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(54) Title: A HANGER AND INSTALLATION THEREOF ON A CLADDING PANEL

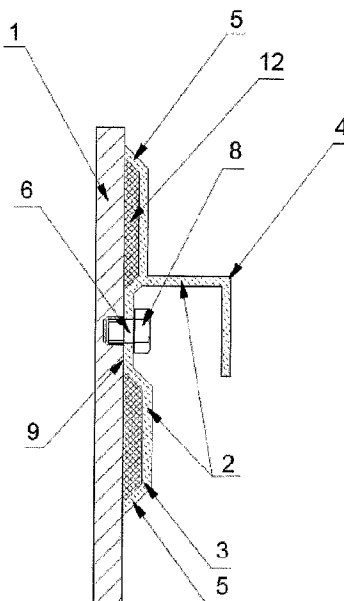


Fig.1

(57) **Abrégé/Abstract:**

The present invention refers to a hanger and installation thereof on a cladding panel. According to the invention, the hanger (2) made of a profile (3) has a permanently fixed upper installation profile (4) and lower installation profile (11). The profile (3) has a flat bend (5) on its upper and lower end. The outer edge of each flat bend (5) is in direct contact with the invisible surface of a cladding panel (1). In the central part of the profile (3), there is an opening (6) to accommodate a mounting pin (7) or a mounting bolt (8) or there is a permanently fixed tongue (10). This central part of the profile (3) is in direct contact with the invisible surface of the cladding panel (1) on a contact line (9).



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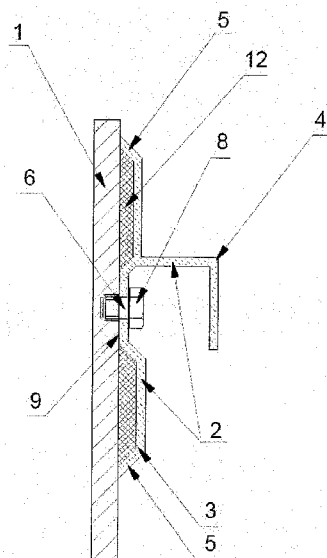


Fig.1

(57) Abstract: The present invention refers to a hanger and installation thereof on a cladding panel. According to the invention, the hanger (2) made of a profile (3) has a permanently fixed upper installation profile (4) and lower installation profile (11). The profile (3) has a flat bend (5) on its upper and lower end. The outer edge of each flat bend (5) is in direct contact with the invisible surface of a cladding panel (1). In the central part of the profile (3), there is an opening (6) to accommodate a mounting pin (7) or a mounting bolt (8) or there is a permanently fixed tongue (10). This central part of the profile (3) is in direct contact with the invisible surface of the cladding panel (1) on a contact line (9).



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A hanger and installation thereof on a cladding panel

The present invention refers to a hanger and installation thereof on a cladding panel.

A particular area where the invention can be of use is installation of cladding panels of interior and exterior façades, which guarantees safety of users and other parties. The invention guarantees especially safe installation of thin-walled cladding panels, having a thickness of 3 mm or more. Cladding panels are usually made of a respectively durable material, in particular a material highly resistant to destructive atmospheric conditions, in particular they are made of stone, mineral mass, especially ceramic mass, which contributes to a significant weight of façades installed on buildings.

There are known methods of installing cladding panels on metal substructures, especially aluminum ones, using certified adhesive systems. These systems use durable elastic adhesives, which make it possible to adapt dimensions of a cladding panel relative to a substructure.

Polish patent document no. PL 174021 discloses a method of mounting installing elements on a building wall, which consists in providing their rear face facing the building wall with a permanently fixed layer of soft foam material, favorably polyurethane material, onto which a liquid adhesive mass is laid until its full volume is

saturated. Next, cladding elements are pressed onto a building wall while the foam material layer is still soft, with this mass of foam material being compressed. While the soft foam material layer is compressed, the adhesive mass is dried or cured until the soft foam material layer reaches inelastic condition and its shape is stable.

Polish patent document no. PL 219887 discloses a method, system and installation set for installation of building tiles to a building partition with a binding agent, said tiles being in particular ceramic or stone tiles. This method comprises consecutive steps, such as installing at least two longitudinal mounting elements in a building partition, applying an adhesive thereto, sliding at least one virtually cuboidal tile on these mounting elements, said tile having at least on longitudinal mounting recess formed over the entire tile length. This method comprises also a stage of pressing a building tile with mounting elements to an adhesive and a building partition, and also stabilizing building tile position by attaching at least two press-on stabilizing elements in the building partition. The foregoing wall façade system comprises multiple exterior building tiles, especially ceramic or stone tiles installed on a building partition of a building with the use of an adhesive and tile mounting elements.

