defined in the opposing surface of the first section of the support base. The smaller socket having the smaller diameter is defined within the bigger socket. The diameter of the bigger round socket matches with outer diameter of the pipe so that the pipe can engage the support base by fitting an end of the pipe into the larger socket. The depth of the bigger socket is selected to receive the pipe and engage with the support base. The slot can be cut on the first section of the support base through the two homocentric round sockets. It can have a length longer than the diameter of the bigger socket and a depth reaching the small socket. In this form, the slot of the first section communicates with the pipe through the smaller socket after the pipe is received into the bigger socket.

Preferably, the second section is designed in such a way that the engaged pipe extends obliquely relative to the surface of the support base opposite the contacting surface. When the first section of the support base is a cuboid, preferably the pipe extends obliquely at an angle of 75 to 87 degrees relative to the opposing surface of the support base. When the second section is a cylindrical outshoot, the cylindrical outshoot deviates from the direction vertical to the wall substrate, and thus the end of said pipe, at which said support base is engaged, is higher than the opposing end of the pipe. That is, when the apparatus is mounted on a wall substrate the pipe is angled downward away from the wall.

Figure 1 illustrates an example of a support base **10** of a venting apparatus of the present invention. The support base is rectangular from a top view and provides a first section **11** and a second section (a cylindrical outshoot) **12**. Cylindrical outshoot **12** is connected to the first section **11** at one end **13** of the cylindrical outshoot **12** and said end **13** is in a form of a circular truncated cone. A space (gap) **14** separates the cylindrical outshoot **12** into two identical parts along its axial direction. A slot **15**, having the same radial direction with gap **14**, is defined in the support base and integrated with the gap **14**. Cylindrical outshoot **12** includes a circular truncated cone at the other end **16**.

Figure 2 provides the side view of support base **10** of Figure 1, it can be seen that cylindrical outshoot **2** extends obliquely relative to the first section **11**.

Figure 3 provides another example of a support base **10**, wherein contacting surface **17**, which is meant to contact a wall substrate, is grooved.

Figure 4 illustrates one more example of a support base **10**. Cylindrical outshoot **12** is separated into four identical parts along its axial direction by two gaps **14a** and **14b**, the radial directions of the two gaps **14a** and **14b** are perpendicular to each other. At the end **13** of the cylindrical outshoot **12** connects with the first section **11**. Two slots **15a** and **15b**, each of them separately having the same direction with one of the gaps **14a** and **14b**, communicate with the intersection of the two gaps **14a** and **14b**.

In the broadest scope of the invention there is no limitation on the pipe of the present invention as long as the pipe is a hollow tube being capable of engaging the support base and discharging moisture. Preferably, the pipe has a circular cross section when engaging with a cylindrical outshoot or a circular socket. Normally the pipe has two ends and a channel running through from one end to the other, wherein one end is engaged with the support base and the other, the distal end, is extended outward to outside atmosphere. Upon installation of the venting apparatus, the distal end of the pipe is preferably lower than the end at which the pipe is engaged with the support base to avoid back flow of rain water. The pipe has a length extending between opposing ends. The length of the pipe can be selected such that the pipe

will not extend out of the outer surface of the panel and therefore affect the appearance after installation. The pipes could be prepared at jobsite, such as cutting a long hollow tube into shorter segments. In a preferred embodiment, the length of the pipe is selected to ensure that the distal end of the pipe is level with the outer surface of the insulation panels.

5 There is no limitation on the materials of the support base and the pipe. Preferably, the support base and the pipe could be made of materials selected from a group consisting of polyethylene, polypropylene, and acrylonitrile-butadiene-styrene (ABS) plastics. In one embodiment, the support base and the pipe are made of polypropylene T300, commercially available from China Petroleum & Chemical Corporation Limited (SINOPEC).

10 Figure 5 provides a typical pipe **20** having a circular cross section. It has two ends **21a** and **21b** and a channel **22** running through from one end to the other.

 Figure 6 provides an illustration of a venting apparatus after engagement of support base **10** of Figure 1 with pipe **20** of Figure 5 (some elements are not marked). Cylindrical outshoot **12** of the support base **10** is inserted into one end **21b** of the pipe, while slot **15** is not
15 completely covered by pipe **20**.

