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(54) Sliding door comprising a section joint sealing system and a method of making a door

(57) This invention discloses a sliding door (1; 101; 201), comprising at least two adjacent panels (2; 102; 202), said panels having a first (3; 103; 203) and a second lateral face (4; 104; 204), said two panels extend in a first direction along which said panels are directed towards each other with one of said first (3, 103, 203) and one of said second lateral faces (4, 104, 204), which two panels are hinged together by means of hinges (5, 105, 205) and forming a panel section joint (6, 106, 206) comprising said first and second lateral face and a hinge axis propagating near the inside surface (7, 107, 207) of said door.

The first lateral face (3, 103, 203) comprises a front nose portion (8, 108, 208) extending adjacent to the outside surface (9, 109, 209) of the door as seen from the side, said first and second lateral face (4, 104, 204) describe a clearance region of said section joint. The clearance region has at least one intermediate member (12, 112, 212; 30, 130, 230) forming a first sealing (12, 112, 212) along said first direction near said outside surface (9, 109, 209) and a second sealing (30, 130, 230) along said first direction near said inside surface (7, 107, 207). The invention also relates to a method of making such a door.

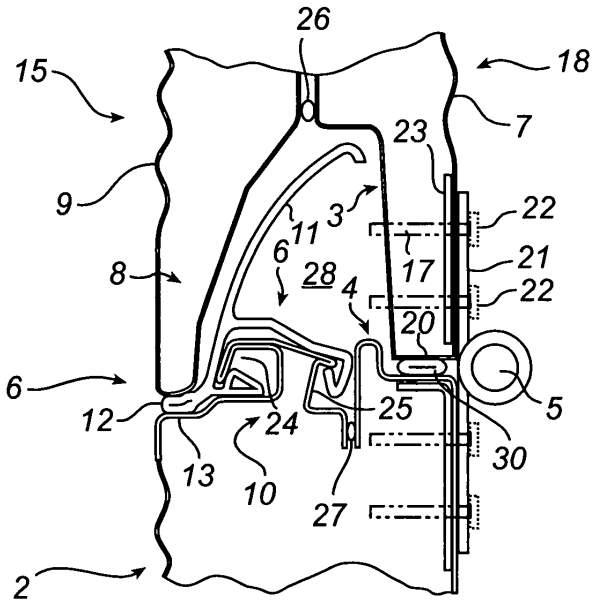

Fig. 2a

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Description

Field of the Invention

[0001] The invention discloses a sliding door that comprises at least two adjacent panels, said panels having a first and a second lateral face, said two panels extend in a first direction along which said panels are directed towards each other with one of said first and one of said second lateral faces, which two panels are hinged together by means of hinges and forming a panel section joint comprising said first and second lateral face and a hinge axis propagating near the inside surface of said door, said first lateral face comprises a front nose portion extending adjacent to the outside surface of the door as seen from the side.

Technical Background

[0002] Doors of this type can be used for e.g. closing larger openings, with the door extending in a horizontal plane, above the passage, in its open condition. When the door is being closed, the panels, which are guided in rails on either side of the passage, are tilted, starting with the lowermost panel. During said tilting, panels positioned adjacently to each other will pivot with respect to each other. Conventionally, such overhead doors constructions are common for industrial buildings and garages.

[0003] There also exist sliding doors which are operated similarly but movable in the horizontal direction during opening and closing of said sliding doors.

[0004] There is a risk that a person's fingers may become wedged in the section joint between two panels when the panels move towards each other during their relative pivoting movement.

[0005] US 3,941,180 discloses a panel construction in which a section joint comprising a rail having a nose portion adapted to narrowly follow a curved portion of a facing end portion of an adjacent lower panel such that in each displacement position of the panels of the door leaf, the clearance region is too narrow for fingers to get caught.

[0006] Furthermore, when the door is in closed condition, adjacent panels touch one another in the front lateral surface and the inner lateral surface of the section joint. This in turn provides stability to the door and support between the door panels. However, two adjacent panels cannot hinge any further than the position in which the front lateral surfaces of the panels touch each other near the outside surface of the door, in which position the panels are in line, so that the door extends in a flat plane. It may be desirable, however, for the two panels of a sliding door to pivot slightly further e.g. when a panel is moved along the guide rails and about to enter the curved part of the guide rail.

[0007] As will be understood from the above given examples the desire to provide finger protection controls the shape and dimensions of the section joint to a large extent. At the same time it is realized that although crucial for some doors there exist doors, especially in higher door openings where other demands such as sealing conditions, stability, and precise aligning during assembling are considered more important. Deformations due to changes in temperature is especially an issue in extreme weather conditions and in areas with harsh environmental conditions. There is a need to improve doors such that they are able to perform better in during more extreme conditions.

[0008] The limited space in conventional section joints adapted to at least some extent for finger pinch protection makes it difficult to present a section joint of a sliding door that enables a combination of these requirements to a satisfactory degree. In addition, a highly automatized process of manufacturing panels, especially sandwich type panels, will to a certain degree permanent one specific shape of such panels. It is desirable to provide a panel which allows for automatized production but yet allows for some adaptations in order to meet a specific demand more accurately.

[0009] EP 1 072 750 presents a design that enables stability and support of panels similar to that of US 3,941,180 and in addition with the possibility to flexibly arrange for finger protection to some extent by means of a separately attachable profile. There seems to be a need for such doors to further avoid pinching of a finger by the mouth of the clearance region between the outer walls of successive panels when the panels move towards each other during their relative movement.

[0010] The issue of achieving a sliding door which is capable of providing improved finger protection by the in and outside surface of the panels by respective section joint remains. Furthermore support, sealing and stability conditions between panels of a sliding door are to be solved accordingly.

Summary of the Invention

[0011] The object of the present invention is to provide a sliding door that overcomes the above issues, and presents support between panels as well as enables finger pinch protection.

[0012] A further object of the present invention is to provide a panel section for a sliding door that allows to be adapted in order to meet various requirements without having to change the whole manufacturing process. In particular there is a need for a sliding door which provides for good sealing conditions, a thorough fastening system for the hinges between panels as well as a capability to withstand various environmental conditions, in particular harsh environmental conditions.

[0013] It is still a further object to provide other advantages that will be apparent and more fully explained by means of examples following the drawings.

[0014] These and other objects are achieved by a sliding door according to claim 1. According to the invention

it is provided a sliding door, comprising at least two adjacent panels, said panels having a first and a second lateral face, said two panels extend in a first direction along which said panels are directed towards each other with one of said first and one of said second lateral faces, which two panels are hinged together by means of hinges and forming a panel section joint comprising said first and second lateral face and a hinge axis propagating near the inside surface of said door, said first lateral face comprises a front nose portion extending adjacent to the outside surface of the door as seen from the side. The first and second lateral face describe a clearance region of said section joint. The clearance region has at least one intermediate member forming a first sealing along said first direction near said outside surface and a second sealing along said first direction near said inside surface.

[0015] The sealing are positioned in between supporting portions. The first lateral face abut to some extent on the first and second sealing. The invention enables to use the ability of a sealing to allow for some load supporting function and in turn deliver a superior sealing effect due to induced pressure in such sealing.

