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(54) **Title**: EMITTING AND ABSORPTIVE PANEL, IN PARTICULAR HEATING AND COOLING PANEL

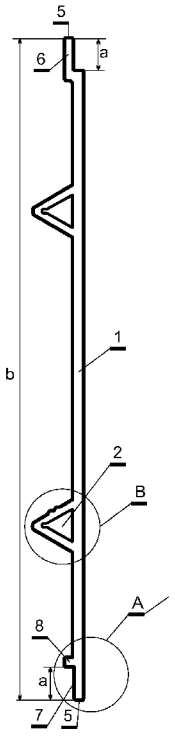


Fig. 1

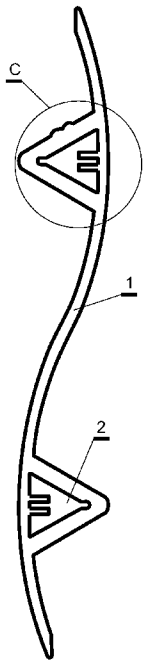


Fig. 5

(57) **Abstract**: The subject of the invention is metal panel with emitting and absorptive characteristics, specifically heating and cooling panel, used in particular in apparatus where heat energy is conveyed from fluids flowing in the heating or cooling systems. The key characteristic of the panel as proposed by the invention, stems from the fact that it consists of at least one heat pipe channel (2) which has a polygon shaped cross section, which is connected with the intermediate layer (1) on the outer surface (20), above which there protrudes the outer surface (20) of the heat pipe channel (2) formed by stamping. The heat pipe channel (2) has at least one longitudinal conduit (3) for condensate on its inner surface. The intermediate layer (1) between the heat pipe channels (2) has holes (4) punched out. Along one of the two longer edges (5) of the intermediate layer (1) there is a strip (6) which has width of (a), and which is bent in an S-shaped form, parallel to the plane of the intermediate layer (1), whereas at a distance equal to (a) from the other longer edge (5) there is parallel rim (7), which has a limiter (8) in form of a flange, with the height matching that of the strip's thickness (6), specifically L-shaped element (9) projecting towards the closer edge (5). The thickness (g) of the intermediate layer (1) is less than 0.25 of the cross section height (h) of the heat pipe channel (2) and / or is less than 0.01 of the distance (b) between the longer edges (5). The intermediate layer (1) is curved. The heat pipe channels (2) are on both sides of the intermediate layer (1). On at least one of the outer surface of the heat pipe channel there are two protrusions with a dent between them. The composition of the panel allows it to be immersed in ceramic material during production of thin wallboards to be used for indoor dry lining works in residential and office building, providing heating or cooling functions, in wall heating systems or as structural elements of heat tanks, where it is essential to transmit and absorb heat without interspersing the layers of fluids with stabilized temperature distribution.

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EMITTING AND ABSORPTIVE PANEL, IN PARTICULAR HEATING AND COOLING PANEL

The essence of the invention is a metal panel with emitting and absorptive characteristics, specifically heating and cooling panel used in particular in apparatus where heat energy is conveyed from fluids flowing in the heating or cooling systems.

From a description of patent EP 0438938 we are aware of a laser beam attack protective system, which is composed of radiator fins fabricated from carbon material connected with insulated clamps to the couplings in the heating pipe. The heating pipes contain a longitudinal baffle separating the steam channel from the continuous liquid channel inside the pipe, and the inside surface of the liquid channel is ribbed to intensify heat energy absorption. The heating pipes are insulated on the outside with multilayer metal foil in order to reduce the heating effected by a direct laser beam. The termination points of the heating pipes are installed in a collector with a cooling agent flowing which cools the vapors in the heating pipes.

From the patent description GB 1064379 we are aware of a panel with heat channels, composed of two pane sections formed by pressing, which once connected form a run of channels partially filled with vaporizing fluid, whereas one of the panes has a semi-cylindrical coupling clip connected to the semi-cylindrical clip on the pipe with the heat transfer fluid.

From the patent description GB 2099980 we are aware of heat radiator panel which discharges or absorbs heat energy, filled with vaporizing liquid, with the bottom section of the hermetic chamber connected to the pipe serving as conduit for transport of heating agent. A similar presentation of a heating panel with

vaporizing liquid is presented in the patent description JP 61246528, where in the bottom part of a hermetic chamber there is a ribbed section of the pipe located, through which the heating medium flows.