 Figure 7 provides a front view of the venting apparatus of Figure 6 (some elements are not marked). It can be seen that pipe **20** extends obliquely relative to the opposing surface **18** of the support base **10** opposite the contacting surface **17**.

20 Figures 8 and 9 illustrate a support base **10** where the second section for engaging a pipe includes two homocentric round sockets defined on the opposing surface **11** of the support case **10**. The smaller socket **1-2** is located inside the bigger socket **1-1**. A slot **15** passes through the two circles and communicating with both sockets.

 Figure 10 illustrates how a pipe is engaged with the support base shown in Figures 8 and 9. The outer diameter of pipe **20** matches with the inner diameter of the bigger round socket (unseen) and is bigger than the inner diameter of the smaller round socket (unseen).
25 Thus the pipe **20** could be received into the bigger round socket, but it could not be received into the smaller socket. Slot **15** communicates with both the smaller socket and the channel **22** of the pipe **20**. The axial direction of the two round sockets extends obliquely relative to the direction vertical to the support base. When the pipe is engaged, the pipe will also extend
30 obliquely relative to the direction vertical to the support base.

 Figure 11 illustrates the installation of the venting apparatus. The venting apparatus is attached with a substrate wall **31**. It can be seen that the distal end **21a** of the pipe **20** is lower than the other end **21b** at which the pipe **20** is engaged with the support base **10** and distal end **21a** is even with panels **30**.

The size of the support base is not limited so long as it is convenient to locate the support base at the joint between two thermal insulation panels, preferably at the intersection of two joints, one of them intersects the other.

In one example, a venting apparatus having a support base of 12×30×3mm is located at a joint between two thermal insulation panels, preferably at an intersection of two joints, one of them perpendicular to the other. The panels typically have an area of 0.5 square meter (m²) and the width of the joints between every two panels is typically in a range of 12 to 15mm. The venting apparatus is desirably applied in an amount of 25 venting apparatuses per 100m² of a substrate wall.

The venting apparatus could be installed directly on a substrate wall, or on a leveling layer which is applied on the substrate wall. The venting apparatus could be attached by any appropriate way, for example by mechanical fasteners, such as nails or screws. In one preferred embodiment, it is attached by adhesives, such as glue, latex, or adhesive mortar. The number of venting apparatus used in an EIFS is various depending on venting requirements. In a typical installation, one venting apparatus could be used per two square meter of the system.

A process for installing the apparatus of the present invention onto a substrate wall is as below.

- 1) Cast a support base having a size of 12×30×3mm as shown in Figure 1;
- 2) Cut a piece of a plastic pipe having an outer diameter of 6 mm as shown in Figure 5;
- 3) Fix the support base on a substrate wall by adhesive mortar and then connect the piece of pipe onto the cylindrical outshoot of the support base as shown in Figure 8 and Figure 11; and
- 4) Seal joints around the pipe and cut it at the same level with the outer surface of the panel to form the whole system.

The venting apparatus of the present invention can be easily manufactured. It has good installation tolerance and thus can be easily installed. At the same time, the installation will not affect the appearance of the panels. The venting apparatus also avoids back flow of rain water.

CLAIMS

What is claimed is:

- 5 1. A venting apparatus for moisture ventilation in exterior thermal insulation systems comprising
- (a) a pipe having two opposing ends and defining a channel extending from one end to the other end, and
- (b) a support base comprising or defining
- 10 (i) a first section having a contacting surface defining a slot, and
- (ii) a second section defining a space in fluid communication with said slot, wherein said second section engages said pipe in a manner such that said pipe is held in a specific position with respect to said support base while said slot of said support base is in fluid communication with said channel of said pipe through said space of said second section,
- 15 and part of said slot is uncovered after said pipe is engaged.
2. The venting apparatus according to the claim 1,
- wherein said second section of said support base is a cylindrical outshoot having two opposing ends, one of the ends being connected with said first section, and said cylindrical outshoot defines said space along its axial direction extending from one end to the other, and
- 20 wherein said cylindrical outshoot engages said pipe by inserting into one end of said pipe, and upon insertion said slot of said support base is in fluid communication with said channel of said pipe through said space.
3. The venting apparatus according to the claim 2, wherein said space is a gap that separates said cylindrical outshoot into two parts along its axial direction.
- 25 4. The venting apparatus according to the claim 2, wherein said space is a through-hole along the cylindrical outshoot axial direction.
5. The venting apparatus according to the claim 2, wherein the end of said cylindrical outshoot opposite to the end connected with said first section of said support base is in a form of a circular truncated cone.
- 30 6. The venting apparatus according to the claim 1,
- wherein said second section of said support base is defined in said first section of said support base as two sockets having different areas, and the smaller socket is defined within the bigger socket; and
- wherein said pipe engages with said support base by inserting one end of said pipe into
- 35 one socket and said slot passes through the other socket or both sockets.

