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(54) **SAFETY HINGE FOR A DOOR, AND ASSEMBLY OF A DOOR, DOORFRAME AND SUCH A SAFETY HINGE**

(57) Safety hinge comprising: a first and a second hinge part (110, 210; 120, 220); a bottom part (130) and an upper part (140) spaced apart therefrom by an intermediate gap, adapted to rotatable connecting the first hinge part with the second hinge part therebetween such that the first hinge part can be rotated about a vertical axis of rotation (A) relative to the second hinge part over at least 180 degrees between a closed position and an open position of the safety hinge, wherein, when viewed in projection in a plane perpendicular to the axis of rotation (A), the first and the second hinge part do not overlap; wherein the first hinge part (110; 210) comprises a first portion with a outer surface (111; 211) with a cylinder-section shape which, when viewed in projection on a plane perpendicular to the axis of rotation, extends over at least 180 degrees about the axis of rotation (A), wherein the cylinder-section shape has a radius (R) of between 0,5 cm and 8 cm from the axis of rotation (A); wherein both in the open position and in the closed position the cylinder-section-shaped outer surface faces away and/or is spaced apart from the second hinge part (120; 220) over at least 180 degrees, wherein in the closed position the cylinder-section-shaped outer surface is located completely between a first plane which is coplanar to a frame-side abutment surface of the first or second hinge part, and a second plane which is coplanar to a doorside abutment surface of an other of the first or second hinge part, preferably wherein in the open position the cylinder-section-shaped outer surface is located completely outside of a volume between the first and second plane.

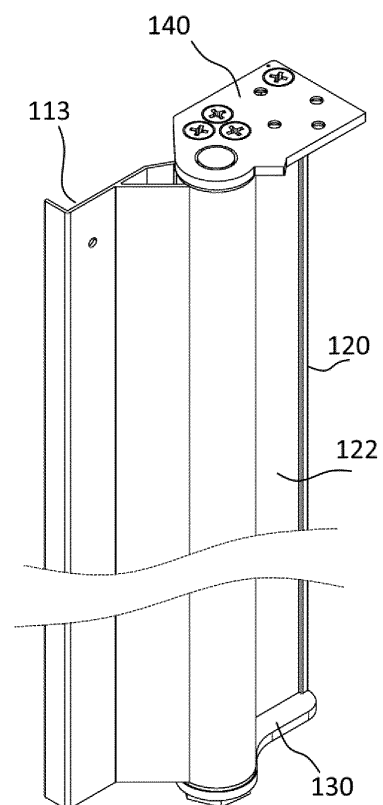


Fig. 3A

Description

[0001] The invention relates to a safety hinge for a door, wherein the hinge prevents fingers from becoming pinched when the hinge is moved from an open position to a closed position. The invention further relates to an assembly of a door and doorframe comprising such a safety hinge.

[0002] European patent application EP 1902 193 describes a safety device which is provided with a first element which defines a profiled channel and is adapted to be coupled to a frame, and a second element which defines a profiled portion and is adapted to be coupled to a door, wherein the profiled portion is adapted for being received in the profiled channel and for rotating therein when the door is rotated relative to the frame to open or close an opening.

[0003] The known hinge allows rotation of the door relative to the frame over an angle of slightly more than 90 degrees from a position in which the door closes off the opening, to a position in which the door is completely open. A drawback of this is that the door, when it is in the open position, takes up a considerable amount of space.

[0004] It is an object of the invention to provide a safety hinge for a door, and an assembly of such a safety hinge and a door and a doorframe, which at least partially overcome this drawback.

Summary of the invention

[0005] To this end, according to a first aspect, the invention provides a safety hinge for a substantially rectangular door which is mountable or is mounted by means of the safety hinge in a doorframe which comprises a rebate, the safety hinge comprising: a first hinge part and a second hinge part, wherein one of the first hinge part or the second hinge part comprises a doorside abutment surface for abutting a backside of the door, and the other of the first hinge part or second hinge part comprises a frame-side abutment surface for abutting the doorframe; wherein the assembly further comprises a bottom part and an upper part spaced apart therefrom by a gap, adapted for rotatably connecting therebetween the first hinge part and the second hinge part such that the first hinge part is rotatable over at least 180 degrees about a substantially vertical axis of rotation relative to the second hinge part between a closed position and an open position of the safety hinge, wherein the first and the second hinge part, along the axis of rotation, each have a length of between 40 cm and 500 cm, and wherein, when viewed in projection in a plane perpendicular to the axis of rotation, the first hinge part and the second hinge part do not overlap; wherein both in the closed position and in the open position the doorside abutment surface and the frame-side abutment surface are substantially parallel to each other; wherein the first hinge part comprises a first portion which has an outer surface with a cylinder-section

shape which extends, when viewed in projection onto a plane perpendicular to the axis of rotation, over at least 180 degrees about the axis of rotation, wherein the cylinder-section shape has a radius of between 0,5 cm and 8 cm from the axis of rotation; wherein both in the open position and the closed position the cylinder-section-shaped outer surface faces away from, and is spaced apart from, the second hinge part over at least 180 degrees, and wherein in the closed position the cylinder-section-shaped outer surface is completely located between a first plane which is coplanar with the frame-side abutment surface and a second plane which is coplanar with the doorside abutment surface, preferably wherein when in the open position the cylinder-section-shaped outer surface is located completely outside of a volume between the first and second plane.

[0006] As the cylinder-section-shaped outer surface faces away from and is spaced apart from the second hinge part over at least 180 degrees, it is possible to rotate the first hinge part over at least 180 degrees relative to the second hinge part. This allows a door, both when the safety hinge mounted thereto is in the open position or in the closed position, to be substantially parallel to a wall in which the door opening is arranged. Thanks to the shape of the safety hinge, a finger which lies against the first and second hinge part during closing of the hinge virtually cannot become pinched between the hinge parts.

[0007] Preferably the cylinder-section-shaped outer surface extends about the axis of rotation over an outer angle of at least 210 degrees, more preferably an angle of at least 240 degrees, and even more preferably an angle of at least 270 or at least 290 degrees.

[0008] Both the first and the second hinge part extend continuously between the bottom part and upper part. Preferably, the length of the first hinge part differs by no more than 5%, more preferably no more than 1%, from the length of the second hinge part. It is especially preferable that the length of the first hinge part is substantially equal to the length of the second hinge part.

[0009] In an embodiment the first and second hinge part are shaped such that, at each position between the bottom part and the upper part, when a finger probe having a length of at least 10 cm and comprising a half-spherical head having a diameter of between 8 and 25 mm, contacts the first and/or second hinge part with its head, the first hinge part can be rotated relative to the second hinge part from the open position completely to the closed position without the head of the finger probe being clamped between the first hinge part and the second hinge part. In particular, the first hinge part can be moved from the open position to the closed position without the finger probe becoming clamped between these hinge parts, even if the finger probe contacts both the first and the second hinge part during part of said movement.

[0010] It will be clear that the finger probe is not part of the safety hinge, but is described merely to clearly define the scope of protection of the invention.

[0011] In an embodiment the finger probe is an 8 mm or a 25 mm finger probe according Annex D.4 of ISO standard EN 1176-1:2017, preferably Fig. D.10 a), b), or c) thereof. This ISO standard describes, amongst others, a finger probe for testing whether a finger might easily become pinched in a playground equipment. The same finger probe is however also suitable for testing whether a finger might easily become pinched between hinge parts. The finger probe preferably is the 25 mm finger probe according Annex D.4 of EN 1176-1:2017.