European patent document no. EP 2336444 discloses a method of attaching insulation panels with the use of assembly aid, which consists in attaching insulation panels to a substrate, e.g. a wall, with an adhesive, usually an adhesive foam. In particular, insulation panels are provided as thermal and/or acoustic insulation panels, e.g. insulation panels made of hard expanded polystyrene foam (EPS), polyurethane foam (PUR), hard extruded polystyrene

foam (XPS), polyisocyanurate (PIR), mineral foam, hard phenolic resin (PF), wooden wool, soft wooden fiber, cork, hemp, sheep wool, and mineral wool, and others. In the first stage of the method, a second insulation panel, favorably made of polystyrene, is attached with an adhesive mass to a substrate close to a first insulation panel which is already attached. This first insulation panel may also be mounted with an adhesive foam to a properly cured substrate. The second insulation panel is placed next to, favorably above, the first insulation panel and is positioned in an appropriate way. In the second stage of the method, at least one assembly aid is used. For this purpose, a binding element is detachably connected to the first insulation panel. It is achieved by inserting connection prongs into the first insulation panel until the abutment surface lies on the first insulation surface. At the same time, abutment center should contact the second insulation panel, specifically, the abutment surface area of the abutment center should be located on the second insulation panel. During the third stage of the method, this assembly aid is removed. Favorably, it happens at the moment after which adhesive foam is cured or one cannot expect any change in the position of the second insulation panel.

Polish patent application no. P.417531 "Anchor-free system for fastening of cladding panels and a method of fastening thereof" discloses an anchor-free system for fastening of cladding board elements which comprises a metal base profile where two-element hangers are mounted. The two-element hangers have the form of an upper element coupled with a bottom element, advantageously with a screw. The contact surface of this connection forms a horizontal or inclined ledge, the central part of which is

advantageously provided with an opening to accommodate an adjustment bolt. The vertical wall of the hanger's upper element has at least one tongue placed at an angle relative to the vertical surface of the hanger's upper element's vertical wall. The vertical wall of the hanger's bottom element has at least one tongue placed at an angle relative to the vertical surface of the hanger's bottom element's vertical wall. Each cladding panel is provided with incised installation grooves for tongue fixing on the invisible side. A method of fastening an anchor-free system for fastening of cladding panels consists in gouging at least two installation grooves on the invisible surface of a cladding element, said grooves being directed at an angle towards the inside of the invisible surface of this cladding element. After that, along the direction of one groove's installation depth, in line with the direction of the installation groove, the tongue of the hanger's bottom element is inserted. This tongue forms a part of a hitch. After that, along the direction of another groove's installation depth, in line with the direction of the installation groove, the tongue of the hanger's upper element is inserted. This tongue forms the other part of the hitch. Afterwards, the upper and the bottom element of the hanger are riveted, screwed or bolted together. Each component of the two-element hanger is attached to the invisible surface of a cladding panel element in line with the direction of the actual installation groove.

In particular technological and structural cases, a method of fastening an anchor-free system to cladding panels uses assembly aid in the form of an adhesive applied between installation grooves of the upper element tongue and bottom element tongue suspension of the anchor-free

system in the area of contact between the bottom element's tongue and the cladding panel.

As it can be concluded from the foregoing, there are no methods to easily, quickly and safely fasten thin-walled and other cladding panels, both interior and exterior ones, which would simultaneously use an adhesive mass and a hanger according to this invention. In the present art, installation of cladding panels at a construction site is conducted by bonding panels directly to vertical profiles of a load-bearing structure. To what extent this installation is effective depends mainly on atmospheric conditions during installation. Moisture, low and excessive temperature as well as dust in the air have negative impact on adhesive bonding quality. Therefore, it is problematic to obtain the required strength properties of bonded structures which are installed directly onsite. Thus, in the previous art, correct installation of cladding panels, including glass panels, in controlled conditions and by bonding is conducted as workshop activity comprising bonding of cladding panels to structural frames of the suspension system. In one of the solutions, workshop is where complete façade forms are made, having a form of a frame with a cladding panel bonded thereto and ready for installation. In the previous art one will not find any connection between a system where interior and exterior cladding panels are bonded with an adhesive and a system of installing profiles and hangers, and other necessary elements enabling installation on the inside faces of cladding panels. In the known art, cladding panels are not installed by simultaneous bonding and mechanical connection of load-bearing structural elements. Either one or the other solution is used.

The present invention refers to a hanger and its installation on a cladding panel which is performed as anchor-free mechanical installation with the aid of an adhesive. The hanger according to the invention is made of a profile, one surface of which is installed on the invisible surface of a cladding panel, and which has a permanently fixed upper installation profile on the other side. Said profile has a bend on its upper and lower end, and the outside edge of the upper and lower bend is in direct contact with the invisible surface of the cladding panel. Inclination angle of the upper and lower bend relative to the hanger's profile ranges from 90° to 165° . In the central part of the profile, there is an opening to accommodate a mounting bolt or a mounting screw, or there is a tongue which is permanently fixed. The central part of the profile is in direct contact with the invisible surface of the cladding panel, thus forming a contact area.