[0016] Another advantage which is obtained from arranging the supporting surfaces in this way is the fact that the sealing member during closing are subjected to a pressure which is perpendicular to the supporting portions. Said pressure of the sealing member from the supporting portions during closing will deform part of the sealing member. The sealing member is forced to extend towards the outside of the section joint, during closing, while a clearance region between the lateral faces of the panels of the section joint shrinks leading to that even a finger tip is gently pushed out from the clearance region. When the door is opened, the sealing members will expand substantially in the opening direction and thus it may be opened without consequent chafing of the section joint surfaces. The location of the sealing members also enables support of the front nose portion in closed condition without adding any friction to the opening movement. Due to the sealing member resilience it rather supports the opening process at the start. A further advantage is that scraping of supporting portions and the resulting noise for that matter due to metal to metal contact is avoided.

[0017] The supporting portions can be arranged in any suitable way and still be able to fulfil their purpose. According to the invention, and particularly for industrial doors, it is especially beneficial when they are on a plane which is perpendicular to the front and back of the sections so that the sections will assume a straight position when they are put on top of each other during mounting.

[0018] Another advantage which is obtained from the location of the sealing member between the supporting portion and front nose portion in the closed position is that influx of air and seepage of water into the section joint is prevented, even in slightly deformed condition.

[0019] When such sealing member is subject to pressure between panels the side towards the outside of the sliding door is pressed out and this in turn will prevent fingers from being squeezed or even enter a gap, said gap also referred to as clearance region in this text, between the lateral faces of the panels in a section joint. Due to its location on the below supporting portion the sealing member will be exposed to a minimum of friction resulting from the relational movement between panels.

[0020] Advantageously, first and second sealing are attached to said second lateral face, one at each side of said section joint as seen from the side of the door. In these locations the clearance region, with its narrowly spaced lateral faces forming part of the section joint is evident. In between these locations the open region may be designed according to any specific need.

[0021] Preferably, said sealings are positioned at a distance from one another, said distance, taken across the thickness of the panel, representing at least 50% and preferably more than 2/3 of the total thickness of the door panel. The longer the distance in relation to the thickness of the door the better support and stability is provided, although the more exact relation is also dependent on the chosen material, size and shape of the sealing.

[0022] Advantageously, said first sealing is deformable at the outside of the door and between the two panel sections while abutting said front nose portion and a below supporting portion of the section joint, when said lateral faces of the two closing panel sections move towards each other, said deformation of the sealing member providing sealing of the section joint and that any objects that may be present at the location of the sealing member, such as a person's fingers, are pushed out from the section joint region of the outside of said door.

[0023] Thus, a flexible sliding door arrangement is accomplished which sealing effect may be selected into detail by solely alter the shape and/or properties of the attachable sealing, thereby enabling more accurate performance for each door without an immediate need for redesign of the whole panel manufacturing line.

[0024] The present invention thus allows for an open and less compact design which makes room for additional improvements in a flexible manner. In one preferred embodiment of the invention the hinge fastening elements protrudes through the sidewalls of the inner nose portion and into said open region. The fact that the fastening elements, such as screws, bolts or similar are left with sufficient space for protruding into the open region provides for often desired additional support to the fastening of hinge elements in that the fastening elements can be held by two support walls instead of just the outer support wall.

[0025] Alternatively, according to a still preferred embodiment said sealings are integrated in one intermediate portion placed in said clearance region.

[0026] In particular when the supporting surfaces are non-perpendicular it is an advantage that the inner nose portion has a sloping tip portion in order to grip more effectively to the sealing material.

[0027] Advantageously, second lateral face comprises

a profile attaching portion, said profile attaching portion has a sloping profile which faces away from the hinge axis and extends obliquely in a direction away from said second lateral face towards the inside surface of the door. The tip of the front nose portion is arranged to follow the upper surface of the sloping part of the sloping profile at a distance less than a fingers width, preferably less than 6 mm and more preferably less than 4 mm, as seen in a cross section along said first direction of said section joint during opening and closing movement of the door.

[0028] In order to reduce risk for finger pinching the front nose portion is arranged to closely follow the upper surface of the sloping profile during pivoting of the door panels. As long as this condition is fulfilled the exact shape of the space between the lower lateral side of the upper panel and the upper surface of the sloping profile attached to the lower panel could be selected from a variety of options in order to meet the demand for reducing finger pinching risk.

[0029] It is preferred that said first lateral face has a polygonal contour as seen in cross section of said section joint along the first direction. Hence, a door panel which is easy to manufacture and yet robust and stable is achieved. More preferably, the polygonal contour is made such that additional space between the upper surface of the sloping profile and the lower lateral side of the upper panel is achieved compared to the space defined by a distance between the nose portion and the upper surface of the lower panel during a pivoting motion. The comparatively increased space generally defined by the shape of the upper panel enables a variety of options as regards shape and dimensions of attachable profiles. It is desirable for many reasons to provide for a margin as regards tolerances and smaller deformations due to e.g. impact or temperature in order to enable a smooth pivoting movement during various conditions.

[0030] Furthermore, the location of the seal, arranged to the sloping profile, enables excellent sealing, improved finger pinch protection together with a high degree of support in the panel section.

[0031] Hence, it is further realised that said sloping profile is advantageously connectable with said profile attaching portion in at least two positions spaced from one another as seen in cross section of said section joint along said first direction in order to secure said sloping profile to the panel. A firm attachment of the sloping profile has the advantage that the pivoting movement can be performed in relation to two mutually lateral faces in a stable manner with reduced risk for obstruction or increased friction due to dislocation etc.

[0032] Preferably, said sloping profile is snap connectable with said profile attaching portion. Such profile would be easy to replace, if desirable, in an assembled door.

[0033] Alternatively, said sloping profile is slip connectable, along said first direction, in said profile attaching portion as seen in cross section of said section joint.

[0034] Advantageously, said door is an overhead sliding door in which the panels are sliding in a path describing a transition from a vertical to a horizontal movement via a curved zone during opening and vice versa during closing. Especially, sliding doors of the kind that has a curved section at a vertical distance within reach for fingers are suitably arranged in accordance with the claimed invention. Also other door types with a need for improved finger pinch protection such as a sideways slidable door in which the panels are sliding in a path describing a transition from a first direction to a second direction via a curved zone during opening and vice versa during closing are anticipated.

[0035] According to an another aspect of the invention a method of making a sliding door comprising at least two adjacent panels, said panels having a first and a second lateral face, said two panels extending in a first direction along which said panels are directed towards each other with one of said first and one of said second lateral faces forming part of a panel section joint, said first lateral face comprises a front nose portion extending adjacent to the outside surface of the door as seen from the side. The first and second lateral face describe a clearance region of said section joint. The method further involves the step that said clearance is being provided with at least one intermediate member forming a first sealing along said first direction near said outside surface and a second sealing along said first direction near said inside surface.

[0036] A step of attaching a sloping profile, propagating along said first direction, said sloping profile comprising said first sealing member, to a profile attaching portion of said second lateral face and further said first sealing member is deformable at the outside of the door and between the two panel sections while abutting a portion of said first lateral face and a supporting portion of the section joint, when said lateral faces of the two closing panel sections during closing movement being near a closed position.

[0037] Advantageously, the step of attaching said sloping profile involves connecting said sloping profile with said profile attaching portion in at least two positions spaced from one another as seen in cross section of said section joint along said first direction.

said sloping profile is being provided with a second leg protruding through the section joint and carrying said second sealing.

[0038] Furthermore, said sealings are being used for support during aligning of said panels.