[0012] In an embodiment, when viewed in projection onto each plane perpendicular to the axis of rotation which is located between the bottom part and the upper part, the first hinge part is rotatable from the open position to the closed position without clamping the finger probe, while the finger probe abuts the first and/or second hinge part and with the longitudinal axis of the finger probe perpendicular with respect to the axis of rotation. If a person holds his or her finger against the first or second hinge with the finger pointing perpendicular to the axis of rotation, the finger will not become pinched between the first and second hinge part.

[0013] In an embodiment, when viewed in projection onto each plane perpendicular to the axis of rotation which is located between the bottom part and the upper part, the second hinge part is located completely outside of the cylinder-section-shaped outer surface, and in the closed position in this projection the distance of each portion of the first hinge part which is located outside of the radius, along a direction perpendicular to said portion, to a facing surface of the second hinge part is at least 2 cm, preferably between 2 and 4 cm. As in the closed position, in a direction perpendicular to the second portion, the distance to the second hinge part, or any other portion of the safety hinge relative to which the first hinge part is rotatable about the axis of rotation, is at least 2 cm is, it is guaranteed that there is at least 2 cm of space between the hinge parts, so that fingers cannot easily become pinched.

[0014] In an embodiment the first hinge part is adapted to be mounted to a door and the second hinge part is adapted to be mounted to a doorframe, wherein the bottom part and upper part are rotationally fixed with respect to the second hinge part. When the hinge is mounted to both a door and a doorframe, the cylinder-section-shaped outer surface is thus rotatable relative to the frame.

[0015] In an alternative embodiment the first hinge part is adapted to be mounted to a doorframe and the second hinge part is adapted to be mounted to a door, wherein the bottom part and upper part are rotationally fixed with respect to the first hinge part. The cylinder-section-shaped outer surface can thus be rotation-fixedly attached relative to the frame.

[0016] In an embodiment the bottom part and/or the upper part is adapted to be mounted to a substantially horizontal surface of a doorframe, floor, or threshold. Preferably, the bottom part can be mounted to the hori-

zontal surface in such a manner that the hinge, and optionally a door attached thereto, are substantially axially supported on the horizontal surface. In such a case, the weight of the door exerts less force on the vertical parts of the frame.

[0017] In an embodiment the bottom part and/or the upper part is adapted to be attached to a substantially vertical surface of a doorframe. In particular, the bottom part, when it is attached to the vertical surface, may thus remain free from the floor, thus preventing water and/or dirt from the floor from coming into contact with the bottom part.

[0018] In an embodiment the first hinge part or the second hinge part is at an upper and/or lower side thereof provided with one or more screw accommodation grooves which extend parallel to the axis of rotation, wherein the screw accommodation grooves, when viewed in projection perpendicular to the axis of rotation, have an open side. The upper or lower part can thus simply be attached to the hinge part which is provided with the screw accommodation grooves. Preferably, one or more of the screw accommodation grooves are located at a distance from the axis of rotation smaller than two times the radius of the cylinder-section shape. This causes the force which is exerted on the door to be transferred over a relatively short distance onto the screw accommodation groove or grooves.

[0019] In an embodiment the first hinge part and/or the second hinge part comprises an extrusion profile extending over the entire length thereof. Such extrusion profiles may easily be produced with different lengths. In case the hinge part is provided with screw accommodation grooves with an open side as described above, such grooves may also be easily manufactured over the entire length of the hinge part. The extrusion profile is preferably formed as an aluminium extrusion profile or as an extrusion profile of an alloy which contains at least 80% aluminium.

[0020] In an embodiment the hinge part which is to be mounted to the frame is provided with one or more grooves for receiving a brush and/or a plastics guide, wherein the one or more grooves both in the open and in the closed position have an open side which faces towards the partial cylinder-section-shaped outer surface, preferably wherein each opening of the one or more grooves is located at a distance of 5 mm or less, preferably 3 mm or less, from the cylinder-section-shaped outer surface. By means of the brush or guide thus further sealing between the two hinge parts is possible. A groove for receiving a brush and/or a plastics guide may in this case be a screw accommodation groove as described above. The brush or guide in general will contact the other hinge part, in this manner partially sealing a gap between the two hinge parts.

[0021] In an embodiment, when viewed in projection perpendicular to the axis of rotation, both in the open position and in the closed position of the first hinge part, a gap between the cylinder-section-shaped outer surface

of the one hinge part and a facing closest surface of the other hinge part bridges a distance of between 0 and 2 mm, preferably between 0,5 and 1,3 mm. If the distance is 0 mm, then the cylinder-section-shaped outer surface abuts the surface of the other hinge part. As long as the distance is smaller than 2 mm, the gap is sufficiently small so that a person's fingers cannot become pinched in the gap.

[0022] In an embodiment the safety hinge further comprises an upper pivot which is connected to the upper part and extends partially within the outer surface, and a lower pivot which is connected to the bottom part and extends partially within the outer surface. The pivots thus allow one of both of the hinge parts to rotate relative to the upper and bottom part.

[0023] In an embodiment the upper pivot and/or the lower pivot is accommodated movably along the longitudinal direction within the hinge part which comprises the outer surface, wherein said hinge part is further provided with a locking mechanism for locking the pivot in a protruding position in which the pivot protrudes partially beyond end face of the hinge part and into the corresponding upper part or bottom part, and wherein in case the pivot is not locked, it can be moved to a position in which it does not protrude into the associated upper part or bottom part. The door and the first or second hinge part attached thereto may thus be easily removed from the frame or placed in the frame when the pivot is not locked.

[0024] The pivot preferably is accommodated in the hinge part in a manner resiliently moveable along the length direction, such that the pivot can be positioned in the upper part or the bottom part when in a state in which the spring is retracted, and wherein the movable pivot is biased to state in which the spring is extended to let part of the pivot protrude beyond the hinge part and into the upper part or bottom part.

[0025] In an embodiment the lower pivot together with the bottom part forms a footstep bearing. The door may thus substantially be supported, via the footstep bearing, on a floor or other horizontal or vertical surface.

[0026] In an embodiment the lower pivot is provided with a circumferential water seal. This prevents water, as may for instance be used during mopping of the floor, from entering the hinge.

[0027] In an embodiment the hinge part which is mounted to the frame is further provided with a shielding part which extends over the length of said hinge part and may be detachably placed in the hinge part, preferably by means of a click-connection. Such a shielding part preferably is formed as an extrusion profile, for example from aluminium or an aluminium alloy. A hinge part may thus be mounted to the frame using fixation means, such as screws, after which the shielding part is placed such that the fixation means no longer are freely accessible and/or visible.

[0028] According to a second aspect the invention provides an assembly of a hinge according to the first aspect of the invention, a frame for the door, and a door which

is attached to the frame by means of the safety hinge. Preferably, the bottom part is fixedly attached to a lower side of the first or second hinge part.

[0029] In an embodiment the frame is provided with a rebate and the door has a rear side, wherein, in case the door is mounted in the frame via the hinge, in the closed position of the hinge the rear side of the door substantially abuts a surface of the rebate which is parallel to the rear side of the door. In this embodiment, when the door is mounted in the frame by means of the hinge, the hinge may be moved in only a single direction of rotation from the closed position to the open position. It is thus prevented that the first hinge part can be moved closer to the second hinge part from the closed position.

[0030] In an embodiment the door has a back side, and the length of the hinge parts is at least 90%, preferably at least 98%, of the length of back side of the door.

Brief description of the drawings

[0031] Examples of embodiments of the invention will be described with reference to the drawings, in which same reference numerals refer to same structures.