Favorably, a hanger has a lower installation profile which is located below an upper installation profile which is permanently fixed. The upper installation profile is permanently connected with the hanger profile and it serves to install the hanger with a cladding panel on a building façade structure. The upper installation profile and the lower installation profile of the hanger make it possible to install the hanger with a cladding panel on an installation structure which is located between a building's exterior wall and a wall which is formed by cladding panels being installed. This interior structure is a basic element of a building's façade structure. The hanger's profile forms its basic structural element and is mounted directly on the invisible surface of the cladding panel. The hanger's profile has a bend at its upper and lower end. This bend's width is favorably equal to the

width of the hanger's profile. The upper and lower bend is directed outside the hanger's profile relative to each other. In the central part of the hanger's profile there is an opening to accommodate a mounting pin or a mounting bolt to fix the hanger to the invisible surface of the cladding panel. This central part of the hanger's profile is in direct contact with the invisible surface of the cladding panel. Favorably, the hanger's profile, in its central part on the side of contact with the invisible surface of the cladding panel, instead of an opening, has a tongue which is fixed over its entire width and which protrudes outside. The tongue is perpendicular or at an angle ed relative to the hanger's profile. Favorably, the hanger's tongue length corresponds to the hanger's width. The hanger's profile central part, having an opening to accommodate a mounting pin or a mounting bolt, or having a tongue protruding towards the outside, adheres directly to the invisible surface of the cladding panel with its surface. Above and below the opening for a mounting pin or a mounting bolt, and also above and below the installed tongue, the hanger's profile has a space in the area of contact with the invisible side of the cladding panel, said space limited by the profile's upper and lower bend. This space is filled in with an adhesive during the installation

Favorably, the hanger's profile height is not greater than the height of the cladding panel to which the hanger is fixed.

Installation of the hanger on a cladding panel is a combination of two systems for cladding panels installation - a system of mechanical cladding panels installation and a system of cladding panel installation with an adhesive. Installation of the hanger on the invisible surface of the cladding panel according to the invention consists in

making an installation opening on the invisible surface of the cladding panel for each hanger so that a mounting bolt or a mounting pin can be accommodated inside. If the hanger with a tongue is used, a longitudinal installation groove is gouged on the invisible surface of the cladding panel to accommodate the tongue. Each longitudinal installation groove is perpendicular or diagonal to the outer area of the invisible surface of the cladding panel. Each longitudinal installation groove has a length and depth making it possible to passively insert a perpendicular or diagonal tongue which is installed in the central part of the hanger's profile. Inclination angle of the longitudinal installation groove relative to the outer area of the invisible surface of the cladding panel corresponds to an inclination angle of the diagonal tongue installed on the hanger profile.

After that, an adhesive is applied inside the installation opening or inside the longitudinal installation groove on the invisible surface of the cladding panel, said adhesive sealing the connection of the hanger with the invisible surface of the cladding panel. The adhesive is also spread above and below the installation opening, or above and below the installation groove for accommodation of the tongue. This area is not lesser than the area of contact between the invisible surface of the cladding panel and the hanger's profile. Next, the hanger profile is laid on the adhesive, thus filling in thoroughly the space limited with the outer bends of the profile. Next, a mounting bolt or a mounting pin is inserted into the hanger's installation opening and into an installation opening drilled into the cladding panel. If the hanger with a tongue is installed, the hanger's tongue fixed to its profile is inserted into the

installation groove at an appropriate inclination angle relative to the groove. This tongue forms part of a hitch. Next, a double-sided adhesive installation tape is temporarily attached to the hanger's profile. As long as the adhesive binds, mechanical loads related to the weight of the cladding panel are transferred by this double-sided adhesive tape attached beforehand. The outer bends of the hanger, closing the inner space from the top and the bottom, push out the excess adhesive to the sides, which makes it possible to bond the hanger in such a way that the adhesive fills in the entire space between the hanger and the panel, assuring quality of the adhesive connection. In such connection of the hanger and the cladding panel, the adhesive used seals the connection.

Favorably, until the adhesive binds, in order to secure the hanger profile and to keep the stability of the cladding panel on an installation substructure, assembly aid is used on the hanger profile in the form of double-sided adhesive tape placed above and below the connection element.

