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(54) **Hinge particularly for a door or shutter**

(57) A hinge (1), particularly for a door, in particular of the reinforced type, or for a shutter, comprising two or more arc-like elements (3), which are approximately annular sector-shaped in plan view and are mutually stacked and slidingly associated; the two or more arc-like elements have means (10) which are adapted to limit their mutual sliding from a closed position, in which they are mutually superimposed, to an open position, in which they are mutually offset so as to determine as a whole, in plan view, an angle which can vary from approximately 180° to approximately 360°.

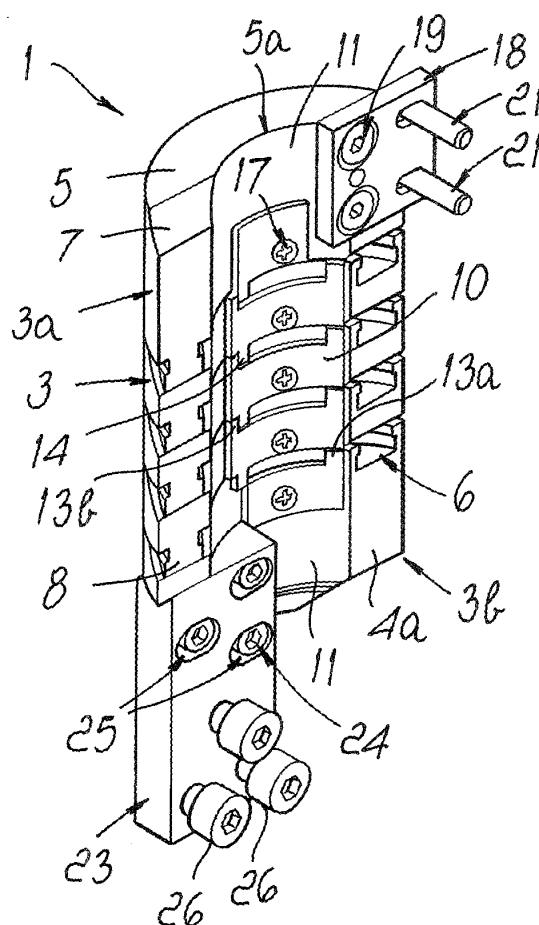


Fig. 4

Description

[0001] The present invention relates to a hinge particularly for a door, in particular of the reinforced type, or for a shutter.

[0002] Currently, one problem which is strongly felt in the field is the provision of a door which is substantially coplanar with respect to a frame which is associated with an opening to be closed.

[0003] Another problem observed in the background art is that the hinges that are used are usually visible, and this degrades the overall aesthetic appearance of the door.

[0004] In relation to the first problem, the product manufactured by the OIKOS company of Gruaro (VE) under the trademark SYNUA is known which provides a tilting opening action by way of the use of two pivots, which are arranged on a same vertical axis and protrude respectively from the upper horizontal edge and from the lower horizontal edge of the door; such two pivots protrude approximately at right angles from said edges and are inserted rotatably in appropriately provided cylindrical seats which are formed respectively in the upper cross-member of the frame and in the floor.

[0005] The door, when closed, lies approximately on the same plane of arrangement as the frame associated with the opening.

[0006] This known solution has drawbacks: there is a lack of airtightness, which can be obviated only partially by an optional addition of a draft excluder on the upper part of the door; there is also difficulty in mutually adjusting the door and the frame; there is also lack of safety, since the tilting system produces a lever effect which is dangerous for hands and feet; finally, the need to use this solution in the presence of openings which are significantly wider than the market standard and installation difficulties are observed.

[0007] A solution provided by the OIKOS company of Gruaro (VE) under the trademark SKURO is also known which, in order to achieve concealed pivoting for a blind, uses a hinge composed of a plurality of arc-like elements which are mutually associated so that they can slide one inside the other.

[0008] These arc-like elements can thus protrude partially from each other by means of a rotation so as to form as a whole, in plan view, an angle of slightly more than 90°.

[0009] The outermost and innermost arc-like elements are fixed, by means of their free end, respectively to a side of the shutter and to the bottom of an appropriately provided groove, which is approximately shaped like a parallelepiped and is formed in an upright of the frame.

[0010] Opening and closure of the shutter are therefore allowed by the telescopic sliding of the various arc-like elements inside each other; when the shutter is in the closed position, the hinge is approximately completely contained within the groove of the frame and is therefore hidden from sight, accordingly not affecting the overall

aesthetics of the building with which the shutter is associated.