Figs. 1A and 1B show an isometric view of assembly of a door, a frame and a safety hinge according to the invention, respectively with the hinge in the open position and the closed position;

Figs. 2A and 2B show a cross-sectional view of an embodiment of the safety hinge of Figs. 1A and 1B, respectively in the open and the closed position;

Figs. 3A and 3B show an embodiment of the safety hinge of Figs. 1A and 1B, respectively in the open and the closed position;

Fig. 3C shows an exploded view of the safety hinge of Fig. 3A; and

Fig. 4 shows a cross-sectional detail of another embodiment of a safety hinge according to the invention, which is provided at its lower side with a water-seal;

Figs. 5A and 5B show a cross-section of a hinge according to an alternative embodiment of the safety hinge according to the invention, respectively in the open and in the closed position;

Fig. 6 shows an example of a prior art finger probe by means of which it may be tested whether a finger can become pinched during closing of the hinge.

Detailed description of the drawings

[0032] Fig. 1A shows an isometric view of an assembly 1 of a safety hinge 100 according to the invention and a door 30 which is mounted, by means of the safety hinge, in a doorframe 10, 20 which comprises a rebate 11, 21. The hinge 100 comprises a first hinge part 110 mounted to a back side 31 of the door 30 which faces the hinge, and a second hinge part 120 mounted to the frame part 10. Both hinge parts extend across substantially the en-

tire length L of the backside 31, wherein in the example the length is about 230 cm. The safety hinge 100 further comprises, at a lower side of the hinge parts 110, 120, a bottom part 130, and the safety hinge 100 comprises an upper part 140 at an upper side of the hinge parts 110, 120. The lower and upper part connect the first and second hinge parts 110, 120 therebetween such that the lower and upper part hold the second hinge part rotatable about axis of rotation A relative to the first hinge part 110.

[0033] In the shown embodiment the bottom part 130 is attached to the second hinge part 120 and to a vertical surface of the frame 10, so that the bottom part 130 is free from the floor. The upper part 140 is attached to the second hinge part 120 and to a horizontal surface at an upper part of the frame (not shown). It will be understood that in an alternative embodiment of the safety hinge both the bottom part 130 and the upper part 140 may be fixedly attached to the second hinge part 120, which will then be attached to a vertical surface of the frame.

[0034] In the open position of the hinge shown in Fig. 1A, the first hinge part 110 of hinge 100 is rotated 180 degrees about the axis of rotation A with respect to the closed position shown in Fig. 1B. When the frame is placed in in a wall (not shown in Figs. 1A and 1B, but partially shown in Figs. 2A and 2B) which is parallel to the plane in which the frame is located, then the door 30, when in the open position, can extend substantially parallel to the wall. The door then takes up relatively little space.

[0035] In the closed position of the hinge 100 shown in Fig. 1B, a side 32 of the hinge 100 which faces away from the door 30 substantially abuts the doorjamb 20 of the frame, wherein the rear side 33 of the door abuts the rebate 11, 21 of the frame.

[0036] When the door is moved from the open position to the closed position it is desirable that the risk of a person's fingers becoming pinched between the first and second hinge part 110, 120 is minimized.

[0037] Figs. 2A and 2B illustrate in more detail how this is achieved by the invention. Figs. 2A and 2B respectively show a cross-sectional view of the safety hinge of Fig. 1A and 1B through a horizontal plane at the height of line H in Fig. 1B.

[0038] In Fig. 2A, the door 30 and the hinge 100 are in the open position in which the door 30 is substantially parallel to the wall 50 and leaves the opening of the frame open. The first hinge part 110 abuts the back side 31 of the door 30 with abutment surface 113 and is attached thereto by means of screws, preferably countersunk screws, or the like (not shown).

[0039] The second hinge part 120 abuts with abutment surface 123 against the frame part 10 and is attached thereto by means of screws 154 or the like. During mounting of the second hinge part 120 in the frame part 10 it is desirable that such screws 154 are freely accessible as shown in Fig. 2A. After the screws have been screwed into the frame part 10, a shielding part 128, shown in Fig. 2B but not shown in Fig. 2A, may be manually clicked

into place in the hinge part 120. The shielding part 128 extends over the length L of the second hinge part and then forms part of the second hinge part 120. In the shown example both the first hinge part 110, the part 123 of the second hinge part 120 against which the frame is mounted, and the shielding part 128 of the second hinge part are manufactured from aluminium by means of extrusion.

[0040] The first hinge part 110 has a first portion with a cylinder-section-shaped outer surface 111 which has an outer radius R from the axis of rotation A of circa 15 mm. The shortest distance between the axis of rotation A and the outer surface 111 thus is equal to the radius R. The first hinge part 110 further has a second portion 112 which is located outside of the radius R and which abuts the outer surface 111 at point 111a and 111b of the outer surface.

[0041] Between point 111a and 111b the outer surface 111 covers an outer angle of at least 180 degrees about the axis of rotation A, wherein the cylinder-section-shaped outer surface 111 is spaced apart from the second portion 112 over an outer angle of about 290 degrees. In both the open position shown in Fig. 2A and the closed position of the hinge shown in Fig. 2B a part of the outer surface 111 is spaced apart from, and faces away from, the second hinge part 120 over at least 180 degrees. This allows second hinge part 120 to be rotated over at least 180 degrees relative to the first hinge part 110. The distance between the first hinge part 110 and the second hinge part 120 at gap G preferably is less than 2 mm.

[0042] The safety hinge 100 is constructed in such a manner that in the closed position shown in Fig. 2B the distances d1, d2 from an inner side of the second portion 112 of first hinge part 110 to a facing side of the second hinge part 120 is always at least 2 cm along a direction perpendicular to the inner side of the first hinge part 110. This prevents that during closing of the hinge fingers can become pinched between the first hinge part 110 and the second hinge part 120. In Fig. 2B the side of the second hinge part 120 which faces the inner side of the second portion 112 of the first hinge part 110 is formed by the side of the shielding part 128 which faces towards the second portion 112 of the first hinge part 110.

[0043] In the open position of the hinge shown in Fig. 2A the abutment surface 113, against which the back side 31 of the door abuts, lies at a distance x1 from a plane V which is parallel to the back side 31 of the door and passes through the axis of rotation A. The distance x1 here in an example is larger than the radius R. In the example shown the distance x1 is equal to 20,5 mm, whereas the radius R is 15 mm. Abutment surface 123 of the second hinge part 120 is both in the closed and in the open position also substantially parallel to the plane V, wherein the distance x2 of the abutment surface 123 to plane V is greater than the distance x1 between the abutment surface 113 and plane V. In the closed position of the hinge shown in Fig. 2B, the cylinder-section-shaped outer surface 111 is located completely between

a first plane P1 which is coplanar to the frame-side abutment surface 123 and a second plane P2 which is coplanar to the doorside abutment surface 113 and which is parallel to the first plane P1. In the open position shown in Fig. 2A the cylinder-section-shaped outer surface 111 is located completely outside of a volume between the parallel planes P1 and P2.

[0044] Figs. 3A and 3B schematically show an isometric view of the safety hinge 100 respectively in the open and closed position, wherein a part of the length of the hinge is not shown in order to provide a better view of the upper part 140 and the lower part 130. Fig. 3C shows an exploded view of the same safety hinge. This more clearly shows that the hinge part 120 which is attached to the frame is provided with four screw accommodation grooves 127 which extend over the length of the second hinge part 120. The bottom part 130 and the upper part 140 are provided respectively with pivots 135, 145, each of which is enveloped by a slide-bearing 136, 146 which is mounted in part 110.

[0045] The upper part 140 may be attached to the second hinge part 120 by screwing screws 152 through the holes 142 in the upper part and into the screw accommodation grooves 127. Screws 153 may be screwed, through holes 143, into an upper part of a doorframe.