[0039] Furthermore, the location of the seal, enables excellent sealing even in at least slightly deformed panel conditions, improved finger pinch protection together with a high degree of support in the panel section. Another advantage which is obtained from arranging the supporting surfaces in this way is the fact that the sealing member during closing are subjected to a pressure which is perpendicular to the supporting portions. Said pressure of the sealing member from the supporting portions during closing will deform part of the sealing member. The sealing member is forced to extend towards the outside

of the section joint, during closing, while a gap between the lateral faces of the panels of the section joint shrinks leading to that even a finger tip is gently pushed out from the gap. When the door is opened, the sealing members will expand substantially in the opening direction and thus without consequent chafing of the section joint surfaces. The location of the sealing members also enables support of the front nose portion in closed condition without adding any friction to the opening movement but rather due to its resilience supports the opening process at the start. A further advantage is that scraping, and resulting noise, of supporting portions due to metal to metal contact is avoided.

[0040] As will be realised by the skilled person the features of various embodiments may be combined in different ways in order to derive further aspects of the invention within the claimed scope of protection.

Brief Description of the Drawings

[0041] Currently preferred embodiments of the present invention will now be described in more detail, with reference to the accompanying drawings.

[0042] Fig. 1 is a perspective view of an example of a sliding door arrangement according to an embodiment of the invention.

[0043] Fig. 2a is a section view of a section joint according to a first embodiment of the invention in a closed condition.

[0044] Fig. 2b is a section view of a section joint according to a first embodiment of the invention in a pivoted condition.

[0045] Fig. 3a is a section view of a section joint according to a second embodiment of the invention in a closed condition.

[0046] Fig. 3b is a section view of a section joint according to a second embodiment of the invention in a pivoted condition.

[0047] Fig. 4a is a section view of a section joint according to a third embodiment of the invention in a closed condition.

[0048] Fig. 4b is a section view of a section joint according to a third embodiment of the invention in a pivoted condition.

[0049] Fig. 5 is a section view of a section joint according to a fourth embodiment of the invention in a closed condition.

[0050] Fig. 6a is a perspective view of section of a sliding door disclosing the principle of elongated sealing enabling support to a panel in a closed condition.

[0051] Fig. 6b is a perspective view of section of a sliding door of fig 6a but in a pivoted condition.

Detailed Description of Preferred Embodiments

[0052] A first embodiment of the invention will be described in more detail in the following with reference to the accompanying drawings.

[0053] Referring now to Fig. 1, an overhead sliding door 1 in partly lifted condition is disclosed. Rollers generally runs in guide rails placed on each side of the door and extending through a curved portion further under the ceiling of a room. The door can be lifted and lowered manually or by using a driving device. The door leaf suitably comprises a plurality of longitudinal panels 2 to which said rollers are arranged in order to be able to carry out a movement where the door is able to run over a curve from a vertical to a horizontal or tilted position.

[0054] Conveniently, wires fastened at the lower part of the door and further arranged via pulleys to a driving shaft. The driving shaft in turn being connected to a motor via a transmission. Said motor may be activated by e.g. an electric control or a remote control.

[0055] A part of a first embodiment of a section joint 6 between a super incumbent panel, or in the following, section and a sub adjacent section is disclosed in cross section from the side in fig 2a and 2b. The two sections are pivotally connected by hinges 5 arranged on the inside surface 7 of the door. In fig 2a the sections are seen in a closed condition and in fig 2b the section joint 6 is seen in a pivoted condition.

[0056] The sections are made up of metal sheets, such as, steel or aluminium joined by a fold 26, 27 which suitably constitute a thermal barrier. The sections are foamed with an insulating mass of polyurethane or similar plastics. The hinges 5 are attached to the sections by fasteners, such as screws, bolts or similar 22 extending through an attachment portion 21 of the hinge 5 and further through the metal sheet of the section. A bracket 23 is provided at a location adjacent the metal sheet for additional support of said fasteners 22.

[0057] The lower part of the super incumbent section has a first lateral face 3 and furthermore comprises a front nose portion 8 and an inner nose portion 17 leaving room for an open region 28 between said nose portions 8, 17. The first lateral face 3 describes a supporting portion by the tip of the front nose portion 8. The first lateral face 3 further describes a supporting portion by the tip 20 of the inner nose portion 17.

[0058] The upper part of the sub adjacent section has a second lateral face 4 and furthermore comprises a supporting portion 13 adapted to support the front nose portion 8 of the super incumbent section with a sealing member 12 in between. The second lateral face 4 further describes a supporting portion for the supporting portion 20 of the inner nose portion 17.

[0059] In the shown case, the supporting surfaces are in a plane which is perpendicular to the outside and inside surface of the section. The supporting surfaces are placed at a large distance from one another, seen in cross section, providing stable support that ensures an aligned orientation of the sections when assembled. Further help for correct aligning of sections is given by a protruding portion of the second lateral face adjacent the inner supporting portion.

[0060] Furthermore, the second lateral face 4 compris-

es a profile attaching portion 10. The profile attaching portion in the first embodiment consists of two grooves or rather attaching parts 24, 25 propagating along the second lateral face. The first attaching part 24 is positioned towards the outside surface 9 of the door and the second attaching part 25 is positioned more towards the inside surface of the door. The first attaching part 24 is shaped like a pocket with an opening towards the outside surface 9. In between the attaching parts 24, 25 the lateral face describes a ridge part. Together said parts forms the profile attaching portion 10 of said first embodiment.

[0061] The sloping profile 11 has a lower part which is adapted for mutual engagement with the attaching portion 10. The sloping profile 11 according to the first embodiment has a protruding portion for engagement with the first attaching part 24, preferably said protruding portion is inserted in the first attaching part 24. Consequently, a second protruding portion of said sloping profile is adapted to be inserted in said second attaching part 25.

[0062] The attachment of said sloping profile is preferably accomplished by snap engagement. The first embodiment as depicted in fig 2a also allows for the sloping profile 11 to be slipped along the attaching portion 10 for mutual engagement of the same.

[0063] The sloping profile 11 preferably has a substantially curved shape of the upper surface with a radius that coincides with the centre of the hinge 5. A sealing member 12 is formed by the foot of the slope of the sloping profile 11 to which sealing member 12 the upper surface of the sloping profile preferably transcends smoothly with a small curved radius. The smooth transition of the sloping profile 11 to the sealing member 12 will gently guide a potential finger out of the region where severe finger pinching may occur and into a region towards the outside of the door where a compressible sealing member 12 will gently push said finger, or rather finger tip, out of the section joint 6. This is further described with reference to fig 2b.

[0064] The sealing member 12 is compressible and furthermore adapted to be deformable such that when compressed by the closing panel sections of a section joint it is forced outwards without being held back by said panel lateral faces in order to find space. Hence, a finger, fingertip or the like will be gently pushed out from the section joint by a deformable member which in turn provides a cushioning effect at the final stage, further improving finger pinch protection. The sealing member 12 is preferably made of rubber or similar material. Advantageously, the sealing member 12 has a cross section comprising an enclosed space for achieving the desired effect, i.e. being forced outwards when compressed in order to push out fingers.

[0065] In order to ensure finger protection during opening and closing the tip 14 of the front nose portion 8 is arranged to follow the upper surface of the sloping part of the sloping profile 11 at a distance less than a fingers width, preferably less than 6 mm and more preferably less than 4 mm, as seen in a cross section along said first direction of said section joint 6 during opening and closing movement of the door. In fig 2b the section joint in a pivoted positions is disclosed. The upper surface of the sloping profile extends further than the maximum pivoting angle of the section joint which may be around 70 degrees.

[0066] Furthermore, the material of the sloping profile 11 apart from the sealing member 12 is plastic or a similar material. The choice of material is related to how the sloping profile is attached. The overall demand is that it is stiff enough not to give in when being pushed by a finger.