After binding, the adhesive bonds the hanger with the cladding panel and secures the hanger against sliding off a bolt, pin or tongue as a result of horizontal force caused wind pressure or suction. The adhesive makes the cladding panel stiffer in the area of the drilled opening or gouged groove. The adhesive improves connection strength by increasing connection resistance to shear force, and it also fixes the hanger on the invisible surface of the cladding panel in a permanent way. This feature results from large elasticity of the adhesive connection relative to the cladding panel and the hanger's profile. As the adhesive is more elastic than the façade board and the hanger, strain is diffused by using the entire space of

the opening or groove. Installation of the hanger is performed with a single-element hanger which is connected to a cladding panel with a mounting pin, mounting bolt or a diagonal tongue according to this invention. Favorably, installation of the hanger is performed with a multi-element hanger connected to a cladding panel. Mechanical installation of the hanger takes over the load directed vertically to the bottom and/or to the top over the entire height of the erected vertical building wall. Using an adhesive makes it possible to achieve significant elasticity of the connection relative to the cladding panel and the hanger. In the area where the hanger is fixed, the panel is made stiffer thanks to being coupled with the hanger. The adhesive strengthens the panel and makes it stiffer in the area where an opening or groove is made, which at the same time increases strength of this connection.

The hanger's profile is installed on the invisible surface of the cladding panel in line with the direction of the installation groove gouged into it. The adhesive used fixes the hanger's profile to the invisible surface of the cladding panel in a permanent way. The spots in which openings or grooves are made on the invisible surface of the cladding panel keep the hanger in position.

Favorably, any inaccuracy in drilling an opening or gouging a groove is compensated by filling these areas with an adhesive.

Favorably, the place where the hanger's profile is installed on the invisible surface of the cladding panel with an adhesive can be optically checked thanks to the side elements of the hanger which make it possible to add some adhesive or remove its excess.

Every cladding panel has at least two hangers according to the invention mounted to its invisible side. Favorably, a set of four hangers according to the invention is mounted in the corners of the invisible surface of the cladding panel. The hangers fixed are not interconnected. Next, a cladding panel with hangers is installed on structural profiles of the interior or exterior building façade.

An advantage of the hanger and installation thereof to a cladding panel is quick and safe installation of cladding panels to substructures upholding a building façade. During installation, no strains occur that would be caused by various linear expansion properties of materials due to change of temperature or absorption of water between a cladding panel and only one element of the hanger inserted into an installation opening or a diagonal installation groove. The connection of the hanger and the cladding panel has large elasticity given by the adhesive to the cladding panel and hanger. Using adhesive during installation of cladding panels secures firmly the hanger, preventing its accidental rotation, and therefore it facilitates and accelerates the process of cladding panels installation. Using the adhesive makes it possible to correctly install the hanger even if the invisible surface of the cladding panel is rough, as it is compensated by a layer of adhesive. A method of installing the hanger according to the invention makes it possible to adapt the depth of mounting bolt insertion in a stepless manner depending on the cladding panel's thickness and to adapt the diameter of a mounting bolt or mounting pin depending on strength requirements. Using hangers according to the invention makes it possible to safely install cladding panels at the height of over 25 meters.

An embodiment of the hanger according to the invention is shown in a drawing, where Fig. 1 shows the hanger connected with a cladding panel with a mounting bolt, Fig. 2 shows the hanger connected with a cladding panel with a mounting pin, Fig.3 shows the hanger mounted with the use of a diagonal tongue, Fig.4 shows the hangers with permanently fixed upper and lower profile, Fig.5 shows the hangers with the height lesser than the height of the cladding panel with permanently fixed upper and lower profile.

The hanger 2 made of a profile 3 has a permanently fixed upper installation profile 4 and a lower installation profile 11. Profile 3 has a flat bend 5 on its upper and lower end. Outer edge of each flat bend 5 is in direct contact with the invisible surface of the cladding panel 1. In the central part of the profile 3 there is an opening 6 to accommodate a mounting pin 7 or a mounting bolt 8 or there is a tongue 10 fixed permanently thereto. This central part of the hanger 3 is in direct contact with the invisible surface of the cladding panel 1 on contact surface 9.

Claims

1. A hanger with an installation opening or a tongue and installation profiles, characterized in that it is made of a profile (3) with a permanently fixed upper installation profile (4), wherein the profile (3) has a bend (5) on its upper and lower end, whereas the outer edge of each bend (5) is in direct contact with the invisible surface of a cladding panel (1), and an inclination angle of the upper bend (5) and the lower bend (5) relative to the profile (3) of the hanger (2) ranges from 90° a 165°, and in the central part of the profile (3) there is an opening (6) to accommodate a mounting pin (7) or a mounting bolt (8) or there is a permanently fixed tongue (10), where the central part of the profile (3) is in direct contact with the invisible surface of the cladding panel (1) on a contact area (9).
2. The hanger as claimed in claim 1 characterized in that said profile (3) has a permanently fixed lower installation profile (11).