[0046] The bottom part 130 may be attached to second hinge part 120 by screwing screws 151 through holes 131 into the screw accommodation grooves 127. The bottom part may be screwed to a vertical surface of a doorframe by screwing screws (not shown) through holes 133 into the doorframe. Subsequently, the vertical force on the bottom part may be transferred onto a threshold or a floor by means of adjustment screw 137.

[0047] The screw accommodation grooves 127 have an open side along their length. At two of the grooves 127 the open side faces towards the first hinge part 110, so that a plastics guide 129 and/or brushes (not shown) may be accommodated therein, for example to prevent draft or friction drag.

[0048] Further shown is that the shielding part 128 can be manually attached by pressing its edge 128a into groove 126, and subsequently rotating the shielding part 128 into the groove 126 and click it into place, to thus form a whole with the second hinge part 120, see also Fig. 2B.

[0049] Fig. 4 schematically shows a cross-sectional detail of an embodiment of the safety hinge according to the invention, wherein at an upper side the hinge is further provided with a resiliently moveable pivot 155 and a locking mechanism to secure it, and at the lower side is provided with a recess in which a water seal is accommodated. Fig. 4 shows the pivot 155 biased by a spring 152 into a protruding position in which the pivot 155 is partially accommodated within the hinge part 110 and partially protrudes beyond the upper side of hinge part 110 into a corresponding recess in upper part 140. The pivot 155 is attached to a bolt 151 which is resiliently accommodated in a bus 153 by means of the spring 152. The bus

153 in turn is mounted within the hinge part 110 at a fixed position by screwing a screw (not shown) from the outer side of the hinge part 110 through the wall of the hinge part in threaded hole 156. When the pivot 155 is in the protruding position, it can be locked along the axis of rotation A relative to hinge part 110 by screwing a screw (not shown) from the outer side of the hinge part 110 into threaded hole 157, in this manner forming a locking mechanism. Due to the movable pivot, it is possible to easily place a door, to which the hinge part 110 has already been mounted, in a frame.

[0050] Figs. 5A and 5B show a cross-section of a safety hinge 200 according to an alternative embodiment of invention, respectively in an open position and in a closed position. In this embodiment the first hinge part 210, with which abutment surface 213 abuts doorframe 10, has a first portion with a cylinder-section-shaped outer surface 211 which extends over at least 180 degrees about the axis of rotation A. In this embodiment the first hinge part 210 comprising the cylinder-section-shaped outer surface 211 is rotation-fixed with respect to doorframe 10 as the hinge is moved from the open to the closed position. The second hinge part 220 of the hinge 200 is provided with grooves 227 which extend over the entire length of the second hinge part 220 and are adapted to thereby attach the upper and lower plate to the second hinge part 220. A brush and/or a guide (not shown) may also be accommodated therein such that the brush or guide protrudes through the opening in the longitudinal side of the groove 227 and contacts the cylinder-section-shaped outer surface 211.

[0051] In the open position of the hinge shown in Fig. 5A the doorside abutment surface 223 of the second hinge part 220 is at a distance x_1 to a plane V which is parallel to the back side 31 of the door and which passes through the axis of rotation A. The distance x_1 here is larger than the radius R. Both in the closed and in the open position the abutment surface 213 of the first hinge part 210 is also substantially parallel to the plane V, wherein the distance x_2 of the abutment surface 213 to plane V is larger than the distance x_1 between the abutment surface 223 and plane V. As in the embodiment of Figs. 2A and 2B, when a finger probe as shown in Fig. 6 contacts the first and/or second hinge with a head of the finger, then the first hinge part can be rotated relative to the second hinge part from the open position completely to the closed position without the head of the finger probe being clamped between the first hinge part and the second hinge part.

[0052] Fig. 6 schematically shows a side view of a finger probe 600 by means of which it can be tested whether a safety hinge according to the invention the first hinge part can be rotated relative to the second hinge part from the open position completely to the closed position without the head of the finger probe being clamped between the first hinge part and the second hinge part. The finger shown has a head at both ends. A first half-spherical head 610 has a diameter h_1 of about 25mm which tran-

sitions into a cylindrical part 615 with the same diameter h1. The combined length w1 of the head 610 and the cylindrical part 615 is about 10 cm. At the other end the finger probe has a second half-spherical head 620 which has a diameter h2 of ca. 8 mm and transitions into a cylindrical part 625 with the same diameter h2. The combined length w2 of the head 620 and the cylindrical part 625 is about 10 cm. The first head allows testing whether relatively large fingers, for example a finger of an adult, may become pinched between hinge parts, and with the second head it can be tested whether relatively small fingers, for example a finger of a child, could become pinched between hinge parts.

[0053] Such a finger probe is known from Fig. D.10c of Annex D.4 of and 1176-1:2017, which shows a finger probe for testing whether a finger can easily become pinched. It has been found that such a finger probe may also be used to predict whether a finger could easily become pinched between a hinge when the hinge is moved from the open position to the closed position.

[0054] In summary the invention relates to a safety hinge comprising: a first hinge part and a second hinge part; a bottom part and an upper part which is spaced apart therefrom by an intermediate gap, adapted for rotatably connecting the first hinge part with the second hinge part therebetween in such a manner that the first hinge part is rotatable over at least 180 degrees about a substantially vertical axis of rotation relative to the second hinge between a closed position and an open position of the safety hinge, wherein, when viewed in projection in a plane perpendicular to the axis of rotation, the first hinge part and the second hinge part do not overlap; wherein the first hinge part has a first portion with an outer surface with a cylinder-section shape which, when viewed in projection onto a plane perpendicular to the axis of rotation, extends over at least 180 degrees about the axis of rotation, wherein the cylinder-section shape has a radius of between 0,5 cm and 8 cm from the axis of rotation; wherein the cylinder-section-shaped outer surface, both in the open position and in the closed position, faces away from the second hinge part and is spaced apart therefrom over at least 180 degrees, and wherein in the closed position the cylinder-section-shaped outer surface is located completely between a first plane, which is coplanar with a frame-side abutment surface of the first or second hinge part, and a second plane which is coplanar with a doorside abutment surface of another of the first or second hinge part, preferably wherein in the open position the cylinder-section-shaped outer surface is located completely outside of a volume between the first and second plane.

Claims

1. Safety hinge (100) for a substantially rectangular door (30) which is mountable or is mounted by means of the safety hinge (100) in a doorframe (10,20) which

comprises a rebate, the safety hinge (100; 200) comprising:

a first hinge part (110; 210) and a second hinge part (120; 220), wherein one of the first hinge part (110; 120) or the second hinge part (120; 220) comprises a doorside abutment surface (113; 223) for abutting a backside (31) of the door (30), and wherein the other of the first hinge part (110; 210) or second hinge part (120; 220) comprises a frame-side abutment surface (123; 213) for abutting the doorframe (10);

a bottom part (130) and an upper part (140) spaced apart therefrom by a gap, adapted for rotatably connecting therebetween the first hinge part (110) and the second hinge part (120) such that the first hinge part is rotatable over at least 180 degrees about a substantially vertical axis of rotation (A) relative to the second hinge part between a closed position and an open position of the safety hinge, wherein the first and the second hinge part, along the axis of rotation (A), each have a length (L) of between 40 cm and 500 cm, and wherein, when viewed in projection in a plane perpendicular to the axis of rotation (A), the first hinge part and the second hinge part do not overlap;

wherein both in the closed position and in the open position the doorside abutment surface (113; 223) and the frame-side abutment surface (123; 213) are substantially parallel to each other;

wherein the first hinge part (110; 210) comprises a first portion which has an outer surface (111; 211) having a cylinder-section shape which extends, when viewed in projection onto a plane perpendicular to the axis of rotation, over at least 180 degrees about the axis of rotation (A), wherein the cylinder-section shape has a radius (R) of between 0,5 cm and 8 cm from the axis of rotation (A);

wherein both in the open position and the closed position the cylinder-section-shaped outer surface (111, 211) faces away from, and is spaced apart from, the second hinge part (120; 220) over at least 180 degrees, and wherein in the closed position the cylinder-section-shaped outer surface (111, 211) is completely located between a first plane (P1) which is coplanar with the frame-side abutment surface and a second plane (P2) which is coplanar with the doorside abutment surface, preferably wherein when in the open position the cylinder-section-shaped outer surface (111, 211) is located completely outside of a volume between the first and second plane.

