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(54) A fire-resistant bulding element

(57) A fire-resistant building element for a facade or the like includes at least one window pane (1) and an aluminium frame (2) therefore. Glass clips (5, 6) for mounting the window pane to the frame are made of stainless steel and are attached to aluminium profiles (3) of the frame at opposite sides of the window pane. The profiles (3) are connected by isolators or thermal breaks (4), and the hollow space hereby defined contains a fire isolating fillet (10). The glass clips have a minimal width and are provided with slots (5B) for minimizing the heat conduction. The fire isolating fillet has a core (10A) of hard board and at each side thereof gypsum strips (10B).

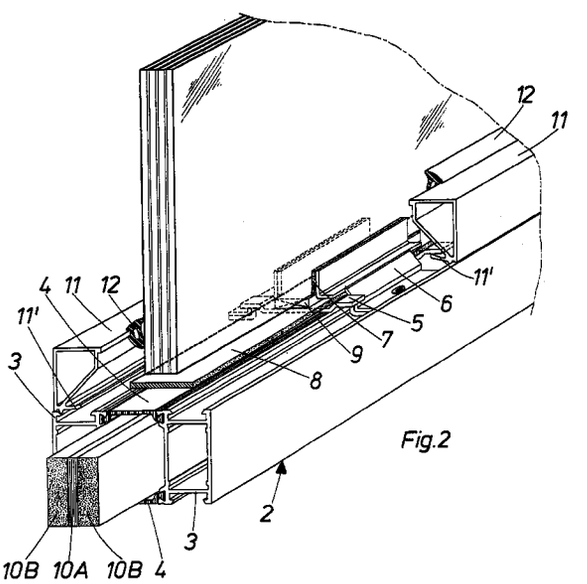

Fig.2

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Description

Technical Field

[0001] The present invention relates to a fire resistant building element for a facade or the like, including at least one window pane and an aluminium frame therefore,

wherein glass clips, preferably made of stainless steel and having flanges for mounting the window pane in the frame, are attached to aluminium profiles of the frame at opposite sides of the window pane and

wherein the frame consists of two such profiles connected in the area for the window pane by at least one isolator or thermal break, preferably of a plastic material.

Background of the Invention

[0002] Aluminium is used to an increasing extent as a building material in frameworks for window panes or other panes. The aluminium profiles used for this purpose may be manufactured by extrusion, and various profiles for different uses may be produced without too much cost and extra effort. The appearance of the aluminium is very neat and may even be improved by relatively simple surface treatment in the factory. Further the aluminium is virtually maintenance-free. By proper construction and dimensioning the aluminium frames may be given the required stability and strength.

[0003] However, increasing demands with regard to fire separation and fire isolation are put on building elements containing aluminium, which in itself melts already at about 650 °C and has a very high heat conductivity. Based on the fact that normal fires often reach temperatures of 850 °C and more it is easy to understand that special measures have to be taken to meet the demands.

[0004] Building elements containing aluminium framework are often used in external walls. Authorities impose rules on manufacturers with regard to resistance to flames and isolation against temperature increases on the side opposite the fire. Presently mentioned times in such cases are 30 min or even 60 min. The building element shall be able to withstand fire from either side.

[0005] Prior attempts to obtain the required fire-resistance have been made. WO-A-97/07315 (Glostal) is regarded as the closest prior art, and a design as shown therein is defined in the introductory portion above. Also DE-A-42 32 312 reveals a similar design.

[0006] It may be difficult to obtain improvements in the fire-resistancy of a design of this nature and seemingly small measures may have a great impact.

The Invention

[0007] A building element as defined is thus according to the invention characterized in that the glass clip has a minimal width with only attachment portions for attachment to the aluminium profiles and therebetween a bridging portion bridging the isolator or thermal break, the bridging portion having slots for minimizing the heat conduction.

[0008] An advantageous design of the glass clip is obtained in that it consists of three parts: one base clip part with the slots and two hold clip parts with the flanges. The base clip part is preferably provided with wings for cooperation with a projection of a glass strip mounted on either side of the profiles with a sealing strip against the window pane so as to obtain an attractive and functionally advantageous finish for the design.

