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- **Smajser, Petr**
742 66 tramberk (CZ)
- **Rafaj, Martin**
75501 Vsetín (CZ)
- **Lammel, Michael**
52076 Aachen (DE)
- **Lederhofer, Benjamin**
40764 Langenfeld (DE)
- **Heller, Markus**
52134 Herzogenrath (DE)

(71) Applicants:
• **Schott AG**
55122 Mainz (DE)
• **SCHOTT Flat Glass CR, s.r.o.**
757 01 Valasské Mezirici (CZ)

(74) Representative: **Patent- und Rechtsanwälte Ullrich & Naumann**
PartG mbB
Schneidmühlstrasse 21
69115 Heidelberg (DE)

(72) Inventors:
• **Diederichs, Jochen**
55128 Mainz (DE)

(54) **SWING DOOR SYSTEM AND FREEZER DEVICE WITH A SWING DOOR SYSTEM**

(57) The present invention relates to a swing door system (1) for a freezer device, comprising at least two adjacent swing doors (2, 3), each swing door having a transparent region (2a, 3a), wherein at least one of said two adjacent swing doors comprise a sealing (20, 30)

and wherein said at least two adjacent swing doors are arranged such that in a closed position said at least one sealing provides an essentially hermetic sealing function between said two adjacent swing doors.

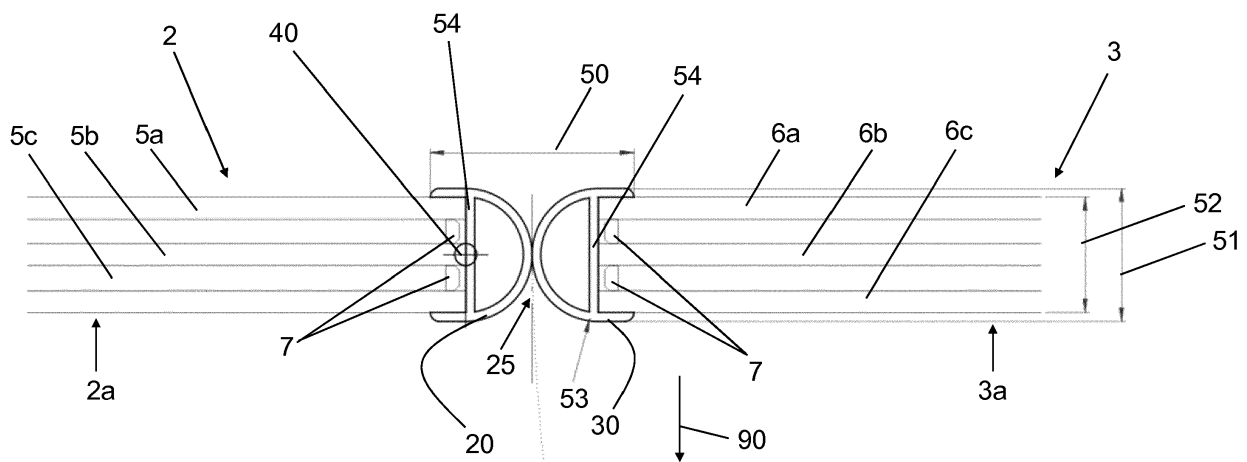


Fig. 2

Description

[0001] The present invention relates to a swing door system, preferably for use with a freezer device, comprising at least two adjacent swing doors, each door having a transparent region.

[0002] The present invention further relates to a freezer device, comprising a swing door system.

[0003] The present invention further relates to a swing door arrangement comprising a swing door system.

[0004] Although applicable to any kind of swing door system, the present invention will be described with regard to a swing door system of a freezer device.

[0005] Conventional freezer devices can be found in super markets, convenience stores or the like to provide frozen products for customers, usually being presented on shelves inside the freezer device. Such freezer devices usually comprise a cabinet and a plurality of swing doors, which can be opened in horizontal direction by a customer, i.e. rotating the swing doors around a vertical axis. The swing doors further have circumferential sealings providing a sealing function between the inner of the freezer device and its outside. The sealings attached to the swing doors can comprise magnets to provide a magnetic force-locking connection with mullions and horizontal profiles of the freezer device. This avoids leakage of ambient warm air from the outside of the freezer device into the inside and therefore avoids unnecessary energy consumption for cooling as well as icing and condensation inside the freezer device. Further, the swing doors usually comprise large glass panes so that a customer can view the products from outside without having to open the swing doors.

[0006] However, most of the freezer devices are arranged with their shelves parallel to the aisles of the supermarket. Due to the vertical mullions of the freezer device, a person, when walking down the aisle, has an angled and very limited view on the products within the freezer device, since the mullions block a non-neglectable part of the total view of a customer on these products.

[0007] Embodiments of the invention therefore address the problems of providing an enhanced comfort for customers when accessing a freezer device while providing a sufficient sealing function between the inside and outside of a freezer device together with a sufficient mechanical robustness, flexibility in terms of applicability and implementation and a high visibility of goods from outside the freezer device.

[0008] In an embodiment the present invention provides a swing door system, preferably for use with a freezer device, comprising at least two adjacent swing doors, each swing door having a transparent region, wherein at least one of said two adjacent swing doors comprises a sealing and wherein said at least two adjacent swing doors are arranged such that in a closed position said at least one sealing provides an essentially hermetic sealing function between said two adjacent swing doors.

[0009] In a further embodiment the present invention

provides a freezer device comprising a swing door system according to one of the claims 1-21 being arranged in a cabinet, such that the opening direction of the swing door system is horizontal and wherein said cabinet is mullion-free.

[0010] In a further embodiment the present invention provides a swing door arrangement comprising a swing door system of the claims 1-21 and an at least partially circumferential outer frame for said swing door system wherein said outer frame has horizontal frame elements providing support for the rotating axis of said swing door system.

[0011] In other words, no frame structure or mullion structure is needed to provide a sealing function.

[0012] The term "freezer device" refers in particular in the claims, preferably in the description to a device in which the temperature of the foodstuffs is typically kept between -12°C and -30 °C on normal conditions of use. Normal conditions are defined as operating conditions which exist when the cabinet, including all permanently located accessories, has been set up and situated in accordance with the recommendations of the manufacturer and is in service. Typical examples for such foodstuffs are the products which are stored according to EN23953, part 2 (September 2012) in the temperature classes L1, L2 and L3.

[0013] The term "mullion" refers in particular in the claims, preferably in the description to a vertical profile of the outer frame of a freezer device where two doors are arranged adjacent to each other in a cabinet and wherein the mullion is not a vertical side profile of the outer frame, but an "inner" vertical profile in particular arranged in the area of both adjacent doors.

[0014] The term "transparent" refers in particular in the claims, preferably in the description to a region, area or the like with which the view on the goods, products or the like inside the freezer device is not obstructed or blocked by one or more opaque elements of the freezer device, for example by spacers, profiles, gaskets, a mullion or by the swing doors.

[0015] The term "non-transparent" refers in particular in the claims, preferably in the description to a region, area or the like with which the view on the goods, products or the like inside the freezer device is obstructed or blocked by one or more opaque elements of the freezer device, for example by spacers, profiles, gaskets, a mullion or by the swing doors.

[0016] The term "translucent" refers in particular in the claims, preferably in the description to a region, area or the like with which the view on goods, products or the like inside the freezer device is not obstructed or blocked but being diffuse, for instance the dimensions of a product can be seen, but not any labeling of the product, at least not clearly.

[0017] The term "width" refers in particular in the claims, preferably in the description, to a length measured in the plane in which the swing doors are arranged when the swing doors are in a closed position.

[0018] The term "depth" refers in particular in the claims, preferably in the description, to a length measured in the plane being perpendicular to the plane in which the swing doors are arranged when the swing doors are in the closed position.

[0019] The term "vertical" refers in particular in the claims, preferably in the description, to the direction aligned with the direction of the force of gravity, up or down, as materialized with a plumb line.

[0020] The term "horizontal" refers in particular in the claims, preferably in the description, to the direction perpendicular to the vertical direction. For instance, a horizontal profile is a profile of the device extending in the horizontal direction, in other words parallel to the surface of the earth.

[0021] The term "essentially hermetic" with regard to the term "sealing function" refers in particular in the claims, preferably in the description, to at least one of humidity tightness, moisture vapor tightness and/or fluid tightness, in particular excluding the passage of air and/or of splash-water or the like for common situations in supermarkets or the like. In other words, the term "essentially hermetic" refers here to a lower level of tightness than the physical definition of "hermetic". Conventional cooler systems are typically not essentially hermetic between adjacent swing doors without mullion. In other words, conventional cooler systems do not provide a sealing function between adjacent swing doors directly. They may have sealings, but in many cases no circumferential sealings, or no continuous, uninterrupted, circumferential contact between the sealings and/or the sealing surface. Since the working temperature of cooler systems is much higher than the working temperature of freezer systems, no icing problems occur due to humidity of the incoming air.