2. Safety hinge according to claim 1, wherein the first

and second hinge part are shaped such that, at each position between the bottom part (130) and the upper part (140), when a finger probe having a length of at least 10 cm and comprising a half-spherical head having a diameter of between 8 and 25 mm, contacts the first and/or second hinge part with its head, the first hinge part (110; 210) can be rotated relative to the second hinge part (110; 210) from the open position completely to the closed position without the head of the finger probe being clamped between the first hinge part and the second hinge part.

3. Safety hinge according to claim 2, wherein the finger probe is an 8 mm or a 25 mm finger probe according to Annex D.4 of ISO standard EN 1176-1:2017.
4. Safety hinge according to claim 2 or 3, wherein, when viewed in projection onto each plane perpendicular to the axis of rotation (A) which is located between the bottom part (130) and the upper part (140), the first hinge part is moveable from the open position to the closed position without clamping the finger probe, while the finger probe abuts the first and/or second hinge part and with the longitudinal axis of the finger probe perpendicular with respect to the axis of rotation (A).
5. Safety hinge according to any one of the preceding claims, wherein, when viewed in projection onto each plane which is perpendicular to the axis of rotation (A) and located between the bottom part (130) and the upper part (140), the second hinge part (120; 220) is located completely outside of the cylinder-section-shaped outer surface (111; 211), and in the closed position in this projection the distance (d1, d2) of each portion of the first hinge part (110) which is located outside of said radius (3), along a direction perpendicular to said portion, to a facing surface of the second hinge part is at least 2 cm, preferably is between 2 and 4 cm.
6. Safety hinge according to any one of the preceding claims, wherein the first hinge part (110) is adapted to be mounted to a door (30), and wherein the second hinge part (120) is adapted to be mounted to a doorframe (10), and wherein the bottom part (130) and upper part (140) are rotationally-fixed with respect to the second hinge part (120).
7. Safety hinge according one of claims 1-5, wherein the first hinge part (210) is adapted to be mounted to a doorframe (10) and wherein the second hinge part (220) is adapted to be mounted to a door (30), wherein the bottom part (130) and upper part (140) are rotationally fixed with respect to the first hinge part (210).
8. Safety hinge according to any one of the preceding

claims, wherein the bottom part (130) and/or the upper part (140) is adapted to be mounted to a substantially horizontal surface of a doorframe, floor or threshold.

9. Safety hinge according to any one of the preceding claims, wherein the bottom part (130) and/or the upper part (140) is adapted to be mounted to a substantially vertical surface of a doorframe.
10. Safety hinge according to any one of the preceding claims, wherein the first hinge part (110; 120) or the second hinge part (120; 220) at a upper and/or lower side thereof is provided with one or more screw accommodation grooves (217; 227) which extend parallel to the axis of rotation (A), preferably wherein the screw accommodation grooves, when viewed in projection perpendicular to the axis of rotation, have an open side.
11. Safety hinge according to any one of the preceding claims, wherein the first hinge part (110; 210) and/or the second hinge part (120; 220) comprises an extrusion profile which extends across the entire length (L) thereof, preferably wherein the extrusion profile is formed as an aluminium extrusion profile.
12. Safety hinge according to any one of the preceding claims, wherein the hinge part (120; 220) which is to be mounted to the frame is provided with one or more grooves (127; 227) for receiving a brush and/or a plastics guide, wherein the one or more grooves, both in the open and in the closed position, comprise an open side which faces towards the partial cylinder-section-shaped outer surface, preferably wherein each opening of the one or more grooves is located at a distance of 5 mm or less from the cylinder-section-shaped outer surface.
13. Safety hinge according to any one of the preceding claims, further comprising an upper pivot (145; 155) which is connected to the upper part and extends partially within the outer surface (111), and a lower pivot (135) which is connected to the bottom part and partially extends within the outer surface (111).
14. Safety hinge according to claim 13, wherein the lower pivot forms a footstep bearing, or wherein the lower pivot together with the bottom part forms a footstep bearing.
15. Safety hinge according to any one of the preceding claims, wherein the hinge part (120; 210) which is to be mounted to the frame is further provided with a shielding part (128; 218) which extends across the length of said hinge part (120; 210) and may be detachably placed in the hinge part (120; 210), preferably by means of a click-connection.

16. Assembly (1) comprising a safety hinge (100) according to any one of the preceding claims, the assembly further comprising:

a frame (10, 20) for the door; 5
a door (30) which is hingeably mounted to the frame by means of the safety hinge.

17. Assembly according to claim 16, wherein the frame (10, 20) is provided with a rebate (11, 21) and wherein the door comprises a rear side (33), wherein, in case the door is mounted to the frame by means of the hinge (100), in the closed position of the hinge (100) the rear side of the door substantially abuts a surface of the frame which is parallel to the rear side of the door. 10 15

18. Assembly according to claim 16 or 17, wherein the door has a backside, and wherein the length (L) of the hinge parts at least 90% is of the length of backside of the door. 20