[0011] However, these known types of hinge have drawbacks: in order to be able to provide adequate support to the shutter, they have large dimensions, such as to reduce significantly the clearance of the opening when the shutter is open.

[0012] Another drawback of these known types of hinge is that they do not allow to achieve the coplanar arrangement of the shutter with respect to the frame.

[0013] Further, the limited opening of the shutter entails possible breakages due to forced opening beyond the indicated limit.

[0014] The aim of the present invention is to solve the above-mentioned problems, eliminating the drawbacks of the cited background art, by providing a hinge which allows to obtain a door, particularly of the reinforced type, or a shutter which allows to achieve a coplanar condition with respect to the supporting frame and a concealed condition for the hinges.

[0015] Within this aim, an object of the invention is to provide a hinge whose application to a door or a shutter is very easy and quick.

[0016] Another object of the invention is to provide a hinge which allows to obtain a maximum opening angle of approximately 180°.

[0017] Another object of the invention is to provide a hinge which is structurally simple and has low manufacturing costs.

[0018] This aim and these and other objects, which will become better apparent hereinafter, are achieved by a hinge, particularly for a door, in particular of the reinforced type, or for a shutter, characterized in that it is constituted by two or more arc-like elements, which are approximately annular sector-shaped in plan view and are mutually stacked and slidingly associated, said two or more arc-like elements having means which are adapted to limit their mutual sliding from a closed position, in which they are mutually superimposed, to an open position, in which they are mutually offset so as to determine as a whole, in plan view, an angle which can vary from approximately 180° to approximately 360°.

[0019] The upper arc-like element and the lower arc-like element are provided with means for connection and fixing to a fixed surface of a frame and to said door or shutter.

[0020] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a particular but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figures 1, 2 and 3 are perspective views of a door to which a device according to the invention is applied, respectively in a closed position, in a partially open position, and in a fully open position;

Figures 4, 5 and 6 are respectively a perspective view, a plan view and a side view of the hinge ac-

cording to the invention in the closed condition; Figures 7, 8 and 9 are respectively a perspective view, a plan view and a side view of the hinge according to the invention in a partially open condition; Figures 10, 11 and 12 are respectively a perspective view, a plan view and a side view of the hinge according to the invention in the fully open condition; Figure 13 is an exploded perspective view of the hinge according to the invention; Figures 14, 15 and 16 are plan views of a detail of a door and of a frame to which the hinge according to the invention is applied, respectively in a closed position, in a partially open position, and in a fully open position; Figure 17 is a perspective view of a second embodiment of the hinge according to the invention in the closed condition; Figures 18 and 19 are respectively a top perspective view and a bottom perspective view of the hinge of Figure 17 in a partially open condition; Figure 20 is a top perspective view of the upper arc-like element which constitutes the hinge of Figure 17; Figure 21 is a perspective view of the lower arc-like element which constitutes the hinge of Figure 17; Figure 22 is a perspective view of an arc-like element which constitutes the hinge of Figure 17; Figure 23 is a plan view of the hinge of Figure 17; Figure 24 is a sectional view of the hinge of Figure 17, taken along the line XXIV-XXIV of Figure 23.

[0021] In the exemplary embodiments that follow, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0022] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0023] With reference to Figures 1 to 16, the reference numeral 1 designates a hinge, particularly for a door of the reinforced type or a shutter 2.

[0024] The hinge 1 is constituted advantageously by two or more arc-like elements 3; in the embodiment shown in the accompanying figures, at least two and for example five arc-like elements 3, having an approximately annular sector-like shape in plan view, have been considered; the arc-like elements are mutually stacked and are slidingly associated in pairs so that they can pass from a closed position (as in the accompanying Figures 4, 5 and 6), in which all of the arc-like elements 3 are exactly mutually superimposed, to a fully open position (as in the accompanying Figures 10, 11 and 12), in which the arc-like elements 3 are mutually offset so as to form, as a whole, in plan view, approximately a round angle.

[0025] Advantageously, tips, designated respectively by the reference numerals 4a and 4b, of each of the arc-like elements 3 are substantially flat and lie approximately

on mutually parallel planes (optionally also at a same plane).

[0026] Advantageously, the upper arc-like element, also designated by the reference numeral 3a, and the lower arc-like element, also designated by the reference numeral 3b, are higher than the other arc-like elements 3 which are interposed between them.