[0022] One of the advantages is, that the swing doors seal against each other and therefore the mullions can be omitted. A further advantage is, that - since a mullion is not necessary - the angled view or the view directly in front of the freezer device on the products is not blocked and therefore the comfort for customers is increased. An even further advantage is, that a cost-effective implementation can be provided.

[0023] Further features, advantages and preferred embodiments are disclosed or may become apparent in the following.

[0024] According to an embodiment said at least one sealing is at least translucent, preferably at least partially transparent. This further enhances the view for customers on the products, since the customer's view is not blocked by a non-transparent sealing. A further advantage is that an overall appealing impression for customers is provided.

[0025] According to a further embodiment each of said at least two adjacent swing doors comprises a sealing for providing said sealing function. This enhances the sealing function and thus energy is saved when using the swing doors in a cooler or freezer device.

[0026] According to a further embodiment said two adjacent sealings have the same shape. The term "same shape" is to be understood in the most general sense or meaning and shall in particular include all shapes which can be transferred into one another, e.g. by rotation or mirroring. This enables manufacturing of the swing door system in a cost-effective way.

[0027] According to a further embodiment one of said two adjacent sealings is adapted to provide at least partially a form-locking connection. This enables providing for instance a stop by one of the swing doors for the adjacent swing door. Thus, mechanical stability in a closed position as well as an enhanced sealing in a closed position of the swing doors is provided.

[0028] According to a further embodiment said at least one sealing has at least partially circular shape. This enhances the flexibility in terms of arranging adjacent doors respectively their opening direction: due to the circular shape of the sealing a swing door can either open in the same or in an opposite opening angle with regard to the adjacent swing door.

[0029] According to a further embodiment said form-locking connection is provided by a partial convex form of one of said sealings and a corresponding concave form of said other one of said sealings. This enables in a simple way to provide a partial form-locking connection.

[0030] According to a further embodiment the sealing surface provided by said at least one sealing is inclined with an angle to the opening direction of the swing doors from said closed position said angle being smaller than 90°, preferably smaller than 60°, in particular smaller than 30°, preferably 0°. This enables to provide a larger sealing surface thus enhancing the sealing function. Further advantages are that a sufficient sealing function and an easy opening of the swing doors and a larger transparent product display area is provided.

[0031] According to a further embodiment said at least one sealing has an essentially triangular shape. This enables a reliable attachment to the swing door with two surfaces of the triangular shape wherein the non-attached third surface provides the sealing surface. The term "essentially triangular" shall include in particular triangular, triangular with rounded corners, multiple edge corners or the like.

[0032] According to a further embodiment said two adjacent swing doors are arranged such that a partial overlap, preferably in a formed common plane, in said closed position of said two adjacent swing doors is provided based on the view parallel to the opening direction. A partial overlap enables a further enhancement of the sealing function between the two adjacent swing doors.

[0033] According to a further embodiment at least one of said two adjacent swing doors comprise an angled S-shaped profile at least on a surface of said swing door directed to the other adjacent swing door. This enables in a simple way a partial overlap of two adjacent swing doors while providing enhanced protection of the corresponding surfaces by the profile. Alternatively, also a

smooth S-shaped profile, a quarter circular profile, or the like can be used.

[0034] According to a further embodiment said angle S-shaped profile is at least translucent, preferably at least partially transparent. This further enhances the angled view of customers on products behind the swing doors since there is no blocking of the view by non-transparent profiles.

[0035] According to a further embodiment said partial overlap is provided by an extending pane of one swing door in the direction to the other adjacent swing door and vice versa. This provides in a simple way a partial overlap and enables an enhanced sealing function.

[0036] According to a further embodiment for providing said closed position between two adjacent swing doors one of said two adjacent swing doors is formed such to provide a stop for the other adjacent swing door. This enhances the handling of the swing doors for customers on the one hand and on the other hand a reliable closure as well as an enhanced sealing function is enabled.

[0037] According to a further embodiment at least one of said two swing doors comprises a gas-filled insulating glass unit or a vacuum glass unit, said gas-filled insulating glass unit or said vacuum glass unit comprises at least two glass panes being spaced apart from each other by one or more spacer elements. This provides a high appealing design of the swing door while providing a high thermal insulation. Said gas-filled insulating unit may comprise air and/or a one or more noble gases.

[0038] According to a further preferred embodiment said spacer elements are at least translucent, preferably at partially transparent. This further enhances the angled view of customers on products behind the swing doors since there is no blocking of the view by non-transparent spacers.

[0039] According to a further embodiment said two sealings are provided with magnetic means, preferably permanent magnets, to provide a magnetic force between said two sealings. This enables a very reliable sealing function between said two adjacent swing doors. The sealing function may be further enhanced by arranging in a step-by-step manner permanent magnets. Alternatively, or additionally at least one of said sealings comprises a horizontal section and/or an additional sealing arranged preferably along the horizontal interface between a swing door element or an area and an outer horizontal frame profile or a cabinet structure providing a sealing of the corresponding door with the frame profile or the cabinet structure.

[0040] According to a further embodiment the rotating axis of at least one of the swing doors is in the center of said swing door, said center being defined with respect to the thickness of the swing door perpendicular to the opening direction in a closed position of said swing door. This enables a reliable opening and closing respectively rotation of the swing door.

[0041] According to a further embodiment the rotating axis of at least one of the swing doors is off the center of

the swing door, said center being defined with respect to the thickness of the swing door perpendicular to the opening direction in a closed position of said swing door. This enhances the flexibility in terms of the adjacent swing door, since only a neglectable part of the swing door moves to the inside, that means opposite to the opening direction when being opened. Such a part may block the adjacent swing door or requires a larger distance to the adjacent swing door so that it can be opened.

[0042] According to a further embodiment said swing doors with the rotating axis in the center of said swing door have a sealing, said sealing having essentially semicircular shape. This provides an easy opening of said swing door without interfering with the adjacent swing door.

[0043] According to a further embodiment at least one of the swing doors comprises hinges at opposite ends of said at least one swing door for providing opening and closing by rotation about a rotating axis. This enhances the flexibility when attaching the swing doors for instance into a cabinet or the like.

[0044] According to a further embodiment preferably when a swing door comprises a gas filled insulation glass unit a thickness of a swing door with at least one sealing is equal to or smaller than 40 mm, preferably equal to or smaller than 30 mm, in particular equal to or smaller than 26 mm, wherein said thickness being measured in a handle-free region parallel to the opening direction in a closed position of said swing door and/or wherein a width of a region in a closed position of said swing door comprising at least one sealing, a center of said rotating axis of at least one of said swing doors, preferably further comprising at least one profile and spacer elements for spacing apart panes of a swing door, wherein said width being measured perpendicular to the opening direction in a closed position of said swing door and parallel to the plane of said panes of said swing door, is equal to or smaller than 50 mm, preferably equal to or smaller than 41 mm, in particular equal to or smaller than 34 mm. This reduces the blocking of an angled view for customers, i.e. the angled view for customers is enhanced on the products when looking through the swing doors. The dimensions of a handle for opening of the swing door are not included when measuring the thickness or width of a swing door. In other words, the minimal distance between the transparent regions of the different adjacent swing doors may be defined as width. Thickness and width are measured in any given height of the transparent panes.

[0045] According to a further embodiment preferably when a swing door comprises a vacuum insulation glass unit the thickness of a swing door with at least one sealing is equal to or smaller than 35 mm, preferably equal to or smaller than 25 mm, in particular equal to or smaller than 20 mm, preferably equal to or smaller than 16 mm, wherein said thickness being measured in a handle-free region parallel to the opening direction in a closed position of said swing door and/or wherein a width of a region in a closed position of said swing door comprising at least

one sealing, a center of said rotating axis of at least one of said swing doors, preferably further comprising at least one profile and spacer elements for spacing apart panes of a swing door, wherein said width being measured perpendicular to the opening direction in a closed position of said swing door and parallel to the plane of said panes of said swing door, is equal to or smaller than 50 mm, preferably equal to or smaller than 41 mm, in particular equal to or smaller than 34 mm, preferably equal to 28mm, This reduces the blocking of an angled view for customers, i.e. the angled view for customers is enhanced on the products when looking through the swing doors.