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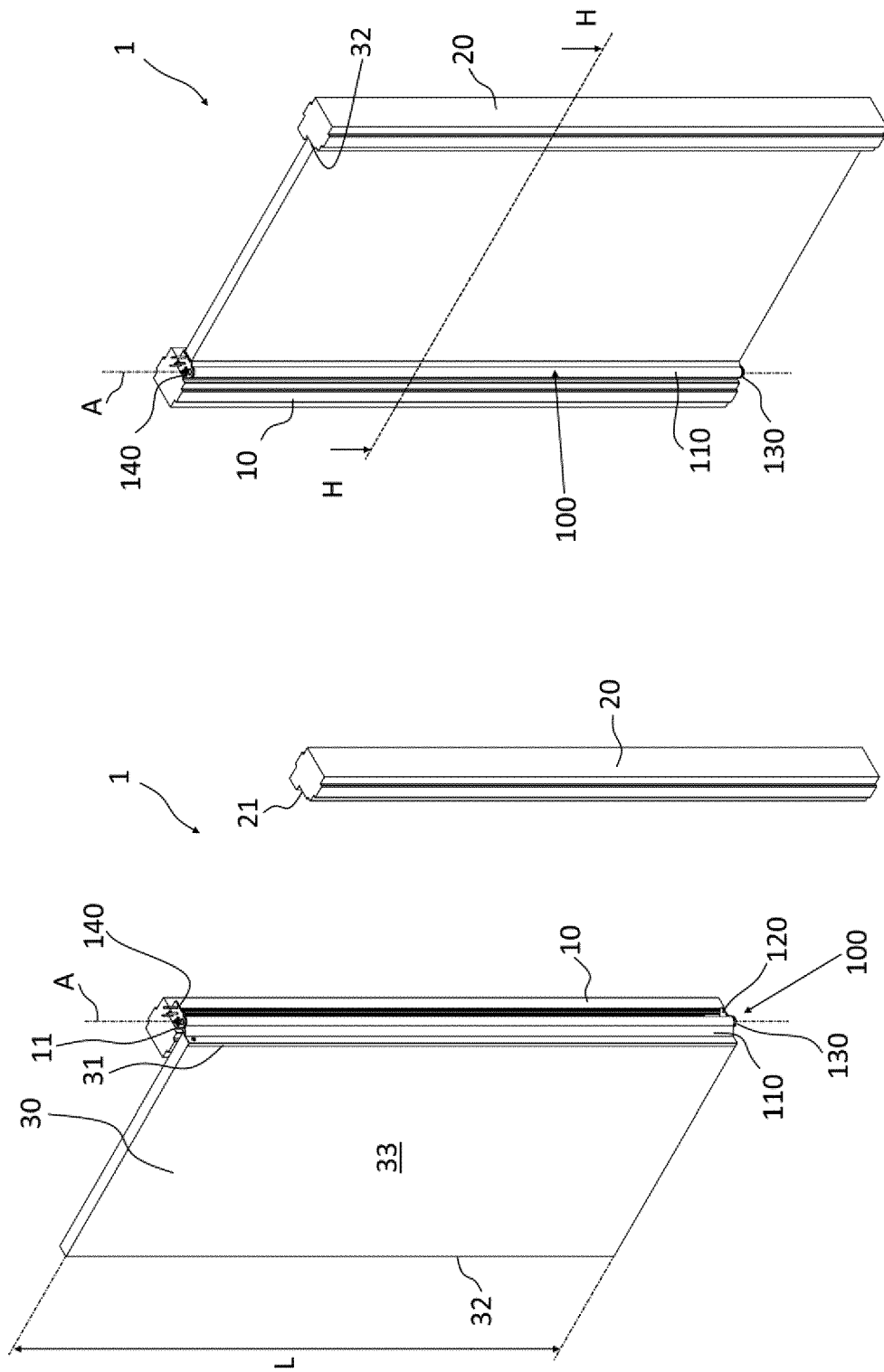


Fig. 1B

Fig. 1A

Fig. 2A

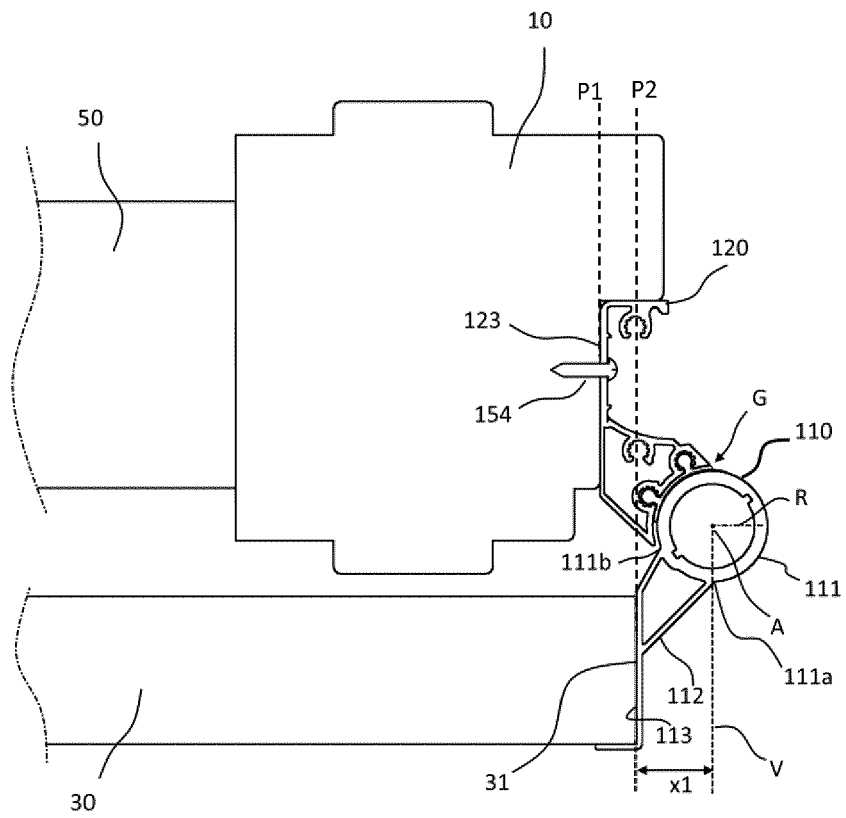
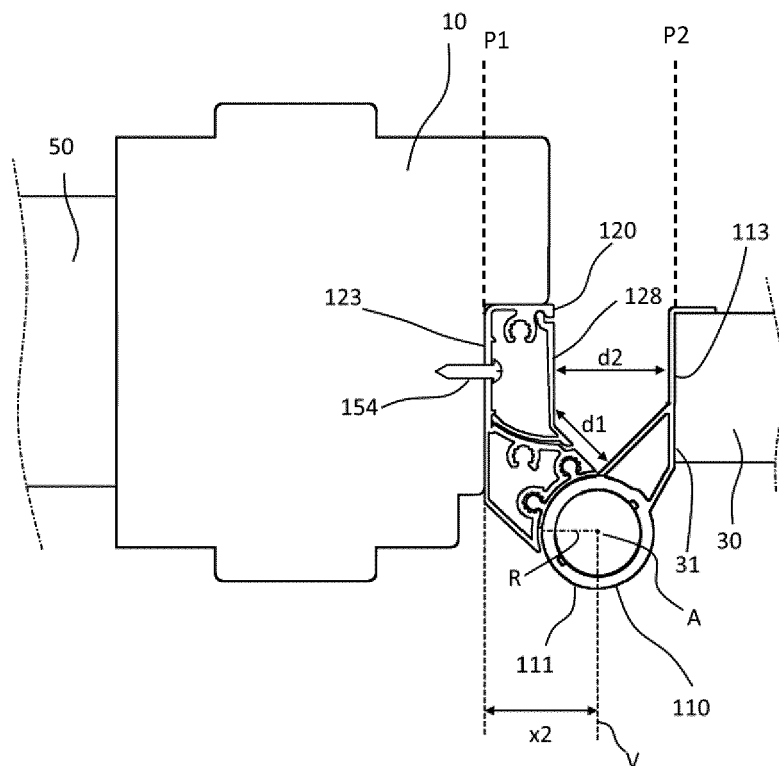