[0067] The fastening elements 22, such as screws, bolts or similar are left with sufficient space for protruding into the open region 28 provides for often desired additional support to the fastening of the hinge elements 5 in that the fastening elements 22 can be held by two support walls instead of just the outer support wall.

[0068] An intermediate member 30 is present between the inner nose portion 17 and at least the part of the second lateral face 4 that supports said inner nose portion 17 via said intermediate member 30. In addition to accomplish a cushioning effect where the panels rest on one another sealing effect is also provided. Furthermore, since this intermediate member 30 is arranged more towards the inside of the door than the sealing member 12 it is normally not exposed to extreme temperature changes and a stable sealing effect may be obtained at this location. Scraping is avoided and noise reduction is provided.

[0069] A part of a second embodiment of a section joint 106 between a super incumbent panel, or in the following, section and a sub adjacent section is disclosed in cross section from the side in fig 3a and 3b. The two sections are pivotally connected by hinges 105 arranged on the inside surface 107 of the door. In fig 3a the sections are seen in a closed condition and in fig 3b the section joint 106 is seen in a pivoted condition.

[0070] The sections are made up of frame structure, conveniently moulded extruded profiles affixed together. The sections are foamed with an insulating mass of polyurethane or similar plastics or being adapted to hold a window panel or similar. The hinges 105 are attached to the sections by fasteners, such as screws, bolts or similar 122 (not shown) extending through an attachment portion 121 of the hinge 105 and further through the section.

[0071] The lower part of the super incumbent section has a first lateral face 103 and furthermore comprises a front nose portion 108 and an inner nose portion 117 leaving room for an open region 128 between said nose portions 108, 117. The first lateral face 103 describes a supporting portion by the tip of the front nose portion 108. The first lateral face 103 further describes a supporting portion by the tip 120 of the inner nose portion 117.

[0072] The upper part of the sub adjacent section has a second lateral face 104 and furthermore comprises a supporting portion 113 adapted to support the front nose portion 108 of the super incumbent section with a sealing member 112 in between. The second lateral face 104

further describes a supporting portion for the supporting portion 120 of the inner nose portion 117.

[0073] In the shown case, the supporting surfaces are in a plane which is perpendicular to the outside and inside surface of the section. The supporting surfaces are placed at a large distance from one another, seen in cross section, providing stable support that ensures an aligned orientation of the sections when assembled. Further help for correct aligning of sections is given by a protruding portion of the second lateral face adjacent the inner supporting portion.

[0074] Furthermore, the second lateral face 104 comprises a profile attaching portion 110. The profile attaching portion in the first embodiment consists of two grooves or rather attaching parts 124, 125 propagating along the second lateral face. The first attaching part 124 is positioned towards the outside surface 109 of the door and the second attaching part 125 is positioned more towards the inside surface of the door. The first attaching part 124 is shaped like a pocket with an opening towards the outside surface 109. In between the attaching parts 124, 125 the lateral face describes a ridge part. Together said parts forms the profile attaching portion 110 of said first embodiment.

[0075] The sloping profile 111 has a lower part which is adapted for mutual engagement with the attaching portion 110. The sloping profile 111 according to the first embodiment has a protruding portion for engagement with the first attaching part 124, preferably said protruding portion is inserted in the first attaching part 124. Consequently, a second protruding portion of said sloping profile is adapted to be inserted in said second attaching part 125. The attachment of said sloping profile is preferably accomplished by snap engagement. The first embodiment as depicted in fig 3a also allows for the sloping profile 111 to be slipped along the attaching portion 110 for mutual engagement of the same.

[0076] The sloping profile 111 preferably has a substantially curved shape of the upper surface with a radius that coincides with the centre of the hinge 105. A sealing member 112 is formed by the foot of the slope of the sloping profile 111 to which sealing member 112 the upper surface of the sloping profile preferably transcends smoothly with a small curved radius. The smooth transition of the sloping profile 111 to the sealing member 112 will gently guide a potential finger out of the region where severe finger pinching may occur and into a region towards the outside of the door where a compressible sealing member 112 will gently push said finger, or rather finger tip, out of the section joint 106. This is further described with reference to fig 3b.

[0077] The sealing member 112 is compressible and furthermore adapted to be deformable such that when compressed by the closing panel sections of a section joint it is forced outwards without being held back by said panel lateral faces in order to find space. Hence, a finger, fingertip or the like will be gently pushed out from the section joint by a deformable member which in turn provides a cushioning effect at the final stage, further improving finger pinch protection. The sealing member 112 is preferably made of rubber or similar material. Advantageously, the sealing member 112 has a cross section comprising an enclosed space for achieving the desired effect, i.e. being forced outwards when compressed in order to push out fingers.

[0078] In order to ensure finger protection during opening and closing the tip 114 of the front nose portion 108 is arranged to follow the upper surface of the sloping part of the sloping profile 111 at a distance less than a fingers width, preferably less than 6 mm and more preferably less than 4 mm, as seen in a cross section along said first direction of said section joint 106 during opening and closing movement of the door. In fig 3b the section joint in a pivoted positions is disclosed. The upper surface of the sloping profile extends further than the maximum pivoting angle of the section joint which may be around 70 degrees.

[0079] Furthermore, the material of the sloping profile 111 apart from the sealing member 112 is plastic or a similar material. The choice of material is related to how the sloping profile is attached. The overall demand is that it is stiff enough not to give in when being pushed by a finger.

[0080] The fastening elements 122 (not shown), such as screws, bolts or similar are left with sufficient space for protruding into the open region 128 provides for often desired additional support to the fastening of the hinge elements 5 in that the fastening elements 122 (not shown) can be held by two support walls instead of just the outer support wall.

[0081] An intermediate member 130 is present between the inner nose portion 117 and at least the part of the second lateral face 104 that supports said inner nose portion 117 via said intermediate member 130. In addition to accomplish a cushioning effect where the panels rest on one another improved sealing effect is also provided. Furthermore, since this intermediate member 130 is arranged more towards the inside of the door than the sealing member 112 it is normally not exposed to extreme temperature changes and a stable sealing effect may be obtained at this location. Scraping is avoided and noise reduction is provided.

[0082] A third preferred embodiment suitable for residential doors will be illustrated by fig 4a-4b. A part of a first embodiment of a section joint 206 between a super incumbent panel, or in the following, section and a sub adjacent section is disclosed in cross section from the side in fig 4a and 4b. The two sections are pivotally connected by hinges 205 arranged on the inside surface 207 of the door. In fig 4a the sections are seen in a closed condition and in fig 4b the section joint 206 is seen in a pivoted condition.

[0083] The sections are made up of metal sheets, such as, steel or aluminium joined by a fold 226, 227 which suitably constitute a thermal barrier. The sections are foamed with an insulating mass of polyurethane or similar

plastics. The hinges 205 are attached to the sections by fasteners, such as screws, bolts or similar (not shown) extending through an attachment portion 221 of the hinge 205 and further through the metal sheet of the section. A bracket 223 is provided at a location adjacent the metal sheet for additional support of said fasteners 222 (not shown).

[0084] The lower part of the super incumbent section has a first lateral face 203 and furthermore comprises a front nose portion 208 and an inner nose portion 217 leaving room for an open region 28 between said nose portions 208, 217. The first lateral face 203 describes a supporting portion by the tip of the front nose portion 208. The first lateral face 203 further describes a supporting portion by the tip 220 of the inner nose portion 217.