[0046] According to a further embodiment, a transparent pane of at least one of said adjacent swing doors comprises a gasfilled insulating glass unit (IG) or a vacuum insulated glass unit (VIG). This provides the advantage that the inside of the freezer device being insulated against the warm ambient air. Typically, the gasfilled insulating glass unit and/or the vacuum insulated glass unit comprise at least two glass panes, often three glass panes, being spaced apart from each other by one or more spacers or spacer elements. The glass panes may comprise a thickness of 3 mm to 5 mm, often 4 mm and/or may comprise an antifog-coating or an antifog foil and/or a heatable coating and/or a low-emissivity coating and/or an anti-reflective coating. In vacuum insulation glass units (VIG) the spacer elements may have a depth of 0.5 mm to 1.5 mm, preferably of below 1 mm. These spacer elements of the VIG are used in combination with a circumferential edge sealing. In gas filled insulation glass units (IG) the circumferential spacer elements may have a depth of 4 to 20 mm. The space between the glass panes can be filled with a gas in case of an insulating glass unit (IG) or may be evacuated in case of a vacuum insulated glass unit (VIG). For not obstructing the view through the glass units the spacers can be made of a transparent material. Generally, the transparent pane of said swing doors can comprise several glass panes one above the other.

[0047] According to a further embodiment said swing door system comprising a passive and/or active heating element and/or one or more light elements and/or one or more sensors. This enhances the flexibility of the swing door system. For example, a heating element can prevent condensation of the transparent regions of a swing door or light elements can illuminate products.

[0048] According to a further embodiment of the freezer device the swing doors of the swing door system are arranged such to open in the same direction of the aperture angle i.e. all doors are left-side hinged or all doors are right-side hinged. This provides a very simple handling in particular opening and closing of the swing doors since the customer is only confronted with swing doors opening in the same way.

[0049] According to a further embodiment of the freezer device the swing doors of the swing door system are arranged such to open in the opposite aperture angle

directions, i.e. for two adjacent doors one is left-side hinged and one is right-side hinged. This provides a large entrance to the inside of a cabinet for a customer, when both swing doors open in opposite directions.

[0050] According to a further embodiment of the freezer device said freezer device comprises an upper and/or lower horizontal element to provide a stop for the swing doors of said swing door system and/or to provide a part for a force-locked swing door at the freezer device. This enables a very reliable opening and closing together with an enhanced handling of the swing doors for a customer. The horizontal element may be provided as a horizontal frame element.

[0051] According to a further embodiment of the freezer device said freezer device comprises an energy source for providing heat and/or electric energy and an interface for connecting a heating element, a light element and/or a sensor of the swing door system to said corresponding energy source. This enables an easy implementation of the single system in a freezer device.

[0052] According to an embodiment of the swing door arrangement the area between two adjacent swing doors, the area being defined as at least the distance between two adjacent swing doors and a distance perpendicular to swing doors in their closed position, is free of a mullion. This avoids any view blocking for customers when walking alongside the swing door arrangement. For stability vertical frame elements or frame profiles or vertical side profiles may be arranged here at opposite ends of the swing door arrangement.

[0053] According to an embodiment of the swing door arrangement, said swing door arrangement comprises only horizontal frame elements. This further enhances the transparency for customers avoiding any view blocking due to vertical frame elements or profiles.

[0054] There are several ways how to design and further develop the teaching of the present invention in an advantageous way. To this end, it is to be referred to the patent claims subordinate to the independent claims on the one hand and to the following explanation of further examples of embodiments of the invention, illustrated by the drawing on the other hand. In connection with the explanation of the further embodiments of the invention by the aid of the drawing, generally further embodiments and developments of the teaching will be explained.

[0055] In the drawing

Fig. 1 shows a perspective view of part of a swing door system according to an embodiment of the present invention;

Fig. 2 shows a cross-sectional view parallel to the opening direction of the swing door system according to figure 1;

Fig. 3 shows a perspective view of a freezer device according to an embodiment of the present invention;

Fig. 4 shows a perspective view of a part of a swing door system according to an embodiment of the present invention;

Fig. 5 shows a cross-sectional view parallel to the opening direction of the swing door system according to figure 4;

Fig. 6 shows a cross-sectional view parallel to the opening direction of the swing door system according to an embodiment of the present invention;

Fig. 7 shows a perspective view of a part of a swing door system according to an embodiment of the present invention; and

Fig. 8 shows a cross-sectional view parallel to the opening direction of the swing door system according to figure 7.

[0056] Figure 1 shows a perspective view of part of a swing door system according to an embodiment of the present invention.

[0057] In figure 1 a swing door system 1 is shown comprising two adjacent swing doors 2, 3. The swing doors comprising a transparent region 2a, 3a, formed by a plurality of glass panes 5a, 5b, 5c, 6a, 6b, 6c which are spaced apart from each other by spacers 7. The glass panes 5a, 5b, 5c, 6a, 6b, 6c provide insulation between opposite sides of the swing doors 2, 3. The glass panes 5a, 5b, 5c, 6a, 6b, 6c are arranged perpendicular to the opening direction 90 of the swing doors 2, 3. On the surface perpendicular to the opening direction and perpendicular to the glass panes 5a, 5b, 5c, 6a, 6b, 6c of each swing door 2, 3 that means the surfaces of one swing door 3, 2 which surface vector is directed to the adjacent swing door 2, 3 comprises a sealing 20, 30 which has a semicircular shape such that the sealings 20, 30 are convex. The sealings overlap the outer glass panes 5a, 5c and 6a, 6c parallel to the glass panes 5a, 5c, 6a, 6c of the respective swing doors 2, 3 in a form-locking manner to provide a reliable attachment of the respective sealing 20, 30 to the respective swing door 2, 3. Due to the semi-circle shape of the sealings 20, 30 they therefore may touch each other only in a single point when viewed in the cross-sectional view. The sealing surface 25 is therefore a line.

[0058] Figure 2 shows a cross-sectional view parallel to the opening direction of the swing door system according to figure 1.

[0059] In detail figure 2 shows a swing door system 1 in a cross sectional view perpendicular to the transparent regions 2a, 3a and perpendicular to the opening direction 90. The rotating axis 40 of the left swing door 2 is in the center of the swing door 2 that means in the plane of the middle glass pane 5b near the surface of the swing door 2, which is next to the adjacent swing door 3. The distance

50 between the opposite ends of the overlapping regions of the sealings 20, 30 parallel to the surfaces of the transparent regions 2a, 3b of the two sealings 20, 30 of the adjacent swing doors 2, 3 is here 46 mm. The thickness 52 of the transparent regions 2a, 3b formed in each swing door 2, 3 by the three corresponding glass panes 5a, 5b, 5c, 6a, 6b, 6c is 26 mm and the thickness 51 of the aforementioned transparent regions 2a, 3b and the thickness of the sealing 20, 30 overlapping in part the corresponding outer glass panes 5a, 5c, 6a, 6c is 30 mm. The radius 53 of the circular shape of the sealing 20, 30 is here 15 mm. The sealings 20, 30 further each have perpendicular to the transparent regions 2a, 3b formed by the glass panes 5a, 5b, 5c, 6a, 6b, 6c a stabilizing and protective bar 54. In other words, the sealings 20, 30 are provided in form of a closed semi-circle together with U- form and the open part of the "U" is placed over common edge formed by the glass panes 5a, 5b, 5c, 6a, 6b, 6c of the swing doors 2, 3.

20 **[0060]** Figure 3 shows a perspective view of a freezer device according to an embodiment of the present invention.

[0061] In detail figure 3 shows a freezer device 100 with a swing door system 1. The freezer device 100 comprises a cabinet 101 and further a top horizontal element 105a and a bottom horizontal element 105b. The freezer device 100 comprises six swing doors 2, 3, two of them each forming a swing door system providing a sealing function between them. The swing doors 2, 3 each have a transparent region 2a, 3a so that a customer in front of the freezer device 100 can see the products 109 placed on shelves 108 inside the freezer device 100 through the swing doors 2, 3 without having to open the swing doors 2, 3. The sealings 20, 30 between each of the two swing doors 2, 3 are transparent.

[0062] Further, the horizontal elements 105a, 105b provide a stop for each of the swing doors 2, 3. The opening direction 90 when the swing doors 2, 3 are closed is perpendicular to the swing doors 2, 3. The angled direction 91 of the swing doors 2, 3 is the same for all swing doors 2, 3 of the freezer device 100. All swing doors open to the right, therefore all doors are hinged at their right side when looking perpendicular to the transparent panes of the freezer device 100. Further, the freezer device 100 comprises an energy source 106, which is connected with an interface 107 which enables to provide energy to a heating element or light elements inside the swing doors 2, 3.

[0063] Figure 4 shows a perspective view of a part of a swing door system according to an embodiment of the present invention.