From the patent presentation JP 10019287 we are aware of a heat panel with side channels tapered to the edges, partially filled with vaporizing liquid in the area of absorption of heat energy, with a ray shaped mounting plate for the pipe holding the heat-transfer fluid.

The aim of the current invention is to design a panel with maximally large emitting and absorptive area and high efficiency of heat energy exchange through the panel elements between the heating medium flowing in the heat pipe conduit and the environment, with essentially uniform heat exchange on the whole surface of the lightweight panel, in particular panel to be used with heat storage tanks with layers of fluids with stabilized distribution of temperatures.

The key characteristic of the panel as proposed by the invention, stems from the fact that it consists of at least one heat pipe channel which has a polygon shaped cross section, which is connected with the intermediate layer on the outer surface, above which protrudes the outer surface of the heat pipe channel formed by stamping. The heat pipe channel has at least one longitudinal conduit for condensate on its inner surface. The intermediate layer between the heat pipe channels has holes punched out. Along one of the two longer edges of the intermediate layer there is a strip which has width of (a) and which is bent in an S-shaped form, parallel to the plane of the intermediate layer, whereas at a distance equal to (a) from the other longer edge there is parallel rim, which has a limiter in form of a flange, with the height matching that of the strip's thickness, specifically L-shaped element projecting towards the closer edge. The thickness of the intermediate layer is less than 0.25 of the cross section height of the heat

pipe channel and/or is less than 0.01 of the distance between the two longer edges. Optionally the intermediate layer may be curved. The heat pipe channels are stamped on the two opposite surfaces of the intermediate layer. On at least one of the outer surface of the heat pipe channel there are two protrusions with a dent between them.

Effective result has been attained at resolving the problem of heat exchange in a thin structure of the emissive and absorptive panel to be utilized for many implementations in the domain of thermo dynamic flows.

The invention is presented on drawing, where Figure 1 presents the cross section view of the panel with the visible heat pipe channels, Figure 2 presents the enlarged cross section view of the heat pipe channel, Figure 3 presents the enlarged view of the limiter as an L-shaped element at the edge, Figure 4 presents fragment of the panel surface with the holes punched out, Figure 5 presents the panel with heat pipe channels presented on both surfaces of the intermediate layer, Figure 6 presents the panel with the curved intermediate layer, Figure 7 presents the fragment of the channel surface with the inner ribs.

The panel possesses at least one heat pipe channel (2) with polygon shaped cross section, specifically with nearly triangular shaped cross section. Its outer surface (20), formed by stamping protrudes above the surface of the intermediate layer (1). The heat pipe channel (2) is furnished with at least one longitudinal conduit (3) for condensate on the inner surface. The conduit (3) serves to collect and distribute flow of vapors of the heating medium which move in anti-current relative to the condensate within the heat pipe channel. Specifically the heat pipe channel (2) on its internal surface has ribs (21). Optionally the intermediate layer (1) between the heat pipe channels (2) is perforated with holes (4). Specifically a strip (6), with width equal to (a), located along one of the two

longer edges (5) of the intermediate layer, is bent in an S-shaped form, parallel to the plane of the intermediate layer (1), whereas at a distance equal to (a) from the other longer edge (5) there is parallel rim (7), which has a limiter (8) in form of a protrusion with the height matching the thickness of the strip (6), specifically L-shaped flange element (9) projecting towards the closer edge. The thickness (g) of the intermediate layer (1) is less than 0.25 of the cross section height (h) of the heat pipe channel (2) and / or is less than 0.01 of the distance (b) between the two longer edges (5). Optionally the intermediate layer (1) may be curved. Optionally the heat pipe channels (2) are stamped on the two opposite surfaces of the intermediate layer (1). On at least one of the outer surface (20) of the heat pipe channel (2) there are two protrusions (22) with a dent between them.

The inventions are presented in more detail in the below examples of implementation.

Example I

The panel possesses two heat pipe channels (2) with nearly triangular shaped cross section. Their outer surface (20), formed by stamping protrudes above the surface of the intermediate layer (1). The heat pipe channels (2) on the inner surface are furnished with longitudinal conduit (3) serving for separated flow of condensate trickling from the inner surface of the heat pipe channels (2). The thickness (g) of the intermediate layer (1) is less than 0.25 of the cross section height (h) of the heat pipe channel (2) and / or is less than 0.01 of the distance (b) between the two longer edges (5). On both outer surfaces (20) of the heat pipe channels (2) there are two protrusions (22) with a dent between them. In order to increase the heat exchange surface, additional strip of metal sheet is installed in the dent.