[0085] The upper part of the sub adjacent section has a second lateral face 204 and furthermore comprises a supporting portion 213 adapted to support the front nose portion 208 of the super incumbent section with a sealing member 212 in between. The second lateral face 204 further describes a supporting portion for the supporting portion 220 of the inner nose portion 217.

[0086] In the shown case, the supporting surfaces are in a plane which is perpendicular to one another. The supporting surfaces are placed at a large distance from one another, seen in cross section, providing stable support that ensures an aligned orientation of the sections when assembled. Further help for correct aligning of sections is given by a protruding portion of the second lateral face adjacent the inner supporting portion. The sealing by the front nose portion will provide the necessary friction for aligning the sections.

[0087] Furthermore, the second lateral face 204 comprises a profile attaching portion 210. The profile attaching portion in the first embodiment consists of two grooves or rather attaching parts 224, 225 propagating along the second lateral face. The first attaching part 224 is positioned towards the outside surface 209 of the door and the second attaching part 225 is positioned more towards the inside surface of the door. The first attaching part 224 is shaped like a pocket with an opening towards the outside surface 209. In between the attaching parts 224, 225 the lateral face describes a ridge part. Together said parts forms the profile attaching portion 210 of said first embodiment.

[0088] The sloping profile 211 has a lower part which is adapted for mutual engagement with the attaching portion 210. The sloping profile 211 according to the first embodiment has a protruding portion for engagement with the first attaching part 224, preferably said protruding portion is inserted in the first attaching part 224. Consequently, a second protruding portion of said sloping profile is adapted to be inserted in said second attaching part 225. The attachment of said sloping profile is preferably accomplished by snap engagement. The third embodiment as depicted in fig 4a also allows for the sloping profile 211 to be slipped along the attaching portion 210 for mutual engagement of the same.

[0089] The sloping profile 211 preferably has a substantially curved shape of the upper surface with a radius that coincides with the centre of the hinge 205. A sealing member 212 is formed by the foot of the slope of the sloping profile 211 to which sealing member 212 the upper surface of the sloping profile preferably transcends smoothly with a small curved radius. The smooth transition of the sloping profile 211 to the sealing member 212 will gently guide a potential finger out of the region where severe finger pinching may occur and into a region towards the outside of the door where a compressible sealing member 212 will gently push said finger, or rather finger tip, out of the section joint 206. This is further described with reference to fig 4b.

[0090] The sealing member 212 is compressible and furthermore adapted to be deformable such that when compressed by the closing panel sections of a section joint it is forced outwards without being held back by said panel lateral faces in order to find space. Hence, a finger, fingertip or the like will be gently pushed out from the section joint by a deformable member which in turn provides a cushioning effect at the final stage, further improving finger pinch protection. The sealing member 12 is preferably made of rubber or similar material. Advantageously, the sealing member 212 has a cross section comprising an enclosed space for achieving the desired effect, i.e. being forced outwards when compressed in order to push out fingers.

[0091] In order to ensure finger protection during opening and closing the tip 214 of the front nose portion 208 is arranged to follow the upper surface of the sloping part of the sloping profile 11 at a distance less than a fingers width, preferably less than 6 mm and more preferably less than 4 mm, as seen in a cross section along said first direction of said section joint 206 during opening and closing movement of the door. In fig 4b the section joint in a pivoted positions is disclosed. The upper surface of the sloping profile extends further than the maximum pivoting angle of the section joint which may be around 70 degrees.

[0092] Furthermore, the material of the sloping profile 211 apart from the sealing member 212 is plastic or a similar material. The choice of material is related to how the sloping profile is attached. The overall demand is that it is stiff enough not to give in when being pushed by a finger.

[0093] The fastening elements 222 (not shown), such as screws, bolts or similar are left with sufficient space for protruding into the open region 228 provides for often desired additional support to the fastening of the hinge elements 205 in that the fastening elements 222 (not shown) can be held by two support walls instead of just the outer support wall.

[0094] An intermediate member 30 is present between the inner nose portion 17 and at least the part of the second lateral face 4 that supports said inner nose portion 17 via said intermediate member 30. In addition to accomplish a cushioning effect where the panels rest on

one another sealing effect is also provided. Furthermore, since this intermediate member 30 is arranged more towards the inside of the door than the sealing member 12 it is normally not exposed to extreme temperature changes and a stable sealing effect may be obtained at this location. Scraping is avoided and noise reduction is provided.

[0095] In fig 5 a fourth preferred embodiment is disclosed having a second lateral face which describes a sloping surface within the section joint. Furthermore, the section joint is provided with an L-shaped sealing towards the inner surface of the door panel and an enclosed space sealing towards the outer surface of the door. Other features of the fourth embodiment will be apparent from the description of the first embodiment.

[0096] In fig 6a and 6b the supporting function of an intermediate member or a sealing member is disclosed, in principle, for an elongated section joint. This illustrate the ability of a sealing to allow for some load supporting function and in turn deliver a superior sealing effect due to induced pressure.

[0097] Although the present invention has been described in connection with particular embodiments thereof, it is to be understood that various modifications, alterations and adaptations may be made by those skilled in the art without departing from the spirit and scope of the invention.

[0098] It is anticipated that the skilled person would have a variety of materials to choose from in order to provide components suitable for the sliding door according to the invention. The described embodiments are the currently preferred and represent three different types of doors with a common concept for a section joint. It is realised that each feature described in relation to a specific embodiment may be combined with other described features resulting in further alternative embodiments. For most of the features further combinations may be made regardless of door type.

[0099] Thus, section joints according to the invention may be provided with various kinds of hinges without departing from the scope of protection. The attachable sloping profile may be attached during manufacturing, assembling or whenever there is a need.

Claims

1. A sliding door (1; 101; 201), comprises at least two adjacent panels (2; 102; 202), said panels having a first (3; 103; 203) and a second lateral face (4; 104; 204), said two panels extend in a first direction along which said panels are directed towards each other with one of said first (3, 103, 203) and one of said second lateral faces (4, 104, 204), which two panels are hinged together by means of hinges (5, 105, 205) and forming a panel section joint (6, 106, 206) comprising said first and second lateral face and a hinge axis propagating near the inside surface (7, 107, 207) of said door, said first lateral face (3, 103, 203) comprises a front nose portion (8, 108, 208) extending adjacent to the outside surface (9, 109, 209) of the door as seen from the side, said first and second lateral face (4, 104, 204) describe a clearance region of said section joint **characterised in that** said clearance region has at least one intermediate member (12, 112, 212; 30, 130, 230) forming a first sealing (12, 112, 212) along said first direction near said outside surface (9, 109, 209) and a second sealing (30, 130, 230) along said first direction near said inside surface (7, 107, 207).

2. A sliding door (1; 101; 201) according to claim 1, wherein said first and second sealing (12, 112, 212; 30, 130, 230) are attached to said second lateral face, one at each side of said section joint (6, 106, 206) as seen from the side of the door (1; 101; 201).

3. A sliding door (1; 101; 201) according to any one of claims 1-2, wherein said sealings (12, 112, 212; 30, 130, 230) are positioned at a distance from one another, said distance, taken across the thickness of the panel, representing at least 50% and preferably more than 2/3 of the total thickness of the door panel.