[0009] In prior art designs use is often made of calcium silicate material as a fire isolating fillet in the hollow space defined by two aluminium profiles and two isolators or thermal breaks. In order to obtain equally good fire isolating properties at a substantially lower cost and advantages with regard to environment and manufacture, use is according to the invention made of a fire isolating fillet consisting of a core of hard board (for example Masonite®) and at each side thereof gypsum strips. The material may be prefabricated as laminated plates and then be cut into suitably dimensioned strips.

Brief Description of the Drawings

[0010] The invention will be described in further detail below under reference to the accompanying drawings, where parts shown in section are not always hatched for the sake of clarity and in which

Fig 1 is a front view to a small scale of a building facade with window and door frames incorporating the invention,

Fig 2 is a perspective and partly sectioned view to a larger scale of a window frame construction according to the invention,

Fig 3 is a cross-section through a window frame construction as shown in Fig 2 but to a slightly smaller scale,

Fig 4 is a cross-section through a base profile of a window frame construction according to the invention,

Fig 5 is a similar cross-section through a glass strip for a window frame construction according to the invention,

Figs 6 and 7 are top views of two parts of a glass clip for use in a window frame construction according to the invention,

Fig 8 is an end view of the glass clip with the lower detail in broken lines,

Fig 9 is an end view of a security element, and

Fig 10 is a section through a door frame and a door case therefore with two security elements as shown in Fig 9.

Detailed Description of Preferred Embodiments

[0011] Fig 1 serves to illustrate the environment for a door or window frame construction according to the invention. Window panes 1 are incorporated or attached in frames 2 to form fixed windows or doors constituting parts of the facade of a building. The purpose of the invention is to make such facade portions as fire- and heat-resistant as possible. It should be noticed that the fire-resistance construction to be described can be used both for windows and for doors but that for practical purposes the general term window frame construction will be predominantly used.

[0012] A base profile construction is shown in Fig 4. It consists of two generally rectangular, hollow aluminium profiles 3 connected by means of two generally plane isolators or thermal breaks 4, for example made of polyamide. These aluminium profiles 3 are preferably - like other aluminium profiles used in the construction - made by extrusion in a conventional way. They can if desired be surface treated by anodizing or lacquering, also in a conventional way.

[0013] Each isolator 4 is as shown preferably connected to the profiles 3 by longitudinal insertion of isolator beads in corresponding profile grooves.

[0014] A base profile 3, 4 is formed from the two aluminium profiles 3 and the isolators or thermal breaks 4.

[0015] A glass clip for holding a window pane 1 or the like to base profiles 3, 4, together forming a window frame, is shown in Figs 6-8, where Figs 6 and 7 are top views showing the three parts forming the clip and Fig 8 is an end view showing the mounted clip with one of its parts drawn with dashed lines.

[0016] In Fig 6 a base clip part 5 and in Fig 7 a hold clip part 6 are shown. They are both stamped and bent from stainless steel plate with a thickness of for example 2 mm.

[0017] The base clip part 5 is at either side or attachment portion 5D provided with holes 5A, is provided with a number of slots 5B in its intermediate or bridging portion 5E and has end wings 5C for a purpose to be described.

[0018] The hold clip part 6 is provided with a hole 6A (corresponding to the hole 5A in the base clip part 5) and a hold flange 6B.

[0019] Means extending through the holes 5A and 6A are used to join one base clip part 5 and two hold clip parts 6 to form a glass clip 5, 6 as shown in Fig 8 (but also in a mounted condition in Figs 2 and 3). In this mounted condition the distance between the two hold flanges 6B with a damping strip 7 at the inside corresponds to the thickness of the window pane 1, which thus may be held in proper position by these glass clips 5, 6.

[0020] Glass clips 5, 6 are mounted at certain distances from each other on the base profiles 3, 4 by means of stainless steel rivets, extending through the holes 5A and 6A and corresponding holes in the aluminium profiles 3, and bridge the isolator or thermal break 4, as is shown in Figs 2 and 3.