[0064] In general, figure 4 shows a swing door system 1 according to Figure 1. In contrast to the swing door system 1 of Figure 1 the swing door system 1 of Figure 4 comprises swing doors 2, 3 with a partial overlap 75. This overlap 75 is provided by the swing door 2 by the backside glass pane 5a extending further as the other glass panes 5b, 5c in the direction to the adjacent swing

door 3. Vice versa the other swing door 3 having the frontside glass pane 6c extending further as the other glass panes 6a, 6b in the direction to the adjacent swing door 3, thus providing a partial overlap 75 without touching of the extending glass panes 5a, 6c. Both swing doors 2, 3 further comprise a protective profile 8, 9 on the surfaces of the swing door 2, 3 in the direction to the other adjacent swing door 2, 3. Therefore, due to the extending glass pane the profiles 8, 9 have a double L-shaped form. Between these profile 8, 9 rectangular space is provided in which two sealings 20, 30 are each being attached to one of the swing doors 2, 3, in detail to the corresponding profiles 8,9. These sealings 20, 30 have triangular form therefore providing an angled sealing surface 25. Each of the profiles 8, 9 and each of the sealings 20, 30 can be transparent. However, a part 77 of the surface covering the profile 8, 9 of the swing door 3 and the spacers 7, when looking against the opening direction 90, can be made non-transparent to avoid a reduction of optical impression by a customer. For instance, a non-transparent layer can be printed on the glass pane 5c, 6c, e.g. by a non-transparent ink.

[0065] Figure 5 shows a cross-sectional view parallel to the opening direction of the swing door system according to figure 4.

[0066] In detail figure 5 shows a swing door system 1 in a cross sectional view perpendicular to the transparent regions 2a, 3a and perpendicular to the opening direction 90. The rotating axis 40 of the left swing door 2 is off the center of the swing door 2 that means the center is in the plane between the middle glass pane 5b and the outer glass pane 5c near the outer surface of the swing door 2 perpendicular to transparent region 2a and next to the adjacent swing door 3 or the profile 8 for the swing door 2. The distance 50 between the opposite ends of the regions next to the other swing door 2, 3 including spacers 7, the profiles 8, 9, the center of the rotating axis 40 and the sealings 20, 30 forming the overlapping region 75 is here 41 mm. The thickness 52 of the transparent regions 2a, 3b formed in each swing door 2, 3 comprising the three corresponding glass panes 5a, 5b, 5c, 6a, 6b, 6c is 26 mm. The sealings 20, 30 being triangular in shape may comprise in the inside of each of the triangles a heating element 44, 45, so that the sealing 20, 30 and at least part of the glass panes 5a, 5b, 5c, 6a, 6b, 6c can be heated.

[0067] Figure 6 shows a cross-sectional view parallel to the opening direction of the swing door system according to an embodiment of the present invention.

[0068] In detail, Figure 6 shows in general a swing door system 1 according to Figure 2. In contrast to the swing door system 1 of Figure 2 the swing door system 1 according to Figure 6 comprises two swing doors 2, 3 each of them having two glass panes 5a, 5b, 6a, 6b instead of three glass panes. Further in contrast to the swing door system 1 of Figure 2 the swing door system 1 of Figure 6 comprises a concave shaped form 21 of the left sealing 20. This sealing 20 of swing door 2 has an S-shaped

surface towards the adjacent sealing 30 of swing door 3, the sealing 30 comprising a convex shape 22, here a kind of semi-elliptical shape as shown in Figure 2. Therefore, when closing the right swing door 3 by moving it against the opening direction 90, the sealing 20 of the left swing door 2 provides a stop for the closing swing door 3 when the glass panes 5a, 5b, 6a, 6b of both swing doors 2, 3 form a common plane. Thus a partial form-locking connection 46 is provided. Since the S-shaped form of sealing 20 and the radius of the semi-elliptic form of the other sealing 30 are adapted to each other, the sealing surface 25 is larger compared to the sealing surface 25 of the swing door system shown in Figure 2. In the cross-sectional view of Figure 6 the sealing surface 25 is here a kind of a quarter circle.

[0069] Figure 7 shows a perspective view of a part of a swing door system according to an embodiment of the present invention and Figure 8 shows a cross-sectional view parallel to the opening direction of the swing door system according to figure 7.

[0070] In general, figure 7 shows in general a swing door system 1 according to Figure 4. In contrast to the swing door system 1 of Figure 4 the swing door system 1 of Figure 7 comprises sealings 20, 30 being of semi-circular shape. The sealings 20, 30 are arranged such that the sealings 20, 30 extent with their semicircular shape perpendicular to the opening direction 90 such that they are touching each other forming a sealing surface 25 in form of a single point when viewed in the cross-sectional view. In other words, the embodiment of Figure 7 combines in general the sealing principle of the two sealings 20, 30 of Figure 1 respectively Figure 2 with the overlapping principle of the two swing doors 2, 3 of the Figures 4 and 5. In further other words the triangular shaped sealings 20, 30 of Figures 4 and 5 have been replaced by semicircular shapes. Further in contrast to the embodiment of the Figures 4 and 5 the profiles 8 and 9 have a swelling to provide a fit for the corresponding sealing 20, 30.

[0071] The rotating axis 40 of the left swing door 2 is off the center of the swing door 2 that means the center is in the plane between the middle glass pane 5b and the outer glass pane 5c near the outer surface of the swing door 2 perpendicular to transparent region 2a and next to the adjacent swing door 3 or the profile 8 for the swing door 2. The distance 50 between the prominent glass pane 6c resp. 5a and the corresponding non-prominent glass panes 6a, 6b resp. 5b, 5c is here 18 mm. The thickness 52 of the transparent regions 2a, 3b formed in each swing door 2, 3 comprising the three corresponding glass panes 5a, 5b, 5c, 6a, 6b, 6c is 28 mm, the spacers 7 having a thickness of 8 mm and a width of 10 mm. The sealings 20, 30 being may comprise in the inside of each of the triangles a heating element so that the sealing 20, 30 and at least part of the glass panes 5a, 5b, 5c, 6a, 6b, 6c can be heated.

[0072] To summarize at least one of the embodiments of the present invention provides or enables

- high customer comfort
- high customer perceived value
- simple and cost-effective implementation
- large field of view compared with conventional swing door systems
- reliable sealing function, thus low energy consumption is enabled
- mechanical robustness

[0073] Many modifications and other embodiments of the invention set forth herein will come to mind to the one skilled in the art to which the invention pertains having the benefit of the teachings presented in the foregoing description and the associated drawings. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

List of reference signs

[0074]

- | | |
|----|--------------------------|
| 1 | Swing door system |
| 2 | Left swing door |
| 2a | Transparent region |
| 3 | Right swing door |
| 3a | Transparent region |
| 5a | Glass pane |
| 5b | Glass pane |
| 5c | Glass pane |
| 6a | Glass pane |
| 6b | Glass pane |
| 6c | Glass pane |
| 7 | Spacer |
| 8 | Profile left swing door |
| 9 | Profile right swing door |
| 20 | Sealing |
| 21 | Concave form sealing |
| 22 | Convex form sealing |
| 25 | Sealing surface |
| 30 | Sealing |
| 40 | Rotating axis |
| 44 | Heating element |
| 45 | Heating element |
| 46 | Form-locking connection |
| 50 | Distance |
| 51 | Thickness |
| 52 | Thickness |
| 53 | Radius |
| 54 | Protective bar |
| 70 | Angle |
| 75 | Overlap |
| 77 | Non-transparent printing |
| 90 | Opening direction |

- | | |
|--------|---------------------------|
| 91 | Angled direction |
| 100 | Freezer device |
| 101 | Cabinet |
| 105a | Top horizontal element |
| 5 105b | Bottom horizontal element |
| 106 | Energy source |
| 107 | Interface |
| 108 | Shelf |
| 109 | Product |

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Claims

- | | |
|----|--|
| 1. | Swing door system (1), preferably for use with a freezer device, comprising at least two adjacent swing doors (2,3), each swing door (2,3) having a transparent region (2a, 3a), wherein at least one of said two adjacent swing doors (2,3) comprises a sealing (20, 30) and wherein said at least two adjacent swing doors (2, 3) are arranged such that in a closed position said at least one sealing (20, 30) provides an essentially hermetic sealing function between said two adjacent swing doors (2, 3), preferably wherein said at least one sealing (20, 30) is at least translucent, preferably at least partially transparent. |
| 2. | Swing door system according to claim 1, wherein each of said at least two adjacent swing doors (2, 3) comprises a sealing (20, 30) for providing said sealing function, preferably wherein said two adjacent sealings (20, 30) have the same shape and/or wherein one of said two adjacent sealings (20, 30) is adapted to provide at least partially a form-locking connection (46). |
| 3. | Swing door system according to one of the claims 1-2, wherein said at least one sealing (20, 30) has at least partially a circular shape (53) and/or essentially triangular shape. |
| 4. | Swing door system according to claim 2, wherein said form-locking connection (46) is provided by a partial convex form (22) of one of said sealings (30) and a corresponding concave form (21) of said other one of said sealings. |
| 5. | Swing door system according to one of the claims 1-4, wherein the sealing surface (25) provided by said at least one sealing (20, 30) is inclined with an angle (70) to the opening direction (90) of the swing doors (2, 3) from said closed position, said angle (70) being smaller than 90°, preferably smaller than 60°, in particular smaller than 30°, preferably 0°. |
| 6. | Swing door system according to one of the claims 1-5, wherein said two adjacent swing doors (2, 3) are arranged such that a partial overlap (75), pref- |