3. The hanger as claimed in claim 1 characterized in that said upper bend (5) and said lower bend (5) are directed towards the outside of the profile (3) relative to each other.
4. The hanger as claimed in claim 1 characterized in that the hanger's profile (3) height is equal to or lesser than the cladding panel's height.
5. Installation of the hanger to a cladding panel consisting in connection of the hanger with the invisible surface of the cladding panel with a mounting bolt or a mounting pin, or with a tongue, or in connection of the hanger with an adhesive with the use of an assembly aid element, characterized in that it consists in the making of an installation opening (6) for each profile (3) of the hanger (2) on the invisible surface of the cladding panel (1), said opening to accommodate a mounting bolt (8) or a mounting pin (7) or in the making of a longitudinal or diagonal mounting groove to accommodate a tongue (10), and then an adhesive (12) is applied inside the installation opening (6) or inside the longitudinal mounting groove on the invisible surface of the cladding panel (1), with said adhesive being also spread over the outer part of the invisible surface of the cladding panel (1), above and below the installation opening (6) or above and below the tongue (1) installation groove, wherein the profile (3) of the hanger (2) is put on the adhesive (12), while thoroughly filling in the area indicated by the outer bends (5) of the profile (3), wherein the mounting bolt (8) or the mounting pin (7) is inserted into the installation opening (6) of the

profile (3) and into an installation opening drilled into the cladding panel (1), and if the profile (3) of the hanger (2) is installed with the tongue (10), the tongue (10) is inserted into a longitudinal mounting groove, said tongue having a proper inclination angle relative to the groove, and as long as the adhesive (12) binds mechanical loads connected with the weight of the cladding panel (1) are transferred to a double-sided adhesive installation tape mounted on the profile of the hanger (2), and the adhesive (12) intensifies connection strength by increasing its resistance to shear force, and it also mounts the profile (3) of the hanger (2) to the invisible surface of the cladding panel (1) in a permanent way.

6. The installation as claimed in claim 5, characterized in that if the hanger (2) is connected with the tongue (10) on the invisible side of the cladding panel (1), a longitudinal installation groove is gouged for each hanger, wherein each longitudinal installation groove is perpendicular or diagonal to the outer area of the invisible surface of the cladding panel (1).
7. The installation as claimed in claims 5 and 6, characterized in that an inclination angle of the longitudinal installation groove relative to the outer area of the invisible surface of the cladding panel (1) corresponds to an inclination angle of the diagonal tongue (1) which is permanently fixed to the profile (3).

8. The installation as claimed in claim 5 characterized in that each longitudinal installation groove has a length and width making it possible to passively insert the perpendicular or diagonal tongue (10) installed in the central part of the profile (3).
9. The installation as claimed in claim 5, characterized in that adhesive is applied after the hanger's profile is installed on the invisible surface of the cladding panel (1) to the left or to the right of the profile (3).
10. The installation as claimed in claim 5 characterized in that as long as the adhesive (12) binds in the area where the profile (3) of the hanger (2) is mounted on the invisible surface of the cladding panel (1), a double-sided adhesive installation tape is temporarily fixed.