[0021] Before mounting of the window pane 2 an intumescent or fire swelling strip 8 is arranged on the base profiles 3, 4 over the isolator 4 and under the window pane 2. The material in this strip 8 may be Intumex LSK®, which has the property to swell significantly when exposed to the high temperature of a fire.

[0022] The window pane 1 rests in a conventional way on distance blocks 9, for example made of hard wood and arranged in certain glass clips 5, 6 above the fire swelling strip 8.

[0023] The space inside the base profile 3, 4 between the two isolators 4 is substantially filled with a fire isolating fillet 10, for example consisting of a core 10A of hard board and at each side thereof gypsum strips 10B.

[0024] The construction as such is hereby completed. For the purpose of providing a neater appearance and preventing water from reaching certain parts of the construction, however, glass strips 11 are arranged around the border of the window pane 2 at each side thereof. Such a glass strip 11 is shown in Fig 5. With a lower rim it is intended to cooperate with a rim of the base profile 3, 4, and it has a projection 11' for locking engagement with the wings 5C of each base clip part 5, as appears in Figs 2 and 3. Sealing against the window pane 2 is provided by a sealing strip 12 in engagement with an upper rim of the glass strip 11. The sealing strip 12, which preferably is made of rubber or the like, will also provide an elastic force on the engagement between the projection 11' and the wings 5c.

[0025] No illustration is provided for how the different base profiles 3, 4 with related parts are joined at corners, but mitered or straight corner joints are possible.

[0026] A construction according to the invention is intended to prevent a fire from passing the construction during a certain period of time, for example 30 minutes or even 60 minutes, and to provide isolation against the heat of the fire. It is of importance that the construction is symmetrically protected against fire at either side and does not fall apart.

[0027] The main material in the frame construction is aluminium, which has a melting point of some 650 °C, wheras a normal fire may reach a normal temperature of some 850 °C, which means that aluminium exposed to the fire will melt at a rather early stage. Aluminium is a rather good heat conductor, and isolation has to be provided between the two sides of the frame. Such isolation is accomplished by the isolators 4 between the aluminium profiles 3 as well as by the fare isolating fillet 10. The high temperature causing melting of aluminium at one side of the construction will not for a very long time spread to the opposite side and cause melting there.

[0028] The glass clips 5, 6 are attached to the aluminium base profiles 3 at each side. If the base profile at one side melts away, support for the window pane 1 will still be provided by the other side. Further, the glass

clips 5, 6 are made of stainless steel, which is a comparatively bad heat conductor but has good strength properties also when heated. Even less heat is conducted through each clip 5, 6 by the provision of the slots 5B.

[0029] Window panes 1 for fire resistant purposes are commercially available. They may consist of glass with an intermediate layer of an isolating and expanding material.

[0030] Instead of a window pane 1, use may be made of another pane, which for example may be made of double gypsym plates and claddings of aluminium or stainless steel plates.

[0031] The intumescent strip 8 is made of a graphite-based material, which when exposed to a high temperature at fire will expand or swell 10-20 times and fill up available space in the construction, when the isolators or thermal breaks 4 and later on the aluminium at one side melt away.

[0032] A security arrangement for a rear edge of a door is illustrated in Figs 9 and 10. A building element according to the invention in the form of a rear jamb 13 of a door case is illustrated to the left in Fig 10 and a similar element in the form of a rear edge 14 of a door leaf to the right therein. The door leaf is pivotably attached to the door case by means of hinges 15, which like the rest of the construction are made of aluminium. In case of fire at the hinge side of the construction the hinges 15 will melt away at an early stage.

[0033] In that case and unless measures are taken the door leaf can fall out of its case and thus break the barrier against the spread of the fire provided by the construction according to the invention.

[0034] For preventing this from happening security elements 16 are attached, preferably riveted, to the sides facing each other of the jamb 13 and the edge 14. These elements 16, of which one is also shown in Fig 9, may be made of stainless steel plate and have the shown wavy shape. Generally speaking, they shall fit together in such a way that mutual pivotal movements shall be allowed but not movements generally perpendicular to the plane of the construction.