Example II

In order to be used in wallboard panels for dry lining of interiors, the aluminum panel has two heat pipe channels (2) with nearly triangular shaped cross section. Their outer surface (20), formed by stamping protrudes above the surface of the intermediate layer (1). The heat pipe channels (2) on the inner surface are furnished with longitudinal conduit (3) for condensate. The intermediate layer (1) between the heat pipe channels (2) is perforated with holes (4) in order to allow for the layers of gypsum plaster on either side of the panel to bond together through holes (4) in the process of immersing the metal panel in the gypsum to produce combined plasterboard panel. These holes are also important for elimination of the risk of the combined plasterboard panel separating into layers. The technical restraints of stamping the thin sheet metal panel and blowing small cross section channels inside, limit the width of the panel. In case of standard sized gypsum wallboard it is necessary to install a larger quantity of panels with heat pipe channels (2). Therefore at one of the two longer edges (5) there is a strip (6) with width of (a), which is bent in an S-shaped form, parallel to the plane of the intermediate layer (1), whereas at a distance equal to (a) from the other longer edge (5) there is parallel rim (7), which has a limiter (8) in form of a flange, with the height matching that of the strip's thickness (6). The limiter (8), which is and L-shaped element (9) projecting towards the closer edge (5) allows for easy fitting and joining of the panels together. For trouble-free maneuvering of joined plates the L-shaped element (9) is flattened thus pressing strip (6) to the rim (7). The heat pipe channel possesses extended internal contact surface in form of longitudinal ribs (21) between which there are longitudinal channels (3). The thickness (g) of the intermediate layer (1) is less than 0.25 of the cross section height (h) of the heat pipe channel (2) and / or is less than 0.01 of the distance (b) between the two longer edges (5).

Example III

The panel possesses heat pipe channel (2) with nearly triangular, polygon shaped cross section. Its outer surface (20), formed by stamping protrudes above the surface of the intermediate layer (1). The heat pipe channel (2) is furnished with at least one longitudinal conduit (3) for condensate on the inner surface. The conduit (3) serves to collect and distribute flow of vapors of the heating medium which move in anti-current relative to the condensate within the heat pipe channel. Specifically the heat pipe channel (2) on its internal surface has ribs (21) increasing the surface absorbing the heat from the condensate. The thickness (g) of the intermediate layer (1) is less than 0.25 of the cross section height (h) of the heat pipe channel (2) and / or is less than 0.01 of the distance (b) between the longer edges (5). The intermediate layer (1) is curved in order to direct the heat radiated by the surface of the heat pipe channels (2).

Example IV

In order to be used in wallboards for indoor dry lining works in form of partition walls which at the same time have heating or cooling function, aluminum panel has 2 heat pipe channels (2) with nearly triangular shaped cross section, whereas heat pipe channels are on both sides of the intermediate layer. Such composition of the panel makes the structure of the panel much tougher and forms a stronger backbone for the ceramic wallboard. The heat pipe channels (2) on the inner surface are furnished with longitudinal conduits (3) for condensate. The intermediate layer (1) between the heat pipe channels (2) has holes (4) punched out in order to allow for the layers of gypsum plaster on either side of the panel to bond together through holes (4). These holes are also important for elimination of the risk of the combined plasterboard panel separating into layers. In case of standard sized gypsum wallboard it is necessary to install a larger quantity of panels with heat pipe channels (2). Therefore at one of the longer edges (5) there is a strip (6) with width of (a), which is bent in an S-shaped

form, parallel to the plane of the intermediate layer (1), whereas at a distance equal to (a) from the other longer edge (5) there is parallel rim (7), which has a limiter (8) in form of a flange, with the height matching that of the strip's thickness (6). The limiter (8) which is and L-shaped element (9) projecting towards the closer edge (5) allows for easy fitting and joining of the panels together. For trouble-free maneuvering of joined plates, the L-shaped element (9) is flattened, thus pressing strip (6) to the rim (7). The heat pipe channel possesses extended internal contact surface in form of longitudinal ribs (21) between which there are longitudinal channels (3). The thickness (g) of the intermediate layer (1) is less than 0.25 of the cross section height (h) of the heat pipe channel (2) and/or is less than 0.01 of the distance (b) between the two longer edges (5).