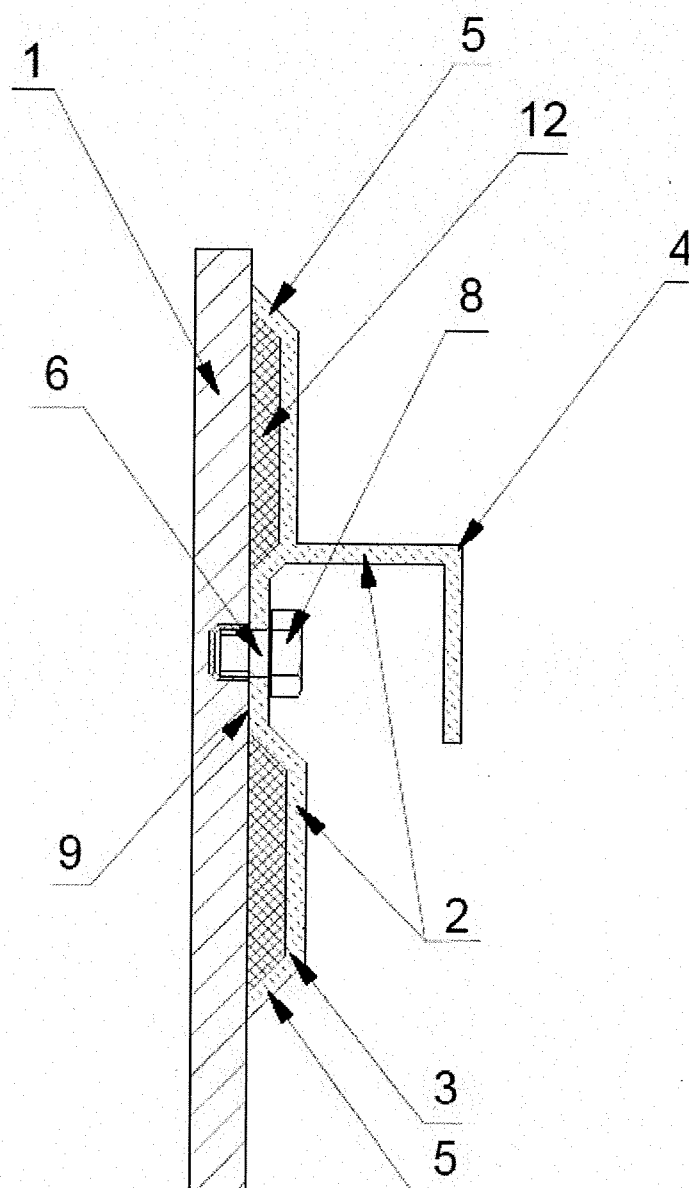


Fig.1

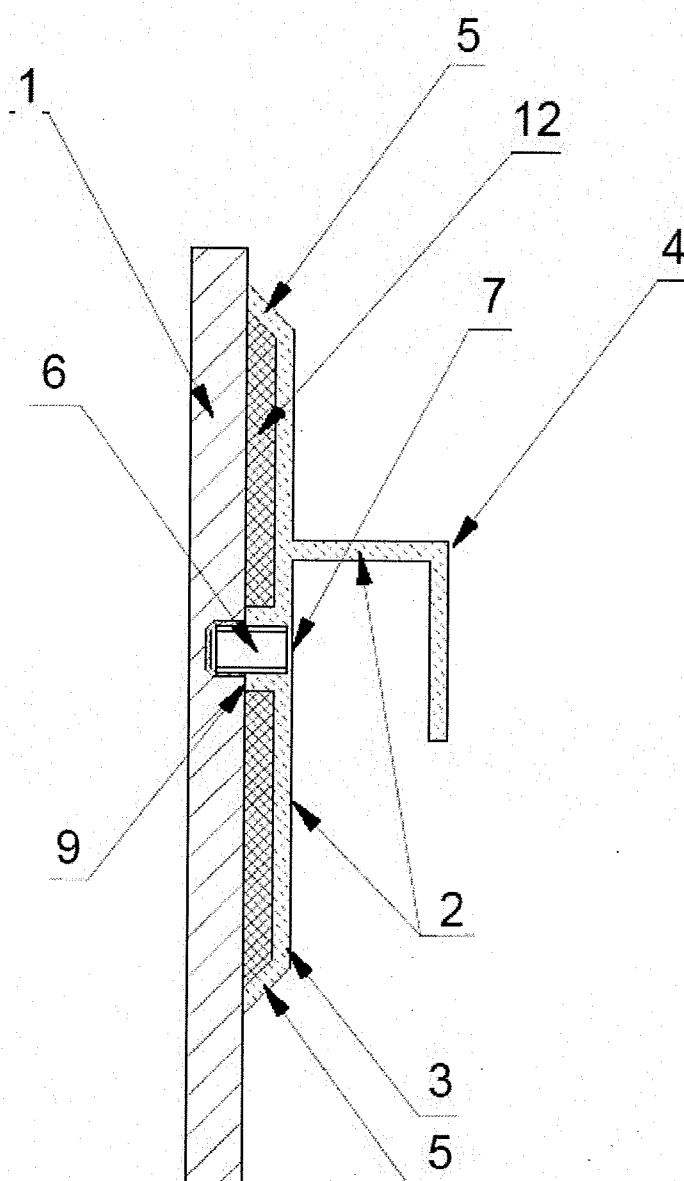


Fig.2