Claims

1. A fire-resistant building element for a facade or the like, including at least one window pane (1) and an aluminium frame (2) therefore,
   wherein glass clips (5, 6), preferably made of stainless steel and having flanges (6) for mounting the window pane (1) in the frame (2), are attached to aluminium profiles (3) of the frame at opposite sides of the window pane and
   wherein the frame (2) consists of two aluminium profiles (3) connected in the area for the window pane (1) by at least one isolator or thermal break (4), preferably of a plastic material,
   characterized in that
   the glass clip (5, 6) has a minimal width with only attachment portions (5D) for attachment to the aluminium profiles (3) and therebetween a bridging portion (5E) bridging the isolator or thermal break (4), the bridging portion having slots (5B) for minimizing the heat conduction.

2. A building element according to claim 1, **characterized** in that each glass clip (5, 6) is built up of three parts: one base clip part (5) with the slots (5B) and two hold clip parts (6) with the flanges (6B).

3. A building element according to claim 2, **characterized** in that the base clip part (5) is provided with wings (5C) for cooperation with a projection (11') of a glass strip (11) mounted on either of the profiles (3) with a sealing strip (12) against the window pane (1).

4. A building element according to claim 1, in which a hollow space defined by two profiles (3) and two isolators or thermal breaks (4) contains a fire isolating fillet (10), **characterized** in that the fire isolating fillet (10) has a core (10A) of hard board and at each side thereof gypsum strips (10B).

5. A building element according to claim 1, **characterized** in that a fire swelling or intumescent strip (8) of for example Intumex LSK® is arranged in the area between the isolator or thermal break (4) and the window pane (1).

6. A building element according to claim 1, **characterized** in that two correspondingly wave-shaped security elements (16) are arranged at the rear edge of a door leaf (13) and a door case (14), respectively, for preventing the door leaf from falling out of its case, even if the door hinges (15) have been melted away by fire.