Fig. 2B



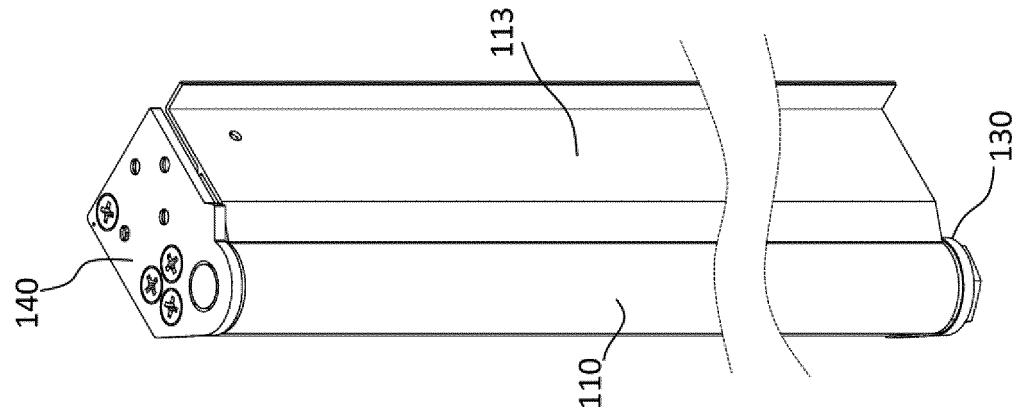


Fig. 3B

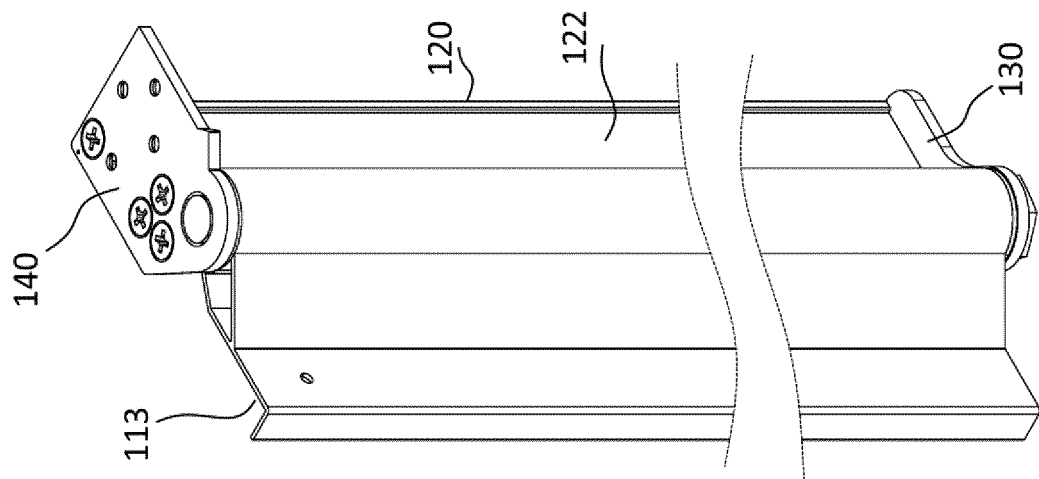


Fig. 3A

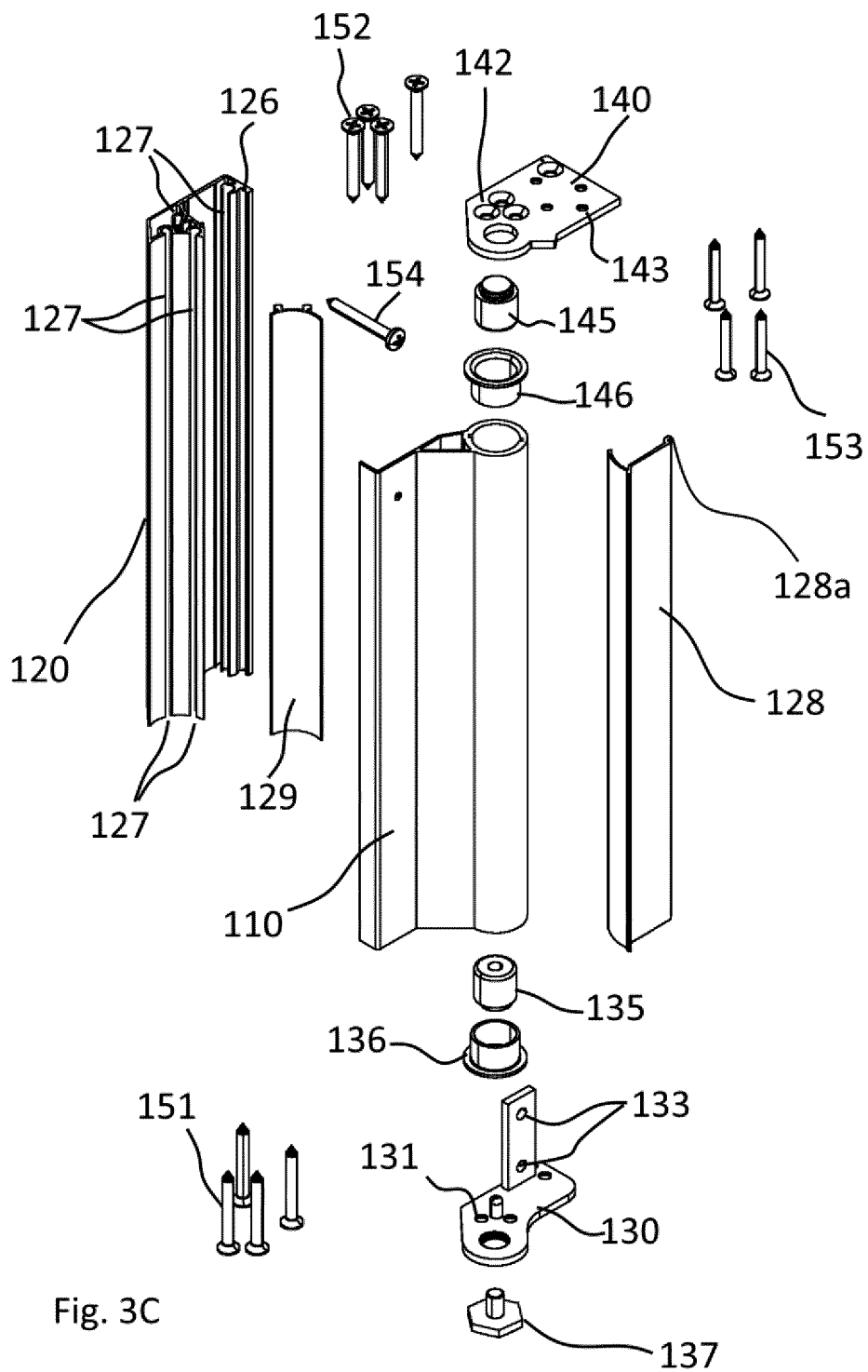


Fig. 3C

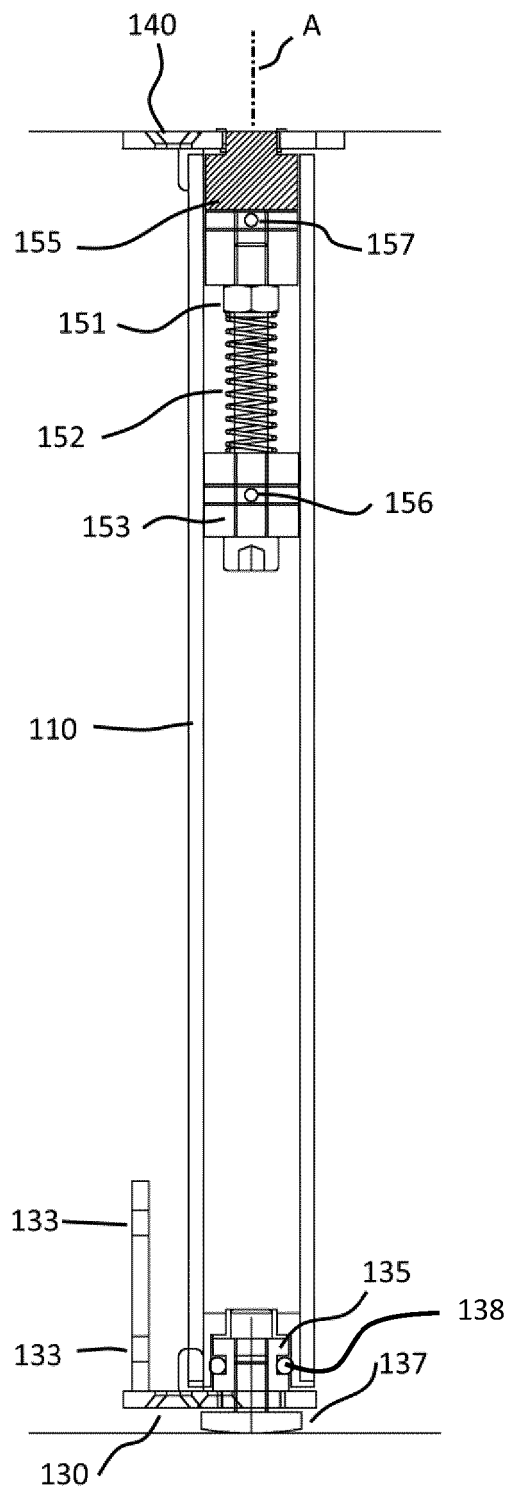


Fig. 4

Fig. 5A

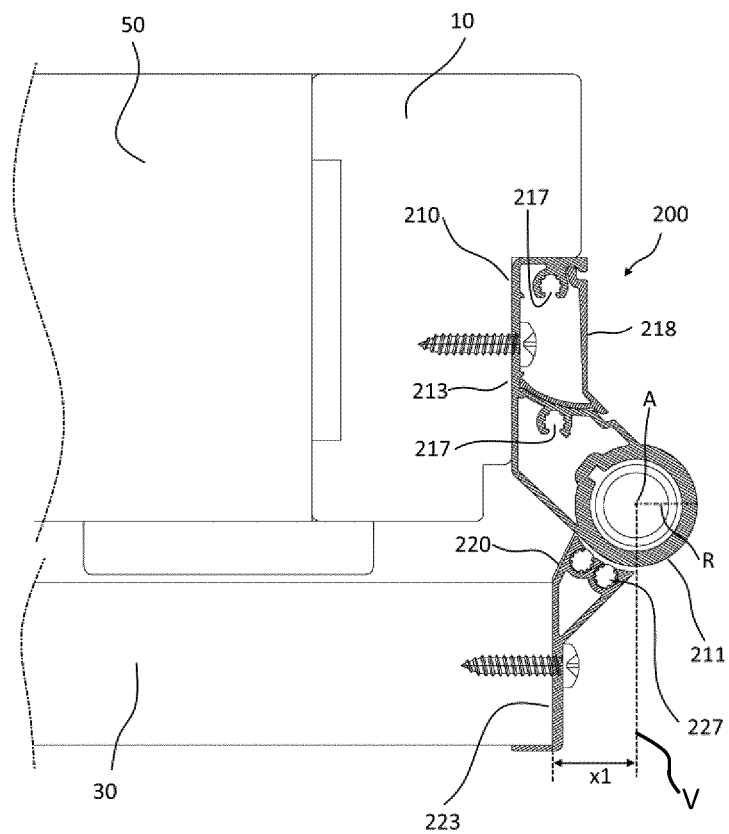
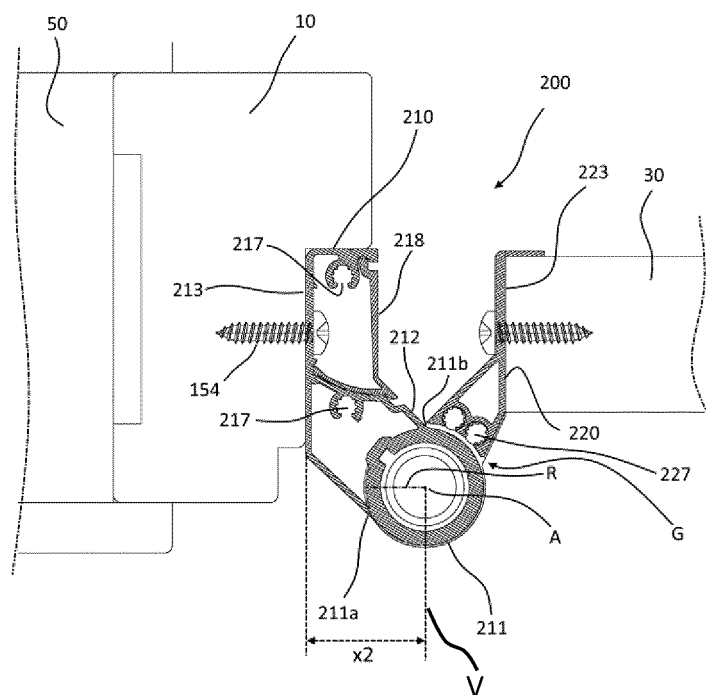


Fig. 5B



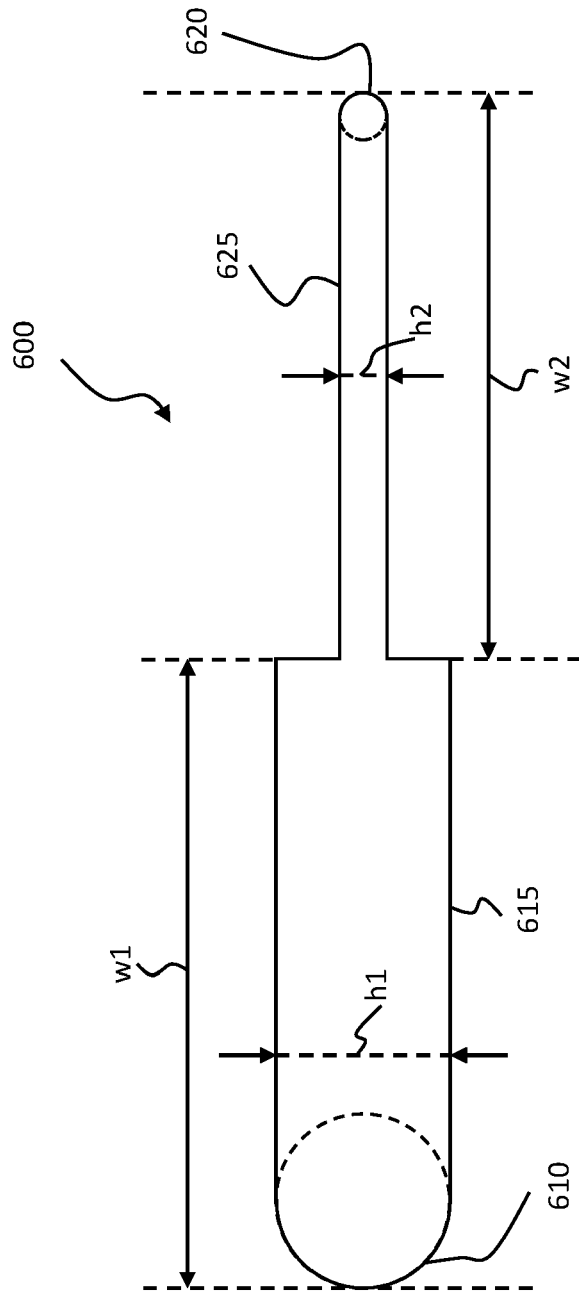


Fig. 6



EUROPEAN SEARCH REPORT

Application Number

EP 24 16 3233

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A	WO 2007/020424 A1 (SHIPLEY STEPHEN P [GB]) 22 February 2007 (2007-02-22) * page 12, line 13 - page 17, line 16; figures 1-6, 20 * -----	1-18	INV. E05D7/081
A	KR 101 353 485 B1 (AN YOU BAE [KR]) 20 January 2014 (2014-01-20) * figures 1-4 * -----	1-18	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 October 2024	Examiner Klemke, Beate
CATEGORY OF CITED DOCUMENTS			
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ON EUROPEAN PATENT APPLICATION NO.**

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

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