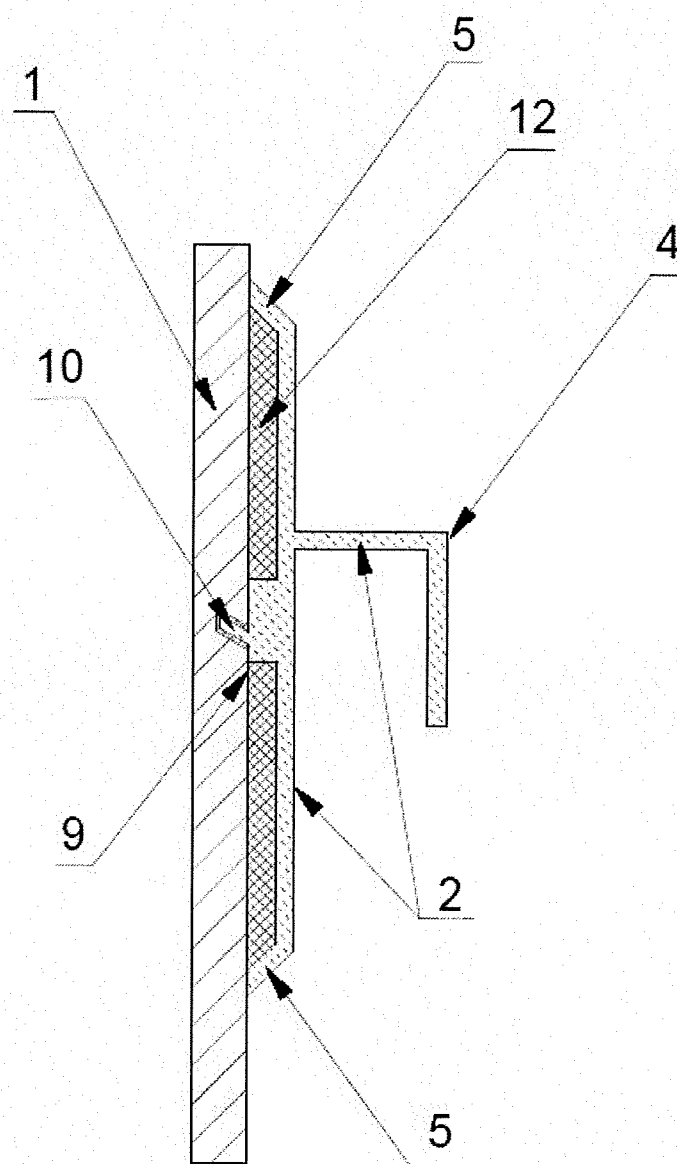


Fig.3

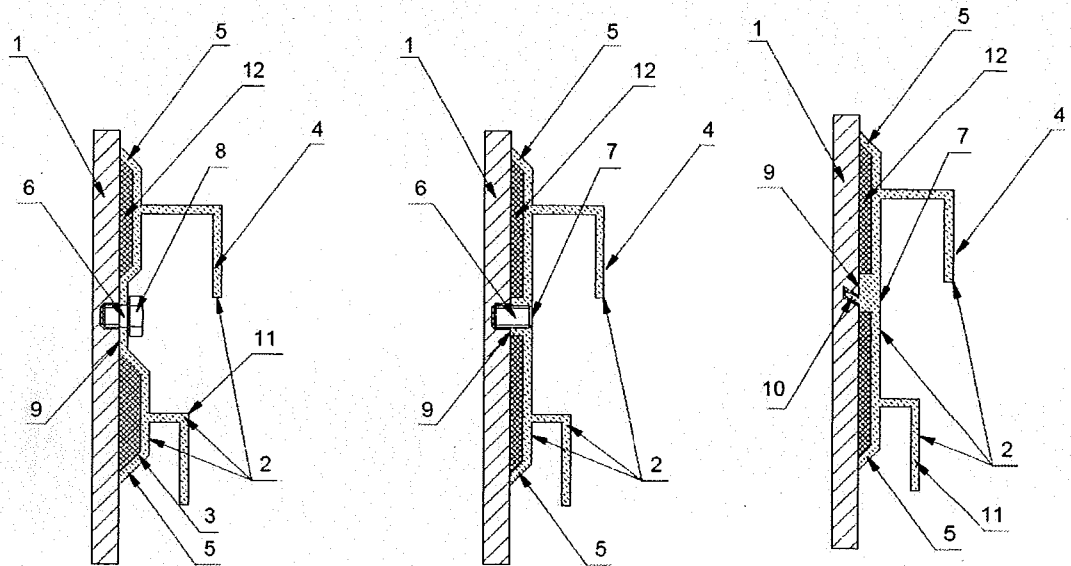


Fig.4