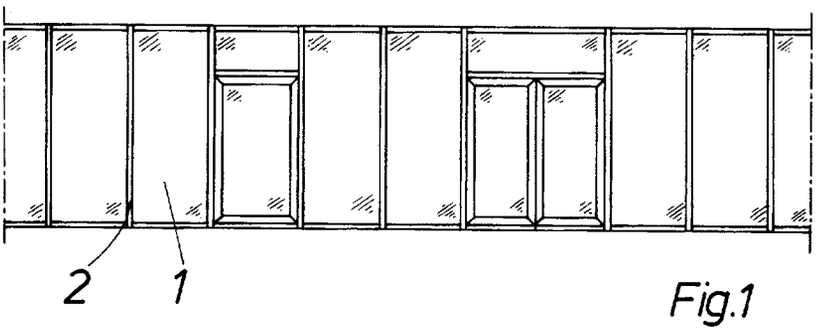


Fig.1

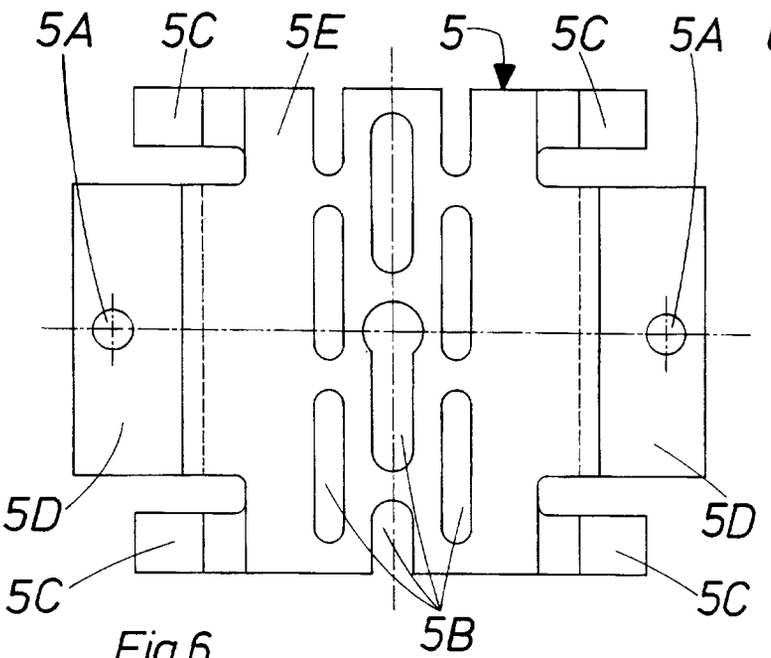


Fig.6

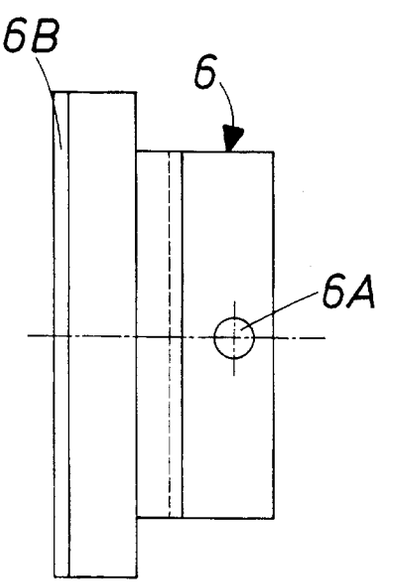


Fig.7