- erably in a formed common plane, in said closed position of said two adjacent swing doors (2, 3) is provided based on the view parallel to the opening direction (90), preferably wherein said partial overlap (75) is provided by an extending pane (5a, 6c) of one swing door (3) in the direction to the other adjacent swing door (2) and vice versa.
7. Swing door system according to one of the claims 1-6, wherein at least one of said two adjacent swing doors (2, 3) comprises an angled S-shaped profile (8, 9) at least on a surface of said swing door (2, 3) directed to the other adjacent swing door (2, 3), preferably wherein said angled S-shaped profile (8, 9) is at least translucent, preferably at least partially transparent.
 8. Swing door system according to one of the claims 1-7, wherein for providing said closed position between two adjacent swing doors (2, 3), one of said two adjacent swing door (2) is formed such to provide a stop for the other adjacent door (3) and/or wherein at least one of said two swing doors (2, 3) comprises a gas-filled insulating glass unit or a vacuum glass unit, said gas-filled insulating glass unit or said vacuum glass unit comprises at least two glass panes (5a, 5b, 5c, 6a, 6b, 6c) being spaced apart from each other by a spacer (7), preferably wherein said spacer (7) is at least translucent, preferably at least partially transparent.
 9. Swing door system according to claim 2, wherein said two sealings (20, 30) are provided with magnetic means (44, 45), preferably permanent magnets, to provide a magnetic force between said two sealings (20, 30).
 10. Swing door system according to one of the claims 1-9, wherein the rotating axis (40) of at least one of the swing doors (2, 3) is in the center of said swing door (2, 3), said center being defined with respect to the thickness of the swing door (2, 3) perpendicular to the opening direction (90) in a closed position of said swing door (2, 3) and/or wherein the rotating axis (40) of at least one of the swing doors (2, 3) is off the center of the swing door (2, 3), said center being defined with respect to the thickness of the swing doors (2, 3) perpendicular to the opening direction in a closed position of said swing door (2, 3), preferably wherein said swing door having the rotating axis (40) in the center of said swing door, has a sealing, said sealing (20, 30) having essentially semicircular shape (53).
 11. Swing door system according to one of the claims 1-10, wherein a thickness (51) of a swing door (2, 3) with at least one sealing (20, 30) is equal to or smaller than 40 mm, preferably equal to or smaller than 30 mm, in particular equal to or smaller than 26 mm, said thickness (51) being measured in a handle-free region parallel to the opening direction (90) in a closed position of said swing door (2, 3), and/or wherein a width (50) of a region in a closed position of said swing door system (1), said region comprising at least one sealing (20, 30), a center of said rotating axis (40) of at least one of said swing doors (2, 3), preferably further comprising at least one profile (8, 9), and spacers (7) for spacing apart panes (5a, 5b, 5c, 6a, 6b, 6c) of a swing door (2, 3), said width (50) being measured perpendicular to the opening direction (90) in a closed position of said swing door (2, 3) and parallel to the plane of said panes (5a, 5b, 5c, 6a, 6b, 6c) of said swing door (2, 3), is equal to or smaller than 50 mm, preferably equal to or smaller than 41 mm, in particular equal to or smaller than 34 mm.
 12. Freezer device (100), comprising a swing door system (1) according to one of the claims 1-11 being arranged in a cabinet (101), such that the opening direction (90) of the swing door system (1) is horizontal and wherein said cabinet (100) is mullion-free, preferably wherein the swing doors (2, 3) of the swing door system (1) are arranged such to open in the same direction of the aperture angle (91), preferably wherein the swing doors of the swing door system (1) are arranged such to open in opposite aperture angle directions.
 13. Freezer device according to claim 12, wherein said freezer device (100) comprises an upper and/or lower horizontal element (105a, 105b) to provide a stop for the swing doors (2, 3) of said swing door system (1) and/or to provide a part for a force-locked swing door (2, 3) at the freezer device and/or wherein said freezer device (100) comprises an energy source (106) for providing heat and/or electric energy and an interface (107) for connecting a heating element, a light element or a sensor of the swing door system (1) to said corresponding energy source (106).
 14. Swing door arrangement comprising a swing door system (1) according to one of the claims 1-11 and an at least partially circumferential outer frame for said swing door system wherein said outer frame has horizontal frame elements providing support for the rotating axis (40) of said swing door system (1), preferably wherein the area between two adjacent swing doors, the area being defined as at least the distance between two adjacent swing doors and a distance perpendicular to swing doors in their closed position, is free of a mullion, preferably wherein said swing door arrangement comprises only horizontal frame elements.