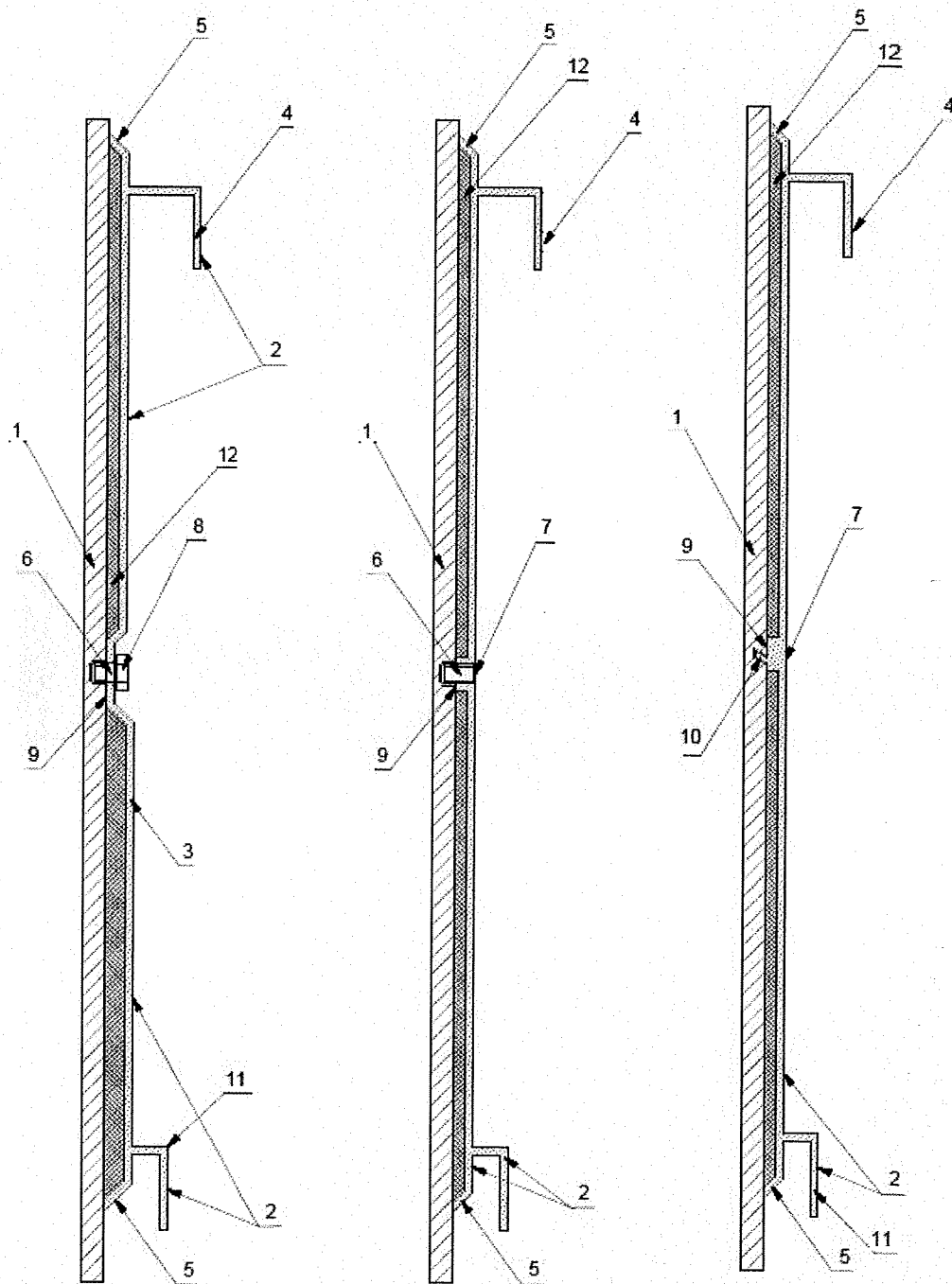


Fig.5

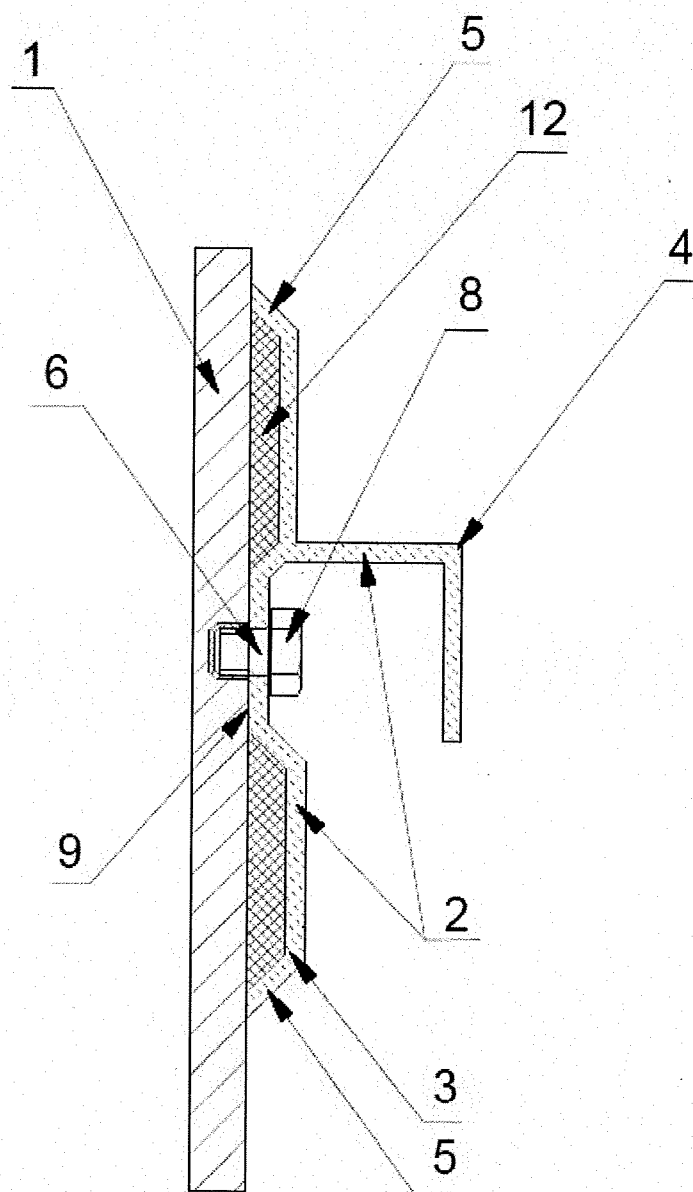


Fig.1