The composition of the panel allows it to be immersed in ceramic material during production of thin wallboards to be used for indoor dry lining works in residential and office building, providing heating or cooling functions, in wall heating systems or as structural elements of heat tanks, where it is essential to transmit and absorb heat without interspersing the layers of fluids with stabilized temperature distribution.

Claims

1. The emitting and absorptive panel, specifically heating and cooling panel, manufactured of material with consistent structure with longitudinal channels, with practically constant cross section profile, characterized by the fact that at least one heat pipe channel (2) with polygon shaped cross section is joined with the intermediate layer (1) on its external surface (20), above which with protrudes the outer surface (20) of the heat pipe channel (2) formed by stamping.

2. The panel compliant with claim no. 1, characterized by the feature that the heat pipe channel (2) has on its inner surface at least one longitudinal conduit (3) for condensate.

3. The panel compliant with claim no. 1, characterized by the feature that the intermediate layer (1) between the heat pipe channels (2) has holes (4) punched through.

4. The panel compliant with claim no. 1, characterized by the feature that that at one of the two longer edges (5) of the intermediate layer (1) there is a strip (6) with width of (a), which is bent in an S-shaped form, parallel to the plane of the intermediate layer (1), whereas at a distance equal to (a) from the other longer edge (5) there is parallel rim (7), which has a limiter (8) in form of a flange with the height matching that of the strip's thickness, specifically in form of an L-shaped element (9) projecting towards the closer edge (5).

5. The panel compliant with claim no. 1, characterized by the feature that he thickness (g) of the intermediate layer (1) is less than 0.25 of the cross section height (h) of the heat pipe channel (2) and / or is less than 0.01 of the distance (b) between the longer edges (5).

6. The panel compliant with claim no. 1, characterized by the feature the intermediate layer (1) is curved.

7. The panel compliant with claim no. 1, characterized by the feature that the heat pipe channels (2) are stamped on the two opposite surface of the intermediate layer (1).

8. The panel compliant with claim no. 1, characterized by the feature that at least on one of the external surfaces (20) of the heat pipe channel (2) there are protrusions (22) with a dent between them.