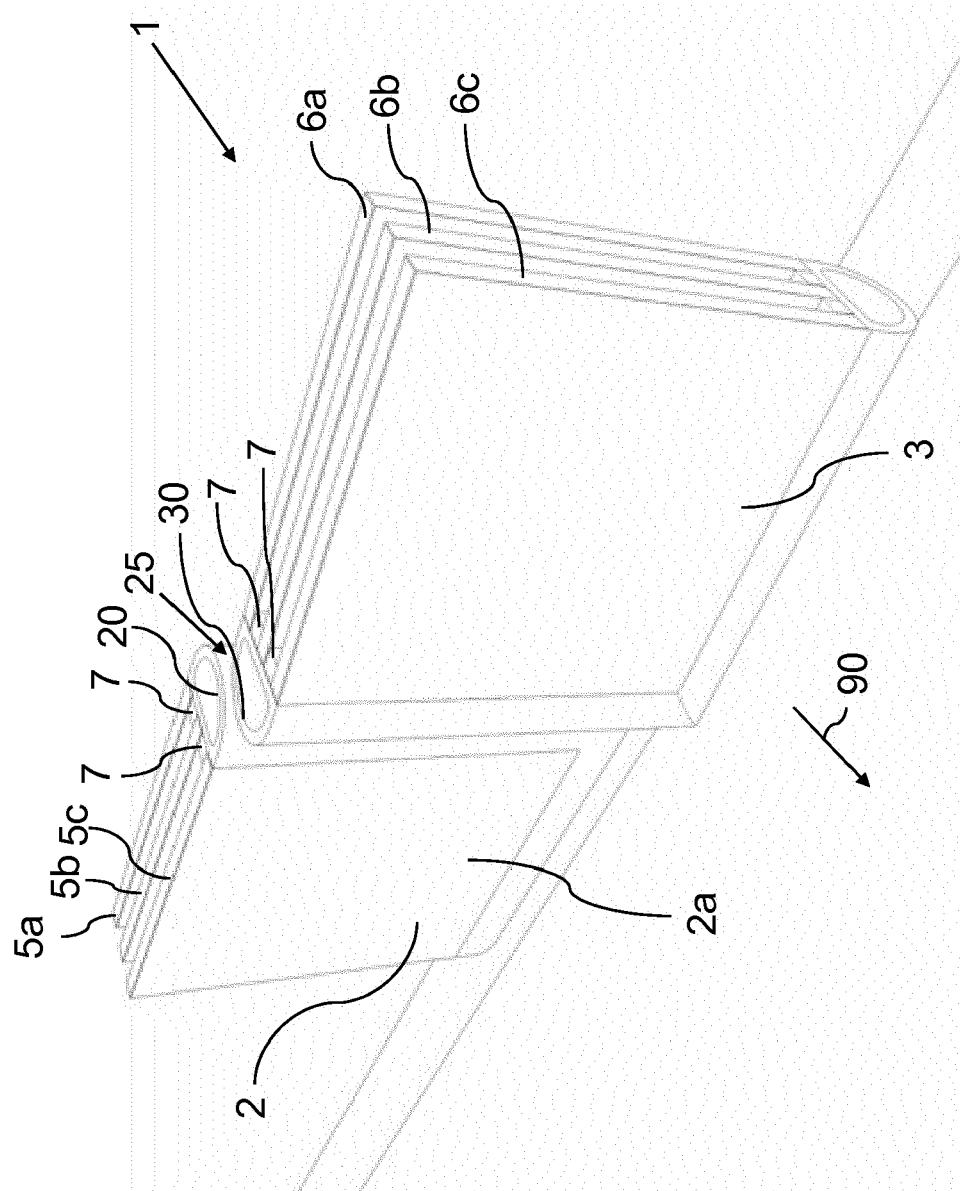


Fig. 1

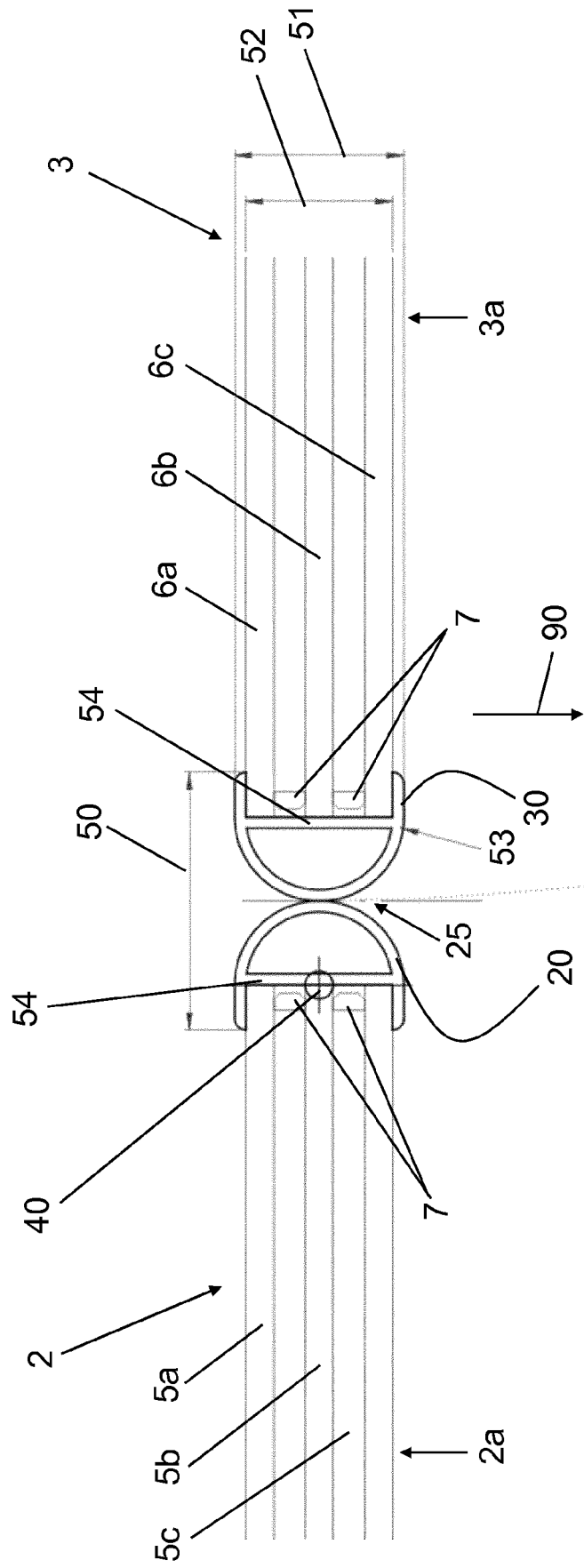


Fig. 2

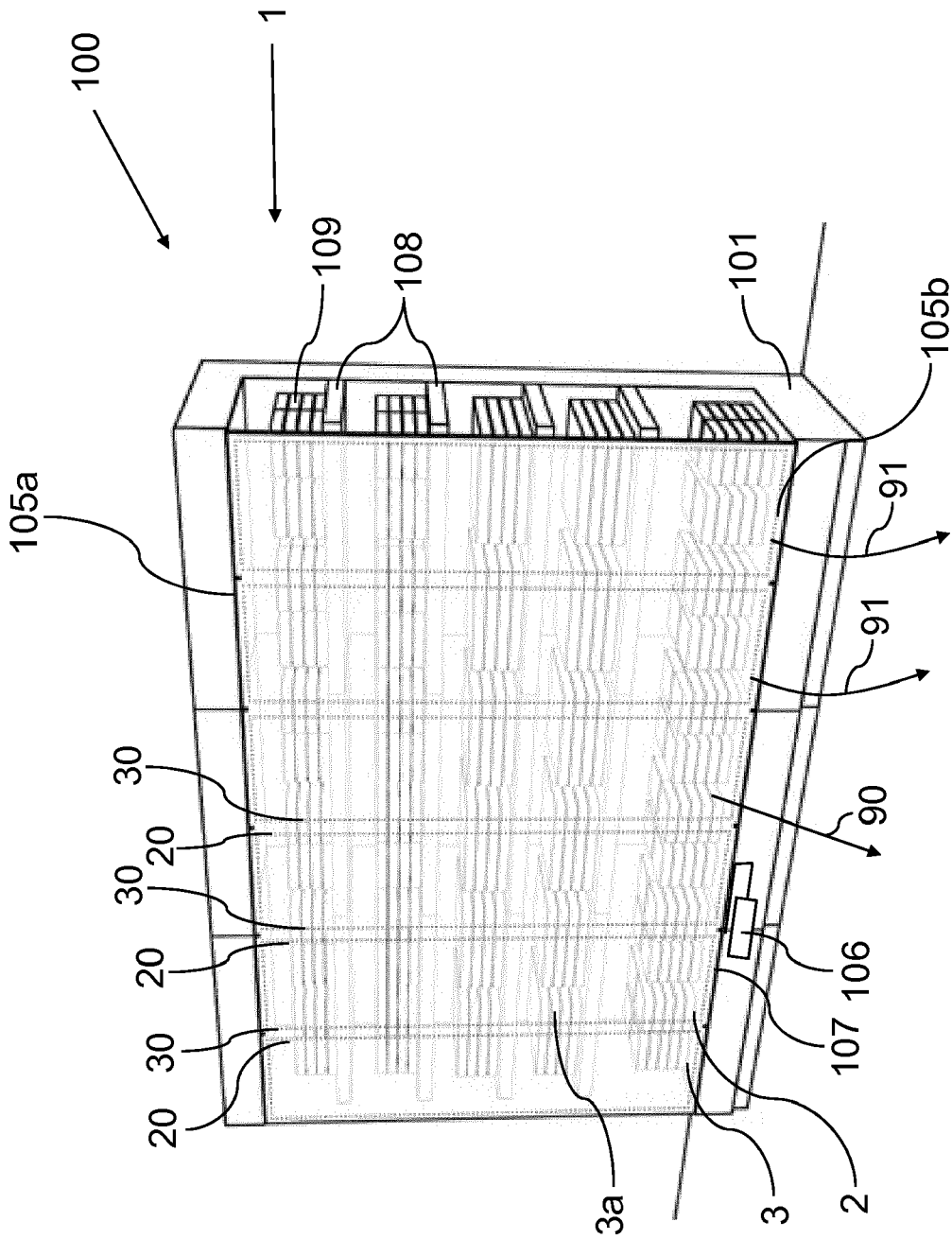


Fig. 3

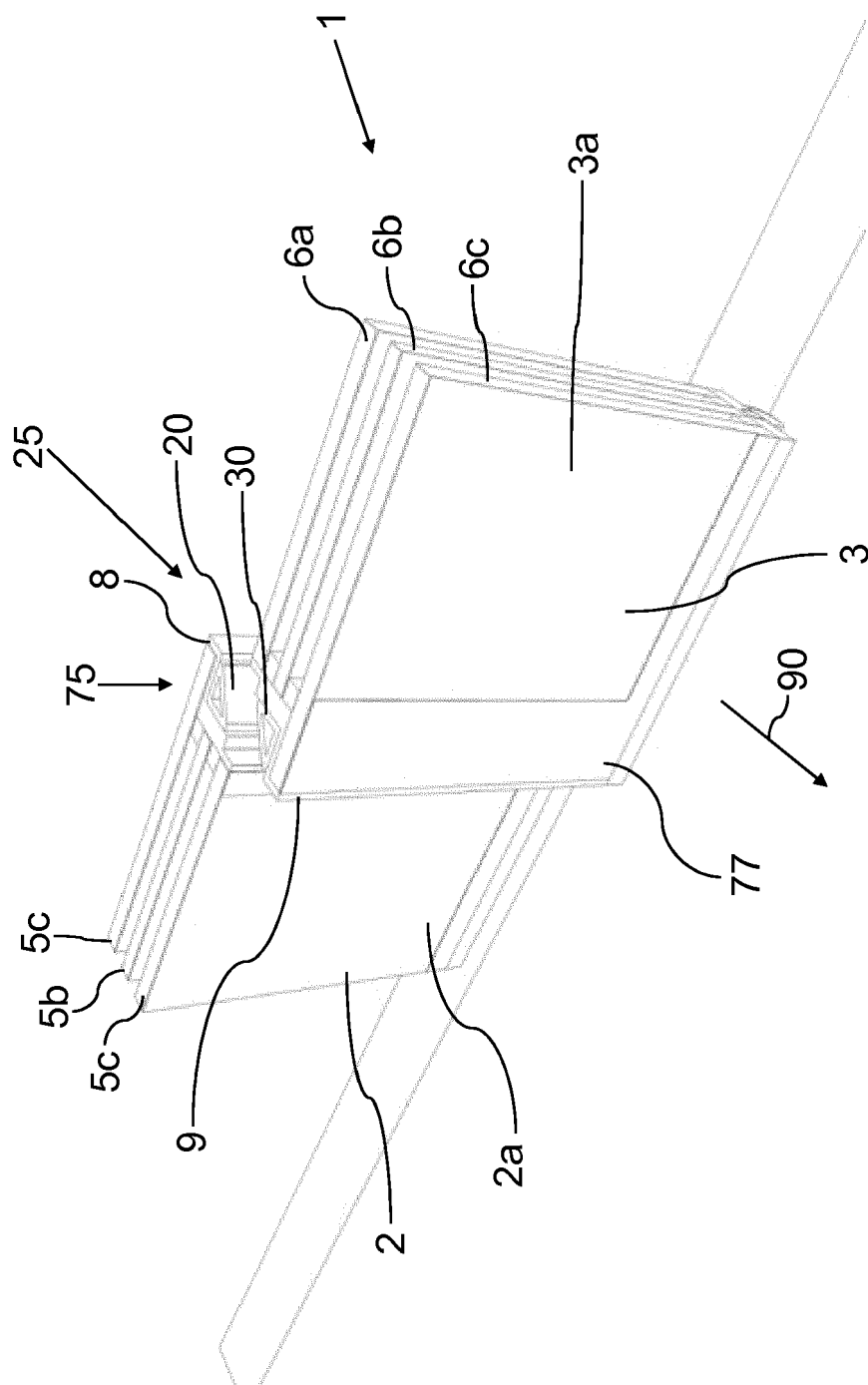


Fig. 4

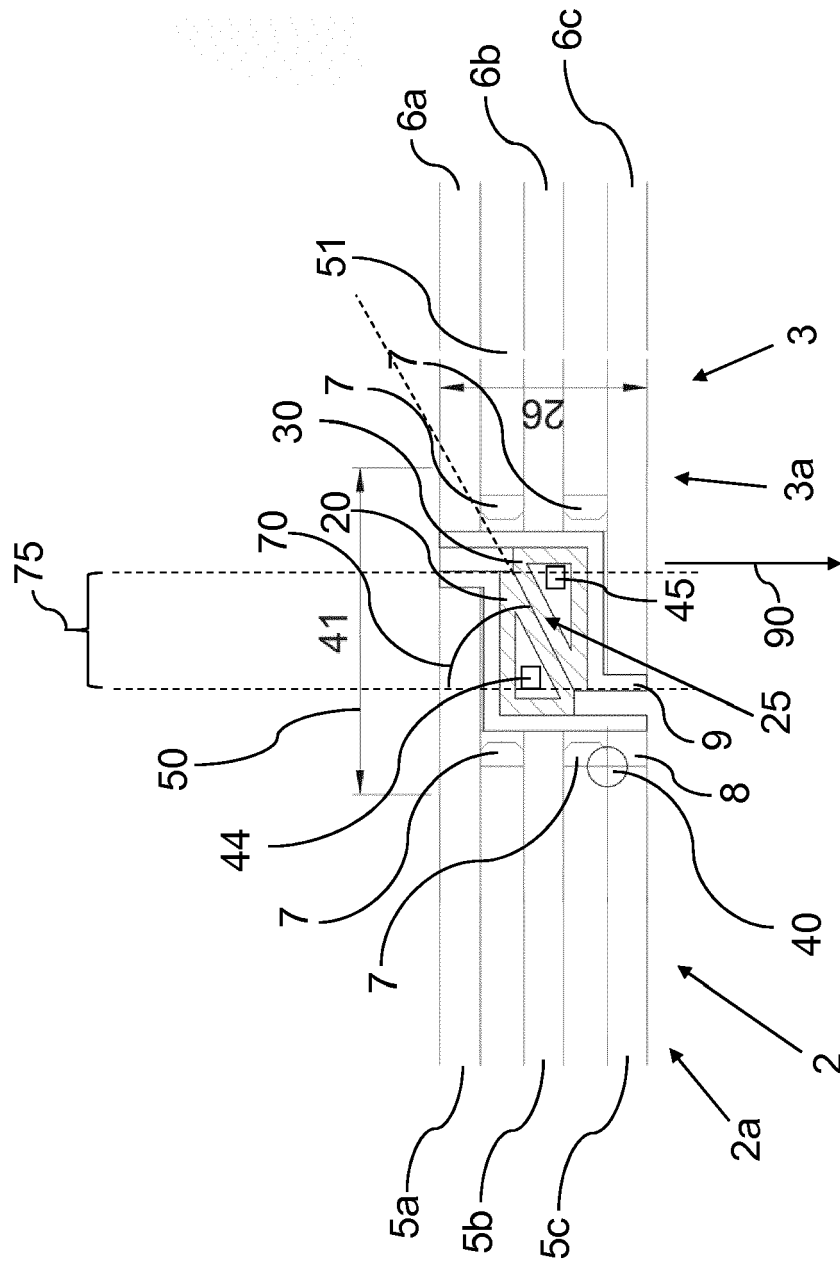


Fig. 5

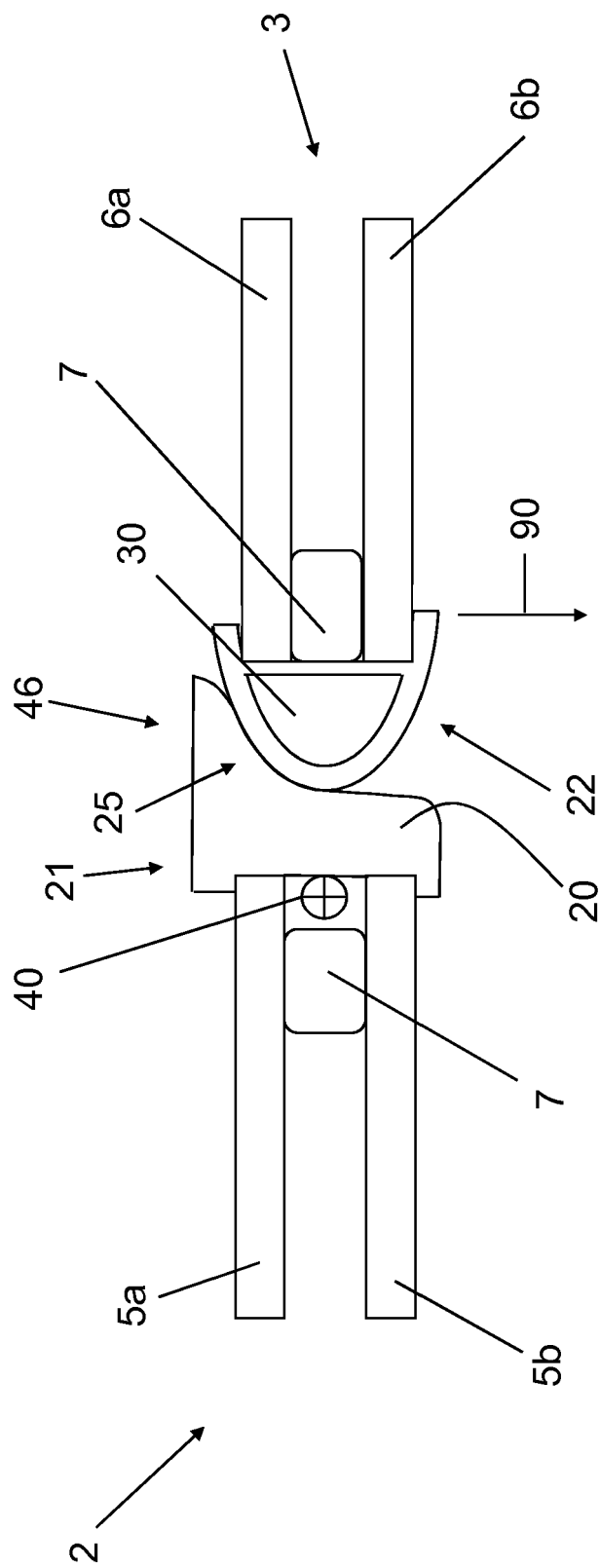


Fig. 6

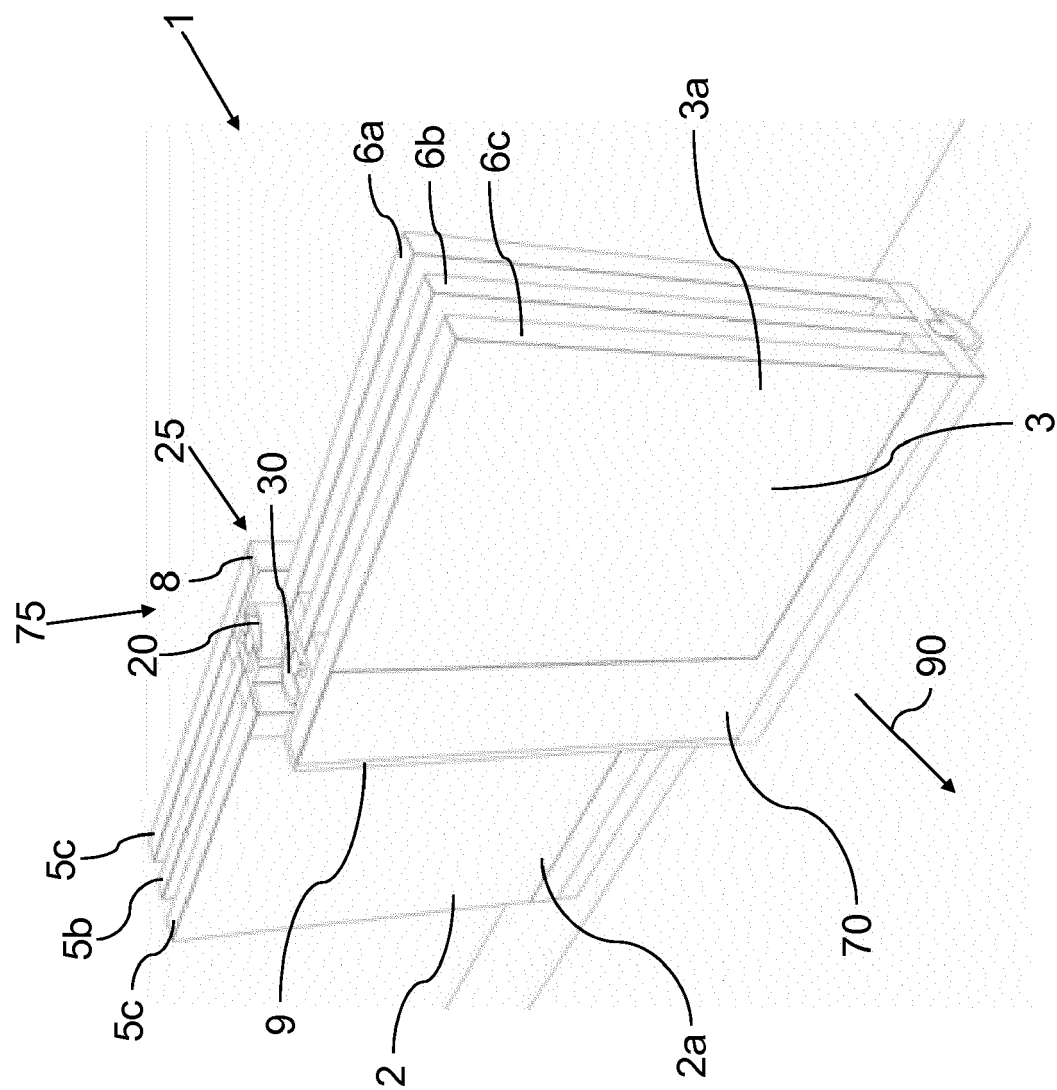


Fig. 7

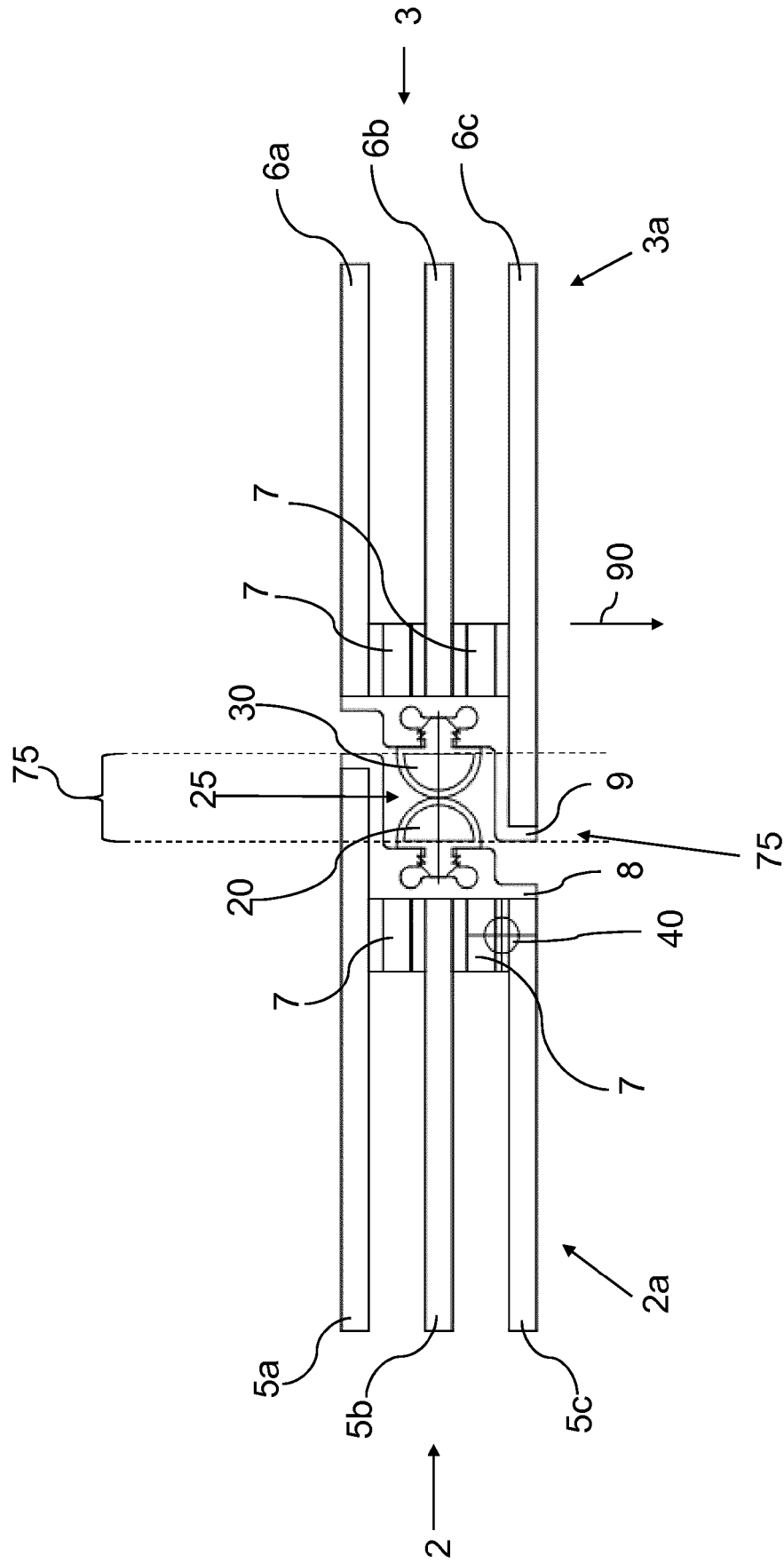


Fig. 8



EUROPEAN SEARCH REPORT

 Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2010/124341 A1 (MASLEN TECHNOLOGY AUSTRALIA PT [AU]; MASLEN JOHN [AU]) 4 November 2010 (2010-11-04) * figures 1-10 *	1,2,5,6,11-14	INV. A47F3/04