4. A sliding door (1; 101; 201) according to any one of claims 1-3, wherein said first sealing (12, 112, 212) which is deformable at the outside (15, 115, 215) of the door and between the two panel sections while abutting said front nose portion (8, 108, 208) and a below supporting portion (13, 113, 213) of the section joint, when said lateral faces of the two closing panel sections move towards each other, said deformation of the sealing member providing sealing of the section joint and that any objects that may be present at the location of the sealing member, such as a person's fingers, are pushed out from the section joint region of the outside of said door.

5. A sliding door (1; 101; 201) according to any one of claims 1-4, wherein the dimension of the pressed first sealing (12, 112, 212) that is present near the outside (15, 115, 215) as seen in a cross section of said first direction in the closed condition of the door is less than 6 mm, preferably less than 4,0 mm and more preferably about 2 mm measured in the normal direction from the below supporting portion (13, 113, 213).

6. A sliding door (1; 101; 201) according to any one of the preceding claims, wherein any one of said sealings (12, 112, 212; 30, 130, 230) has a cross section comprising an enclosed space.

7. A sliding door (1; 101; 201) according to any one of claims 1-6, wherein said second sealing (30, 130, 230) that is present between an inner nose portion

(17, 117, 217) and at least the part of the second lateral face (4, 104, 204) supports said inner nose portion (17, 117, 217).

8. A sliding door (1; 101; 201) according to any one of claims 1-7, wherein said sealings (12, 112, 212; 30, 130, 230) is made of a material which is more compressible than the outer surface of the panel sections.

9. A sliding door (1; 101; 201) according to any one of the claims 10-11, wherein said sealings (12, 112, 212; 30, 130, 230) are integrated in one intermediate portion placed in said clearance region.

10. A sliding door (1; 101; 201) according to any one of the claims 7-9, wherein said inner nose portion (17, 117, 217) has a sloping tip portion (20, 120, 220).

11. A sliding door (1; 101; 201) according to any one of the claims 1-10, wherein said second lateral face (4, 104, 204) comprises a profile attaching portion (10, 110, 210), said profile attaching portion has a sloping profile (11, 111, 211) which faces away from the hinge axis and extends obliquely in a direction away from said second lateral face (4, 104, 204) towards the inside surface (7, 107, 207) of the door.

12. A sliding door (1; 101; 201) according to claim 11, wherein the tip (14, 114, 214) of the front nose portion (8, 108, 208) is arranged to follow the upper surface of the sloping part of the sloping profile (11, 111, 211) at a distance less than a fingers width, preferably less than 6 mm and more preferably less than 4 mm, as seen in a cross section along said first direction of said section joint (6, 106, 206) during opening and closing movement of the door.

13. A sliding door (1; 101; 201) according to any one of the preceding claims 11-12, wherein the upper surface of the sloping part of the sloping profile (11, 111, 211) has a curved shape.

14. A sliding door (1; 101; 201) according to any one of preceding claims 11-13 and 7, wherein an open region (28, 128, 228) is formed between the sloping profile (11, 111, 211) and the inner nose portion (17, 117, 217).

15. A sliding door (1; 101; 201) according to claim 14, wherein hinge fastening elements (22, 122, 222) protrudes through the sidewalls of the inner nose portion (17, 117, 217) and into said open region (28, 128, 228).

16. A sliding door (1; 101; 201) according to any one of the preceding claims, wherein said first lateral face (3, 103, 203) has a polygonal contour as seen in cross section of said section joint (6, 106, 206) along the first direction.

17. A sliding door according to any one of the preceding claims, wherein said door is an overhead sliding door in which the panels are sliding in a path describing a transition from a vertical to a horizontal movement via a curved zone during opening and vice versa during closing.

18. A sliding door according to any one of the claims 1-16, wherein said door is a sideways sliding door in which the panels are sliding in a path describing a transition from a first direction to a second direction via a curved zone during opening and vice versa during closing.

19. Method of making a sliding door comprising at least two adjacent panels (2; 102; 202), said panels having a first (3; 103; 203) and a second lateral face (4; 104; 204), said two panels extending in a first direction along which said panels are directed towards each other with one of said first (3, 103, 203) and one of said second lateral faces (4, 104, 204) forming part of a panel section joint (6, 106, 206), said first lateral face (3, 103, 203) comprises a front nose portion (8, 108, 208) extending adjacent to the outside surface (9, 109, 209) of the door as seen from the side, said first and second lateral face (4, 104, 204) describe a clearance region of said section joint
characterised by the step that said clearance is being provided with at least one intermediate member (12, 112, 212; 30, 130, 230) forming a first sealing (12, 112, 212) along said first direction near said outside surface (9, 109, 209) and a second sealing (30, 130, 230) along said first direction near said inside surface (7, 107, 207).

20. Method according to claim 19 comprising a step of attaching a sloping profile, propagating along said first direction, said sloping profile comprising said first sealing member (12, 112, 212), to a profile attaching portion (10, 110, 210) of said second lateral face and further said first sealing member (12, 112, 212) is deformable at the outside (15, 115, 215) of the door and between the two panel sections while abutting a portion of said first lateral face (8, 108, 208) and a supporting portion (13, 113, 213) of the section joint, when said lateral faces of the two closing panel sections during closing movement being near a closed position.

21. A method according to claim 20, in which the step of attaching said sloping profile (11, 111, 211) involves connecting said sloping profile with said profile attaching portion (10, 110, 210) in at least two positions spaced from one another as seen in cross section of said section joint (6, 106, 206) along said

first direction.

22. A method according to any one of claims 20-21, in which said sloping profile (11, 111, 211) is being provided with a second leg protruding through the section joint and carrying said second sealing (30, 130, 230).

23. A method according to any one of claims 19-22, in which said sealings (12, 112, 212; 30, 130, 230) are being used for support during aligning of said panels.