7. The venting apparatus according to the claim 6, wherein said two sockets are two homocentric round sockets having different diameters.

8. The venting apparatus according to the claim 7,

wherein said bigger socket having a larger diameter is firstly formed on a surface opposite to said contacting surface, and then said smaller socket having a smaller diameter is formed inside said bigger socket, and

wherein said pipe is received into said bigger socket.

9. The venting apparatus according to the claim 1, wherein said contacting surface has grooves defined therein.

10. The venting apparatus according to the claim 1, wherein said pipe is oblique relative to the surface of said support base opposite said contacting surface and the end of said pipe, at which said support base is engaged, is higher than the opposing end.

11. The venting apparatus according to the claim 1, wherein the material producing said base and pipe is selected from a group consisting of polyethylene, polypropylene, and acrylonitrile-butadiene-styrene plastics.

12. An exterior thermal insulation system comprising prefabricated panels which comprise a thermal insulation layer and a facing layer, and the venting apparatus according to the claim 1, wherein said venting apparatus is fixed between the panels.

13. A wall comprising prefabricated panels and the venting apparatus according to the claim 1, wherein said venting apparatus is positioned at the intersection of two joints, each of them located between two panels and said venting apparatus is used in an amount of 25 venting apparatuses per 100m² of said wall.

FIG.1

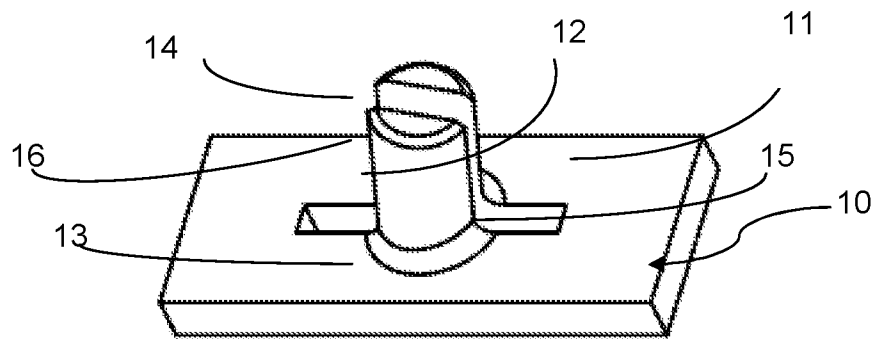


FIG.2

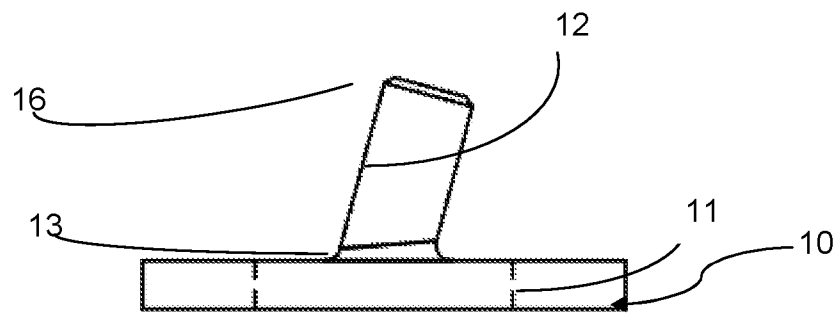


FIG.3

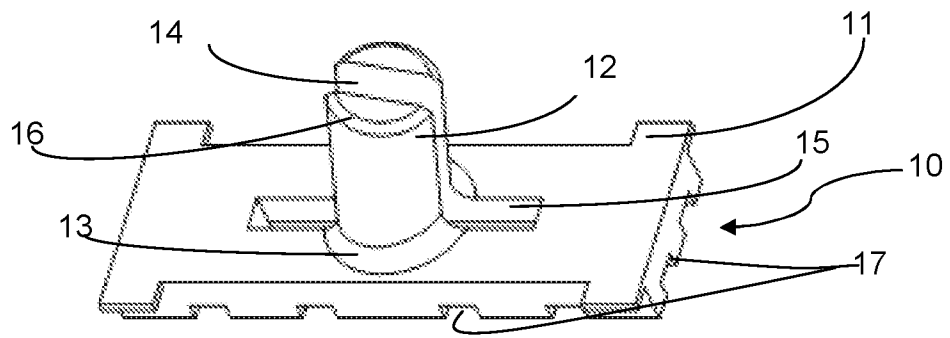


FIG.4

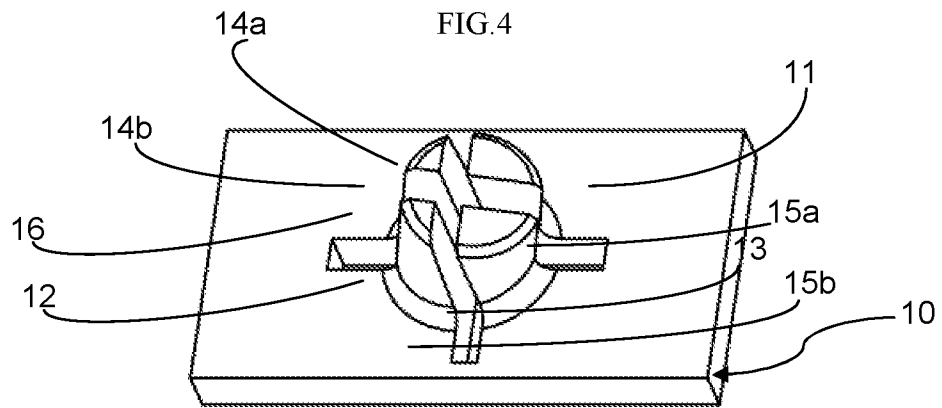


FIG.5

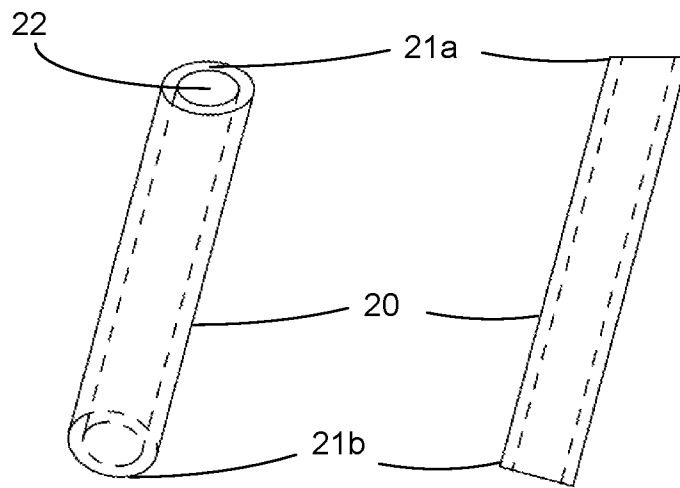