X	US 5 930 955 A (BIEBUYCK LAWRENCE F [US]) 3 August 1999 (1999-08-03) * figures 1-4 *	1,3,7,10	
X	US 10 240 388 B2 (ANTHONY INC [US]) 26 March 2019 (2019-03-26) * figures 5-9 *	1,2,8	
X	US 2015/054396 A1 (TRULASKE SR STEVEN L [US]) 26 February 2015 (2015-02-26) * figures 1-31 *	1,2,9	
A	US 2014/217877 A1 (MIERSEN ROGER C [US] ET AL) 7 August 2014 (2014-08-07) * figures 3A-3B *	4,6	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47F F25D E06B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 5 September 2019	Examiner Ibarrondo, Borja
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 17 2074

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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05-09-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010124341 A1	04-11-2010	AU 2010242546 A1	01-12-2011
		CA 2797132 A1	04-11-2010
		CN 102428329 A	25-04-2012
		EP 2425190 A1	07-03-2012
		NZ 596270 A	31-05-2013
		TW 201042225 A	01-12-2010
		US 2012062080 A1	15-03-2012
		WO 2010124341 A1	04-11-2010

US 5930955 A	03-08-1999	NONE	

US 10240388 B2	26-03-2019	US 2016174734 A1	23-06-2016
		US 2017138116 A1	18-05-2017
		US 2017245660 A1	31-08-2017

US 2015054396 A1	26-02-2015	CN 105765326 A	13-07-2016
		EP 3036488 A1	29-06-2016
		JP 2016530476 A	29-09-2016
		KR 20160044516 A	25-04-2016
		US 2015054396 A1	26-02-2015
		WO 2015027019 A1	26-02-2015

US 2014217877 A1	07-08-2014	NONE	