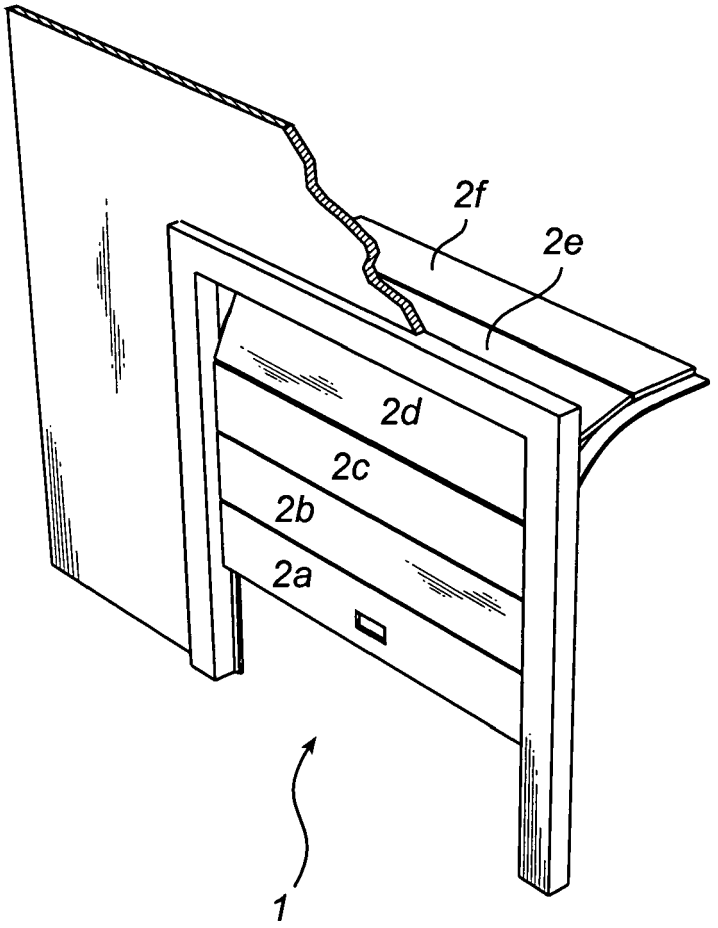

Fig. 1

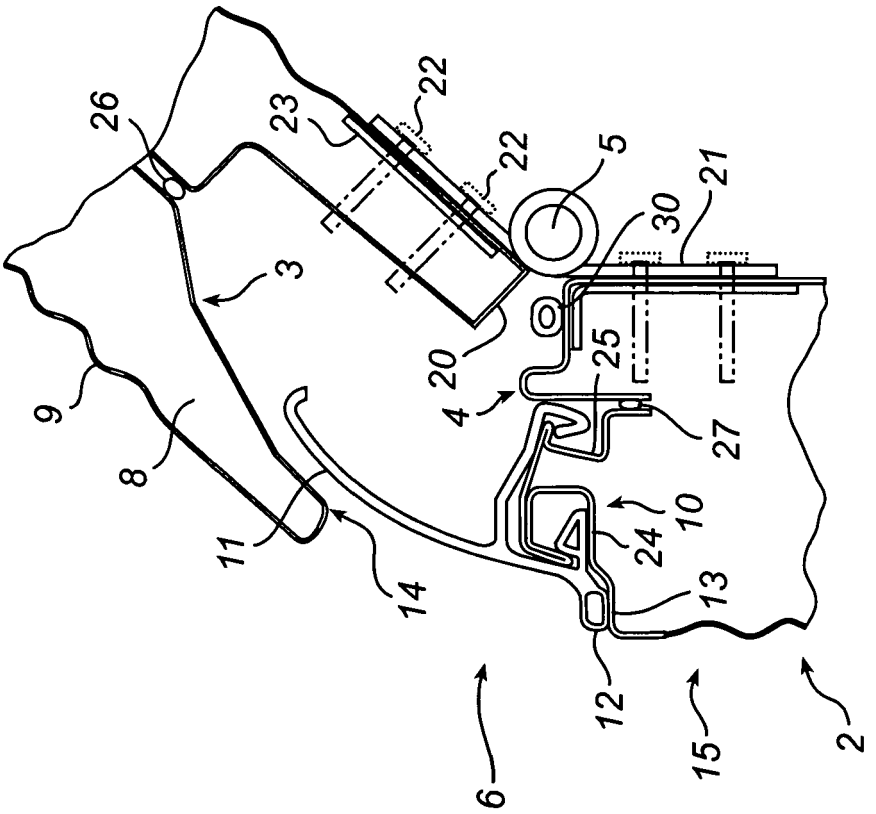
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Fig. 2b

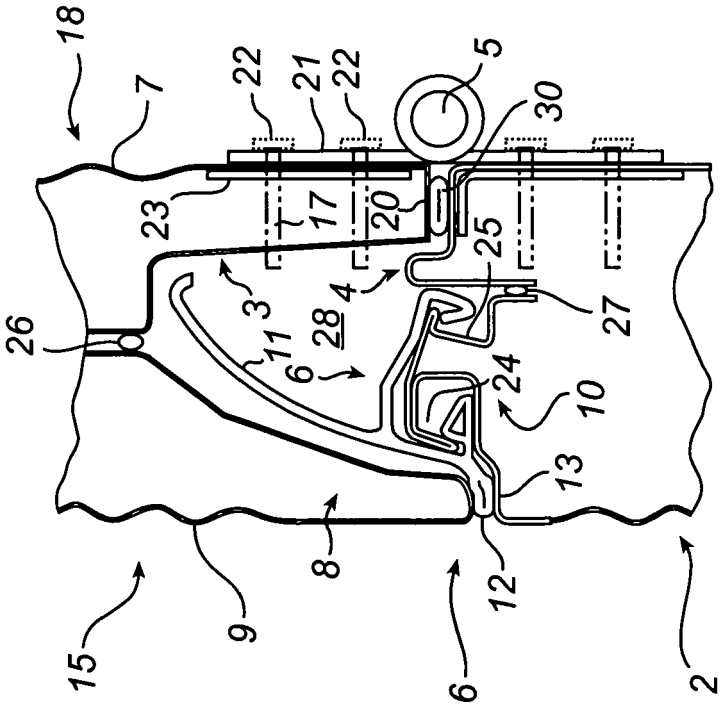
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Fig. 2a

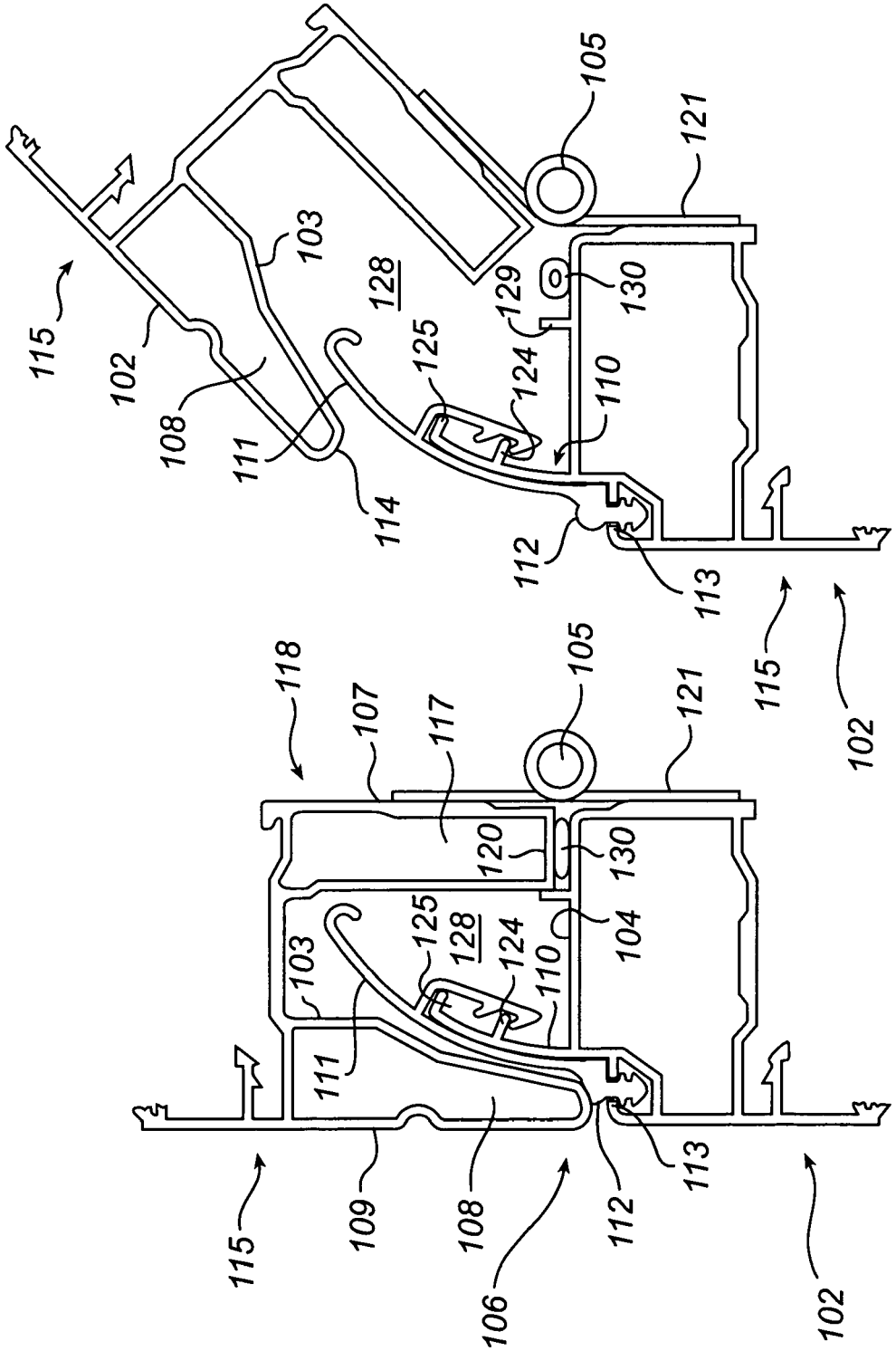
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Fig. 3b