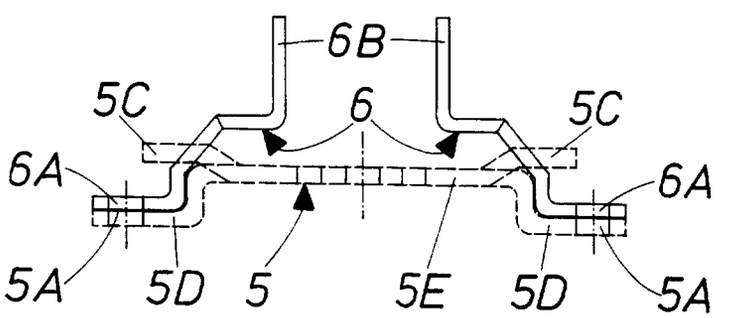


Fig.8

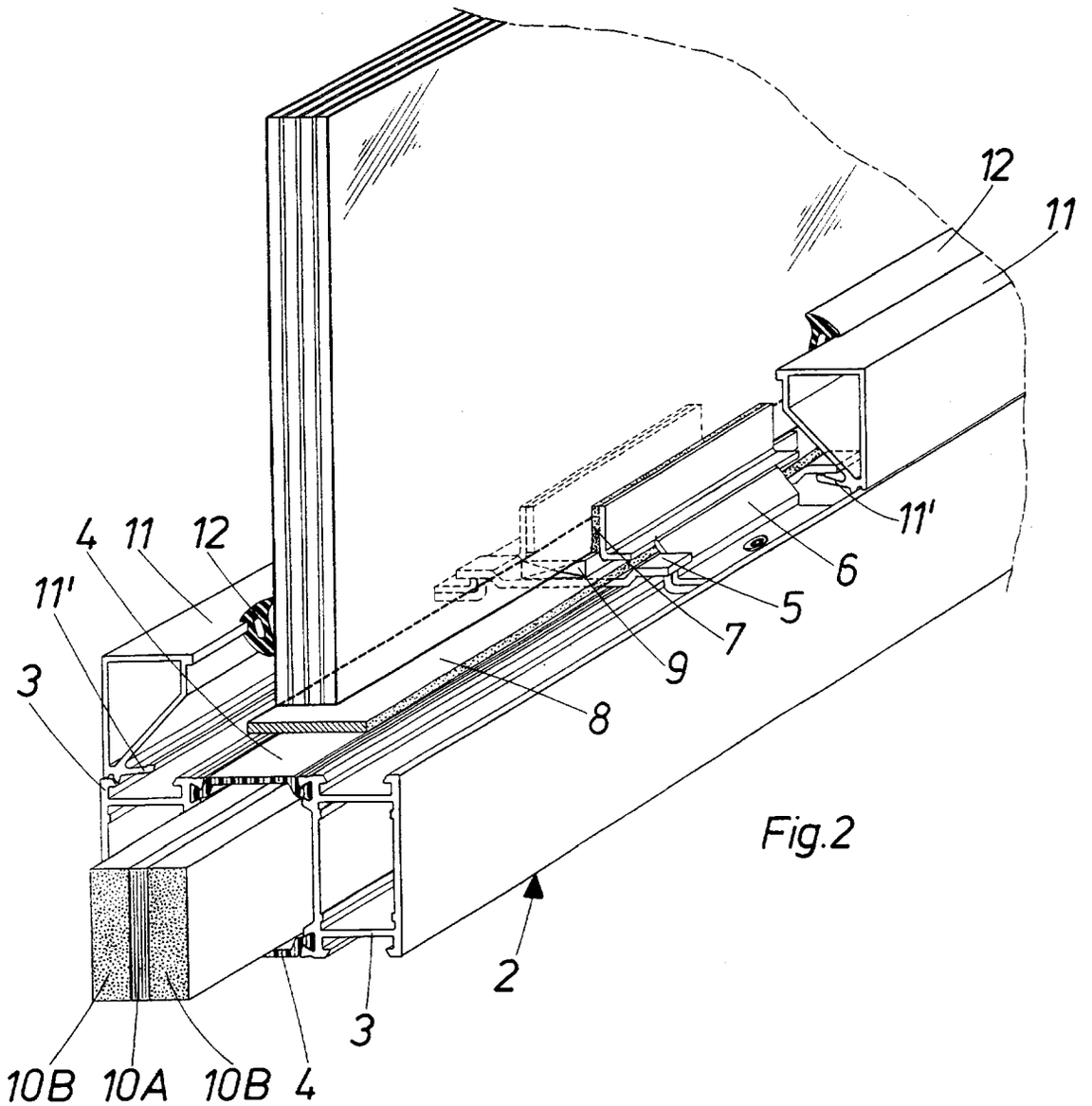


Fig.2

Fig.3

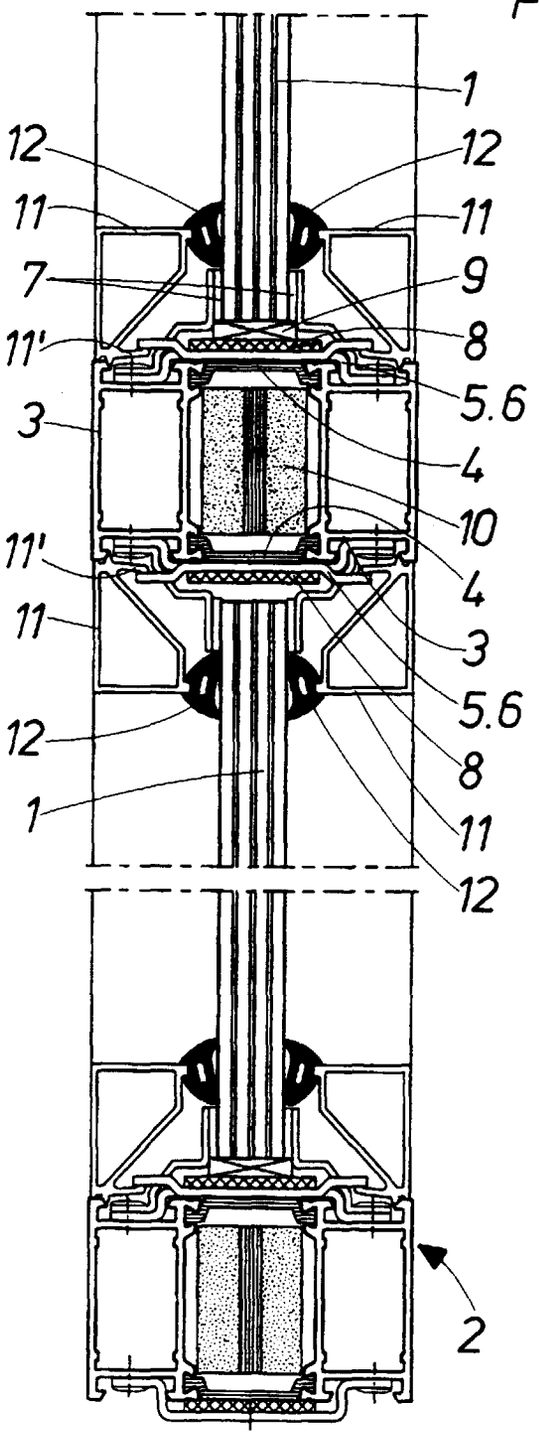


Fig.5

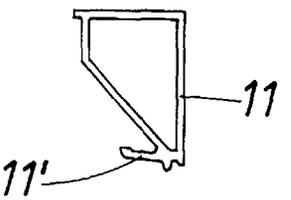