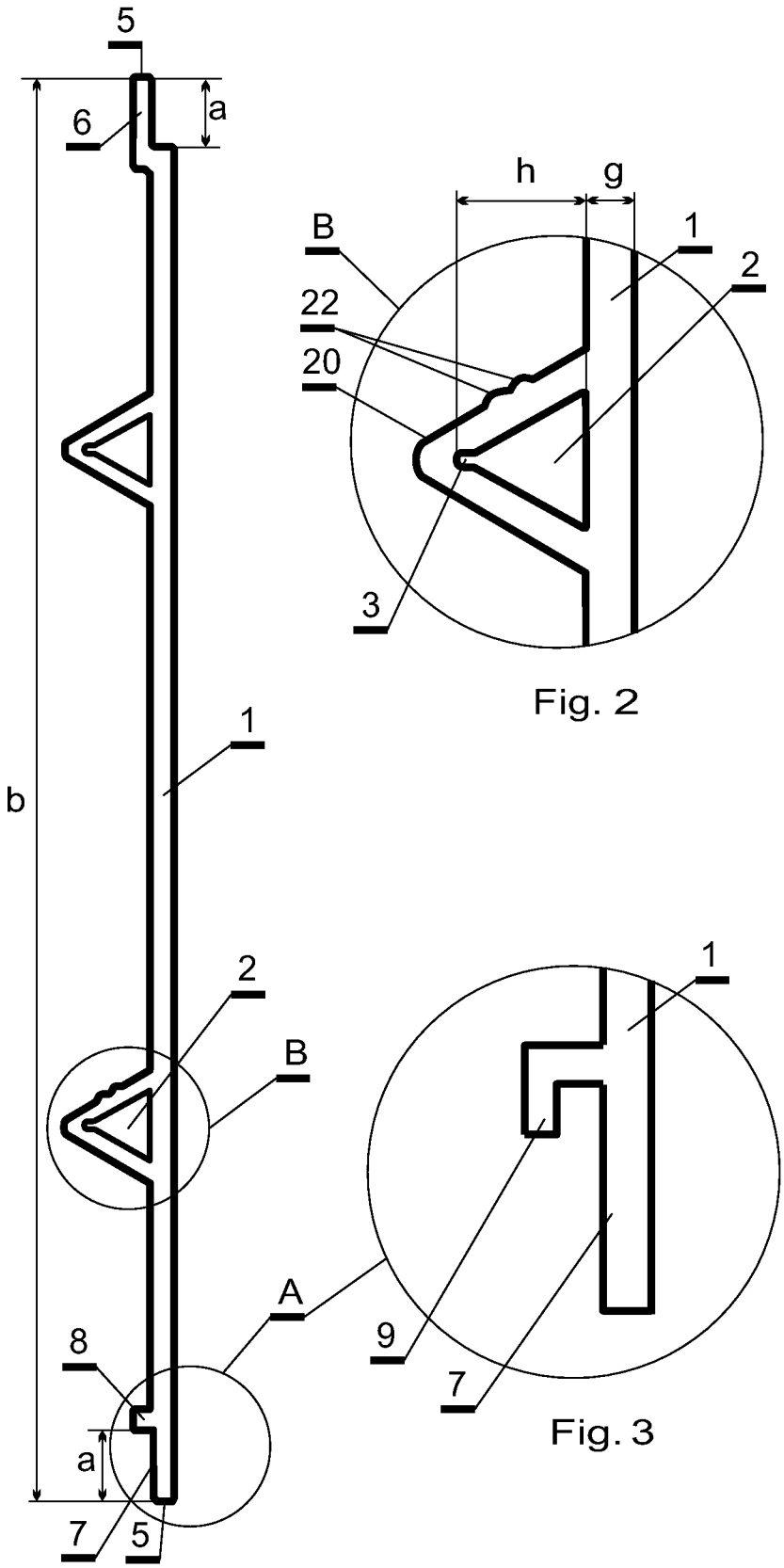


Fig. 2

Fig. 3

Fig. 1

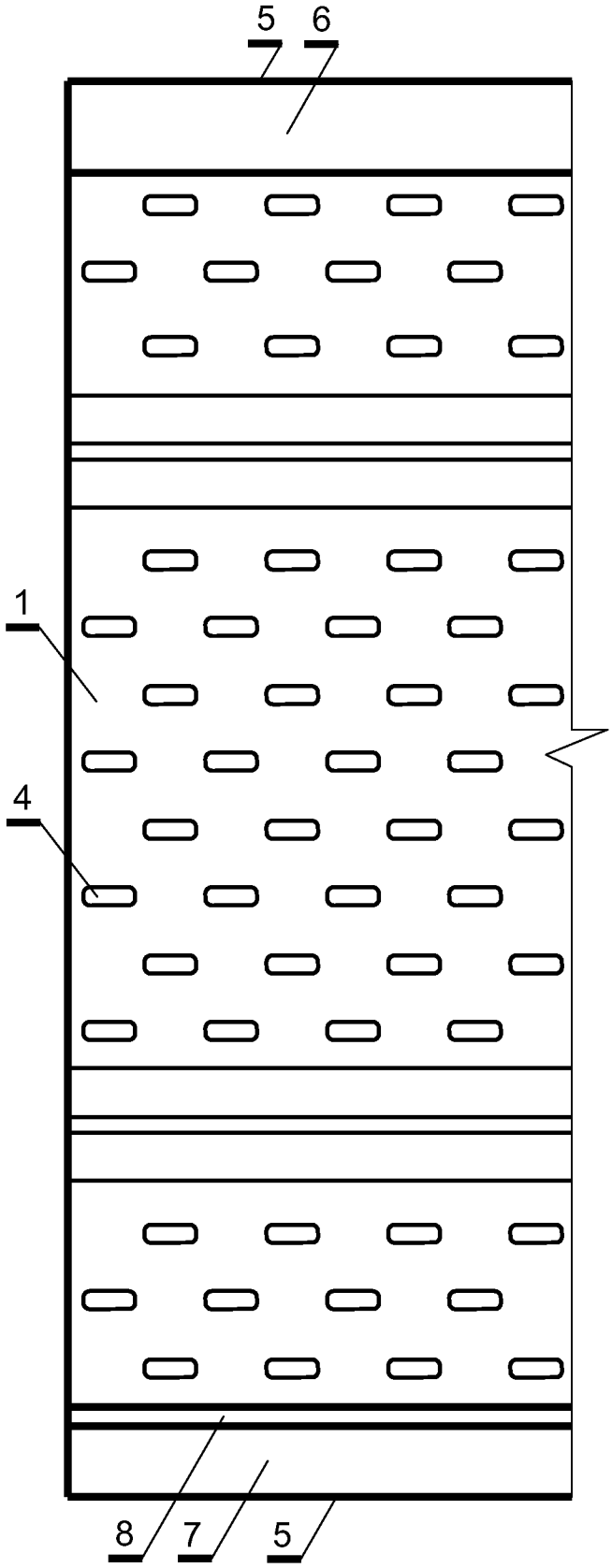


Fig. 4