Fig. 3a

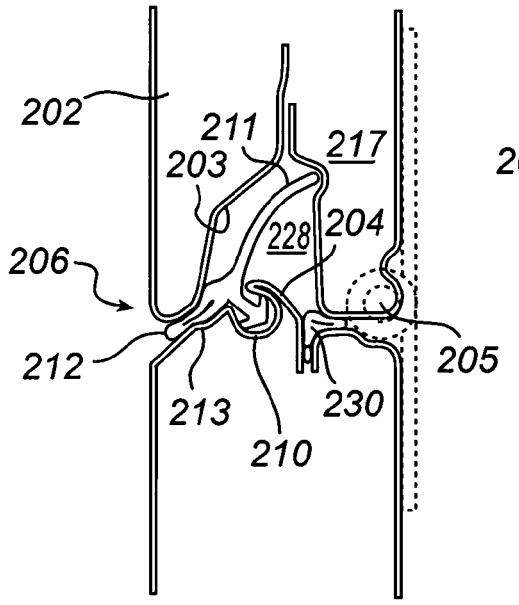
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Fig. 4a

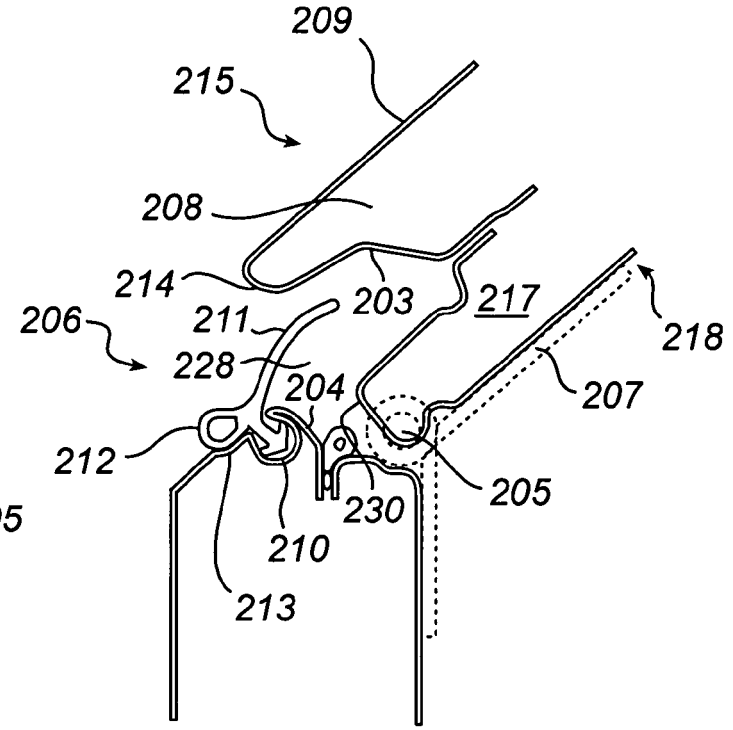
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Fig. 4b

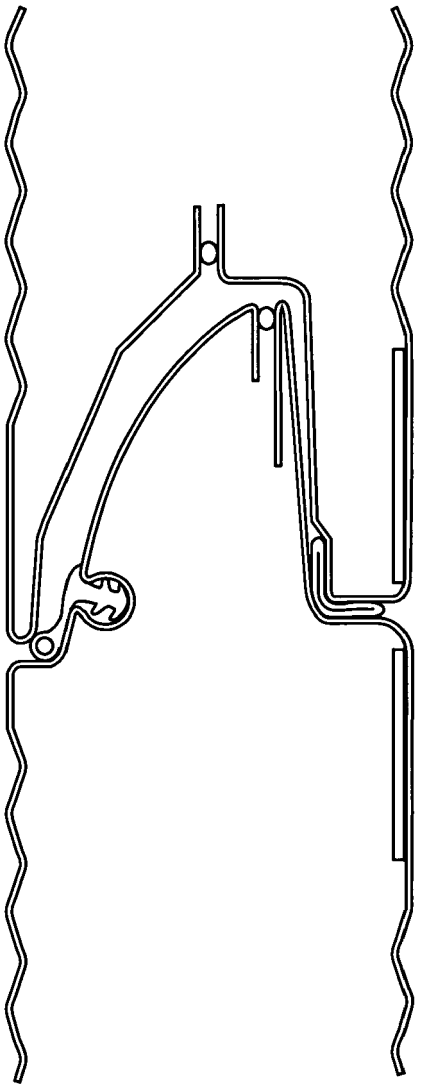

Fig. 5

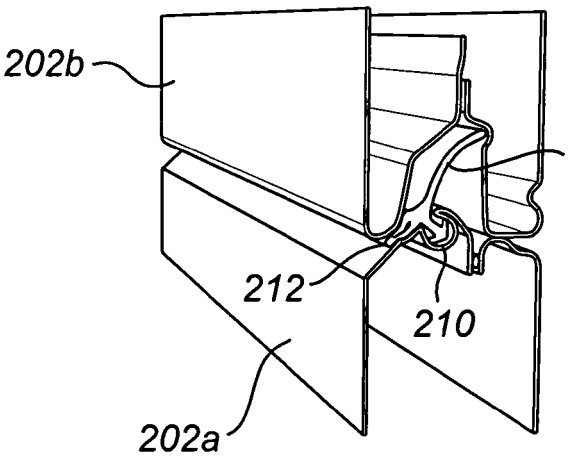

Fig. 6a

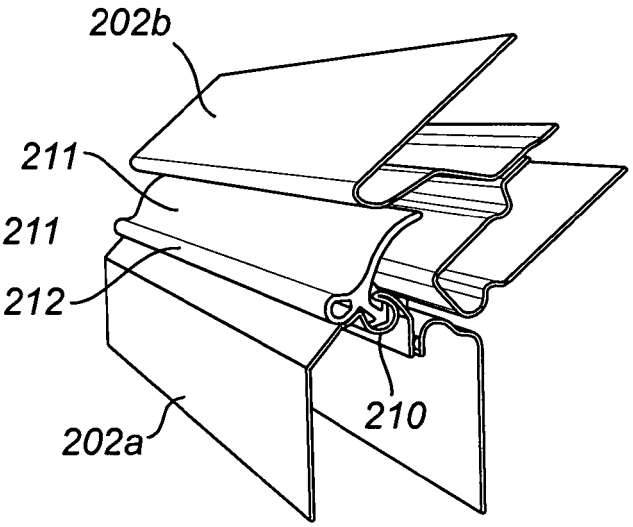

Fig. 6b

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 02 3176

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 February 2005	Verdonck, B

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 02 3176

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82