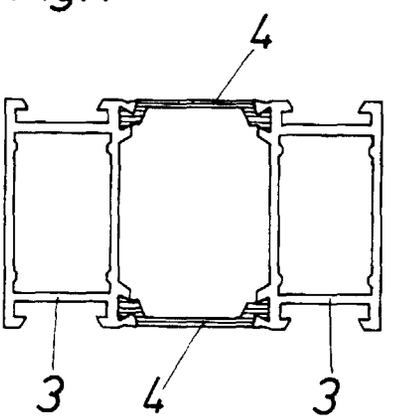


Fig.4



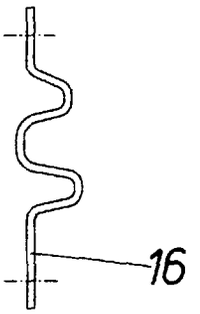


Fig.9

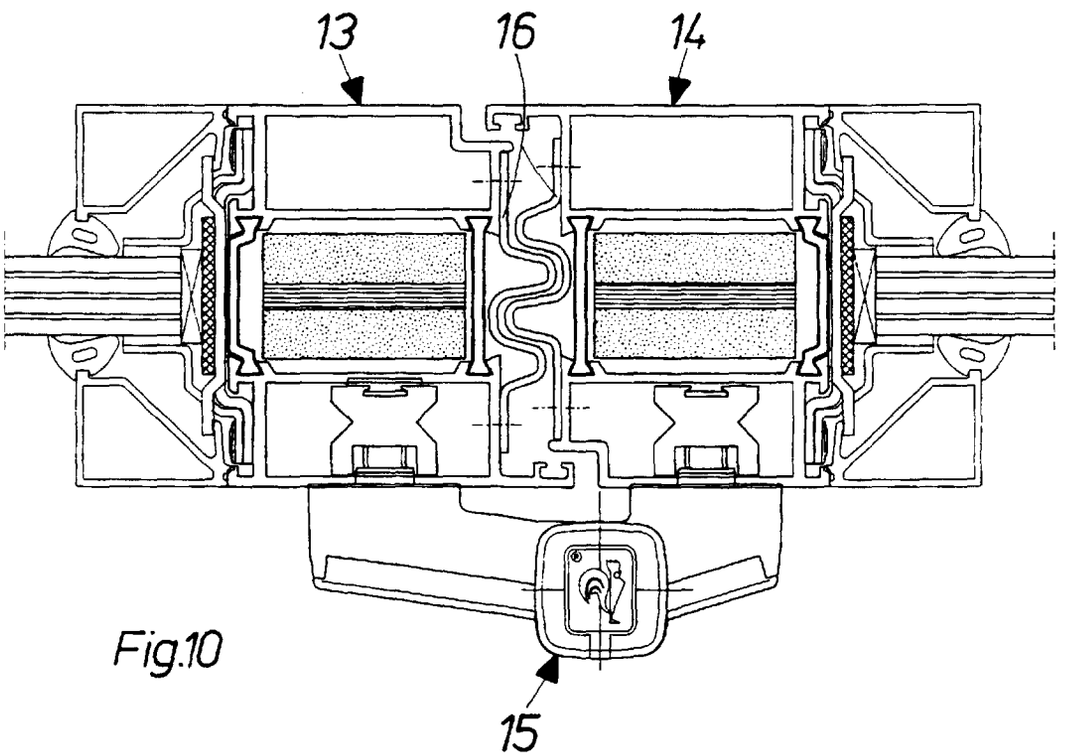


Fig.10