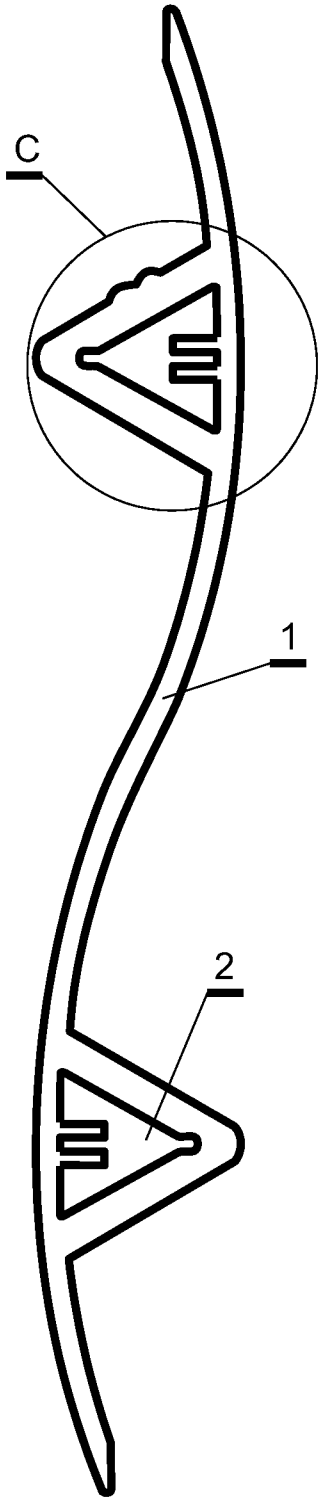


Fig. 5

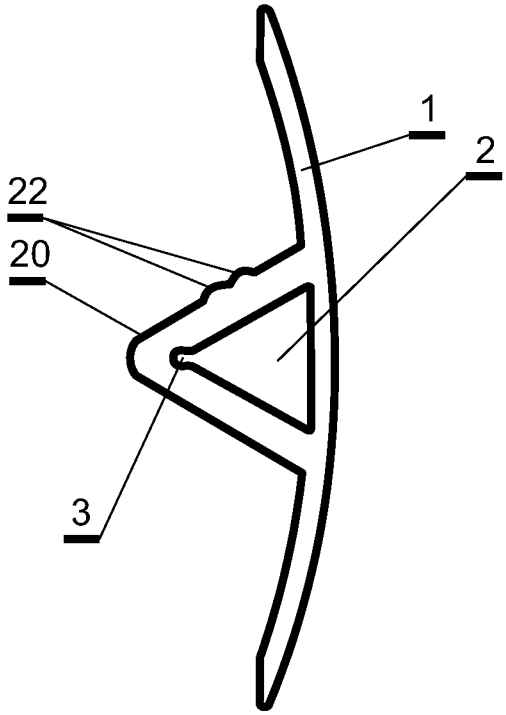


Fig. 6

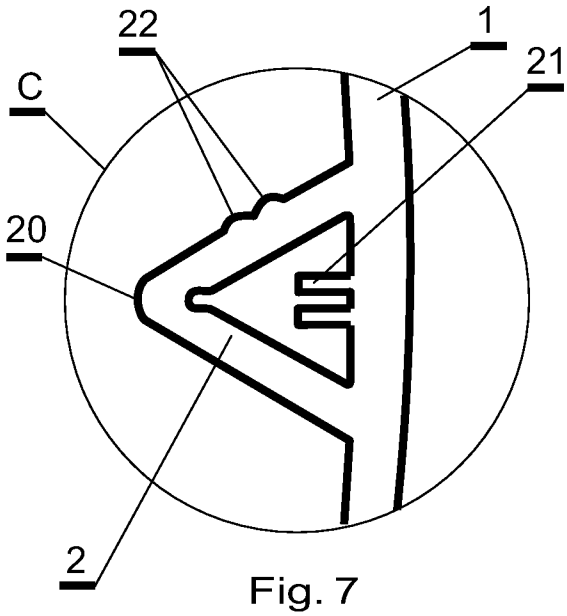


Fig. 7