FIG.6

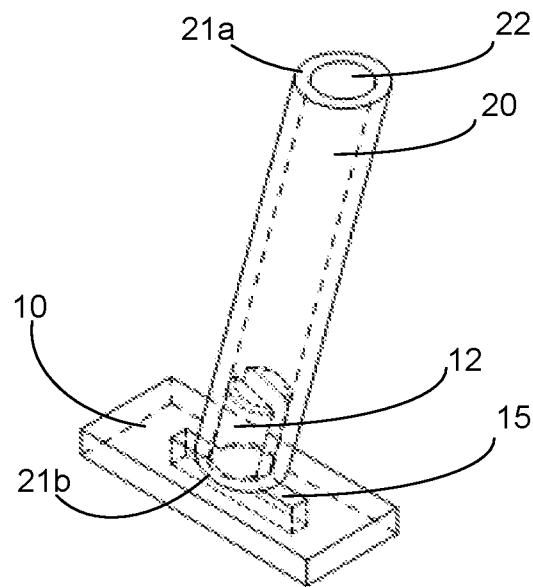


FIG.7

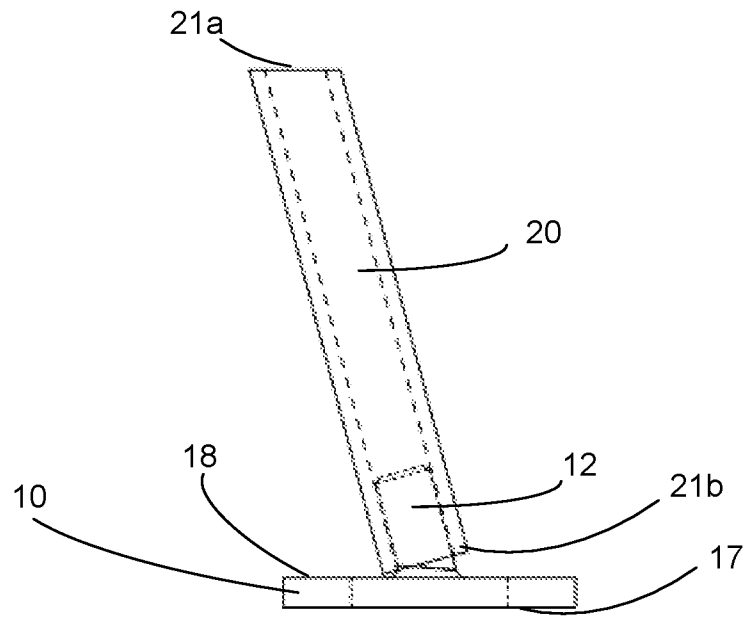


FIG.8

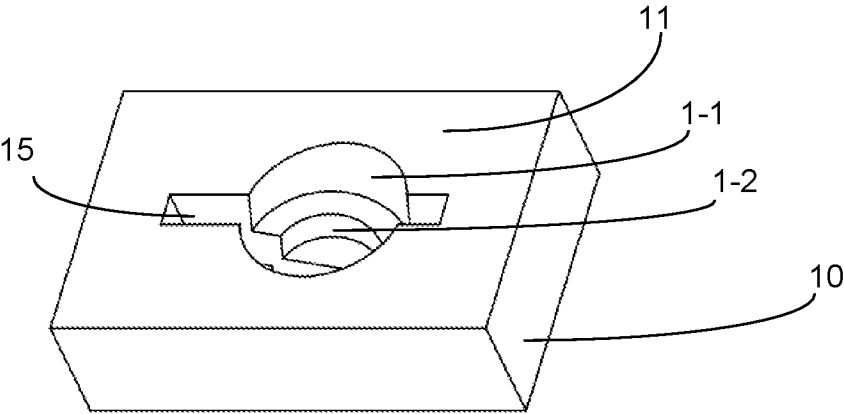


FIG.9



FIG.10

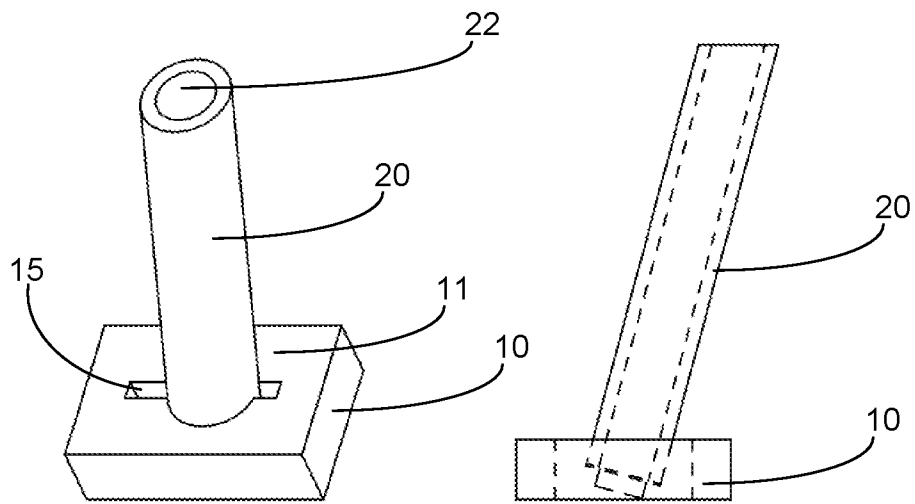


FIG.11

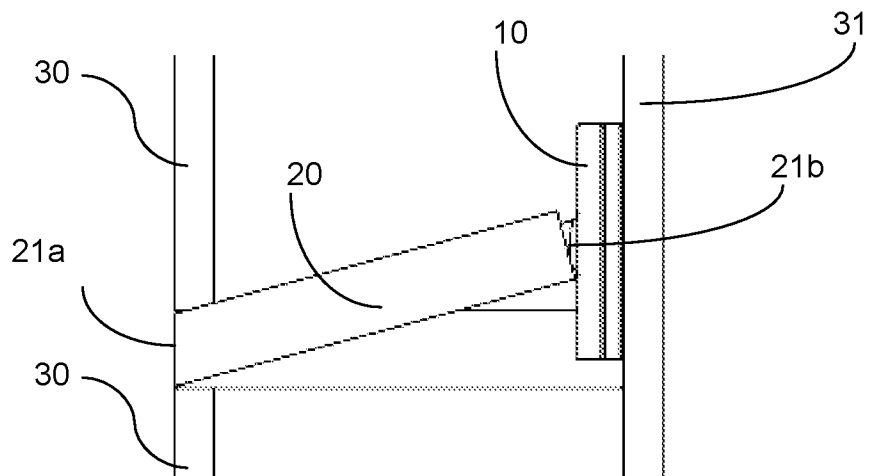
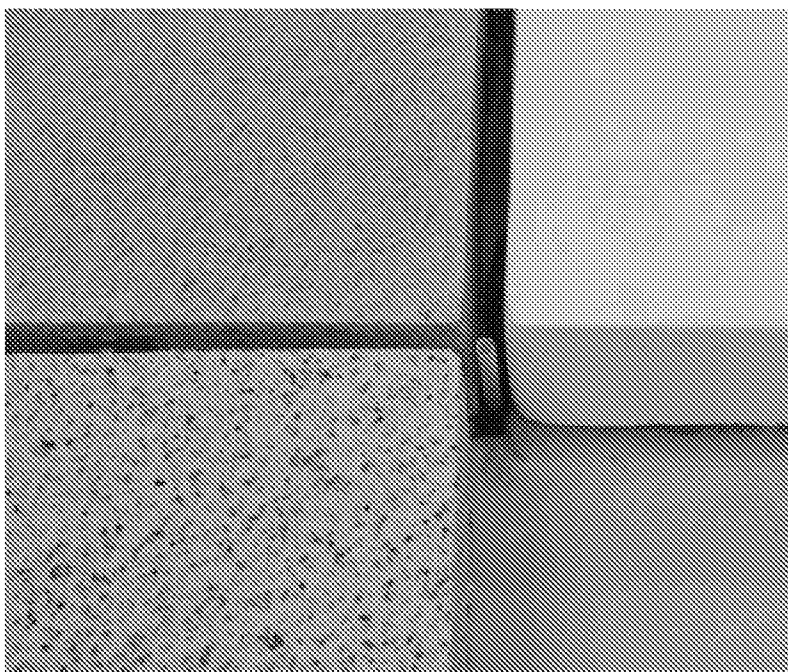


FIG.12



INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/074416

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: E04B1, E04F13, E04D11, E04D13

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)

CNPAT; CNKI; WPI; EPODOC

vent+, ventilat+, exhaust+, discharg+, damp, moisture, insualt+, heat+, thermal+, pip???, tub???, duct?, channel?, slot?, space?

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP11210099A (SHOKUKEN KK) 03 Aug. 1999(03.08.1999) Desc. Paras. 0009-0012, Figs. 1-5	1-13
A	CN201395904Y (BEIJING CHAOYANG URBAN CONSTR COMPREHENSIVE DEV CO LTD) 03 Feb. 2010(03.02.2010) whole document	1-13
A	CN101755097A (FRAUNHOFER GES FOERDERUNG ANGEWANDTEN EV) 23 Jun. 2010(23.06.2010) whole document	1-13
A	CN201695586U (CHINA 22MCC GROUP CORP LTD) 05 Jan. 2011(05.01.2011) whole document	1-13

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

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“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)	“&” document member of the same patent family
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“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 21 Dec. 2011(21.12.2011)	Date of mailing of the international search report 19 Jan. 2012 (19.01.2012)
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer HUO, Fang Telephone No. (86-10)62084833

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/074416

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PCT/CN2011/074416

CLASSIFICATION OF SUBJECT MATTER:

E04B1/70(2006.01)i

E04B1/64(2006.01)i