[0027] A guide 6 is provided on the upper surface 5 of the arc-like elements 3, except for the upper arc-like element 3a, and follows in plan view the shape of the respective arc-like element 3, affecting it over its entire longitudinal extension; the guide 6 preferably has an inverted-T cross-section along a transverse plane.

[0028] Advantageously but not necessarily, a first bevel which forms a first inclined plane 7 is provided on the upper surface 5 of the arc-like elements 3 at one of the two tips 4a or 4b thereof.

[0029] Advantageously, a complementarily shaped first tab 8 is slidingly associable within the guide 6 of each arc-like element 3 and protrudes approximately at right angles from the lower surface of the arc-like elements 3, except for the lower arc-like element 3b.

[0030] The tabs 8 therefore are approximately annular sector-shaped in plan view and have an approximately inverted-T cross-section, along a transverse plane, which is shaped complementarily with respect to the guide 6.

[0031] Advantageously, a second bevel, which forms a second inclined plane 9, is provided on the lower surface, not shown in the accompanying figures, of the tabs 8, at the tip of the arc-like element 3 which lies opposite the end provided with the first inclined plane 7.

[0032] The arc-like elements 3 are provided with means which are adapted to limit mutual sliding, such as stroke limits which are suitable to prevent them from mutually separating during their mutual rotations.

[0033] Such means are constituted preferably by plates 10, which have an arc-like profile which partially follows the profile of the inner lateral surface 11 of the respective arc-like element 3 and a height which is approximately equal thereto; each plate 10 is fixed to the respective inner lateral surface 11 by way of appropriately provided fixing means, such as for example a first screw 17.

[0034] Advantageously, the plates 10 are approximately U-shaped and have a first approximately rectangular base 12, from the transverse ends of which two arms, designated respectively by the reference numerals 13a and 13b, protrude preferably toward the arc-like element 3 that lies above the one with which the plate 10 is associated; the ends of said arms are preferably arranged approximately flush with the upper perimetric edge 5a of the upper surface 5.

[0035] Advantageously, proximate to one of the two transverse ends of the plate 10, a second tab 14 protrudes approximately at right angles and on the opposite side with respect to the arms 13a and 13b and is shaped so as to protrude below the arc-like element 3, so as to

be arranged slidably, during use, between the space formed between the arms 13a and 13b of the underlying plate 10 which is associated with the underlying arc-like element 3; the abutment of the second tab 14 against the arms 13a and 13b, between which said tab is arranged slidably, acts as a stroke limit both for opening and for closure for the mutual sliding of the arc-like elements 3.

[0036] The position of the second tab 14, respectively proximate to one transverse end or the other of the plate 10, determines the opening direction of the hinge 1; in the examples shown in Figures 1 to 16, the second tab 14 is arranged proximate to the left transverse end of the respective plate 10 and therefore determines, for the hinge 1, a clockwise opening direction.

[0037] Advantageously but not necessarily, the plate 10 associated with the upper arc-like element 3a is not provided with the arms 13a and 13b.

[0038] Advantageously but not necessarily, the plate 10 associated with the lower arc-like element 3b is not provided with the tab 14.

[0039] The plate 10 associated with the lower arc-like element 3b further preferably but not necessarily has only one of the arms 13a and 13b, and in particular the arm arranged on the opposite side with respect to the tab 14 of the overlying plate 10 associated with the overlying arc-like element 3; the closure stroke limit for the arc-like element 3 which is arranged directly above the arc-like element 3b is in fact provided by the abutment of the arc-like element 3 against an upright 27 of a frame 28 which can be associated with the perimetric edge of an opening, not shown in the accompanying figures, to be closed by means of the door or shutter 2.

[0040] The upper arc-like element 3a and the lower arc-like element 3b are provided with appropriate means for connection and fixing to a surface, which comprise a first coupling plate 18 which is substantially square in plan view and is fixed to the tip, of the tips 4a, 4b of the upper arc-like element 3a, that lies furthest from the second tab 14 of the plate 10 associated with the arc-like element 3a; in the embodiment shown in Figures 1 to 16, this is the tip designated by the reference numeral 4a.

[0041] The first coupling plate 18 is fixed to the upper arc-like element 3a preferably by means of appropriately provided second screws 19, for example of the Allen type.

[0042] Advantageously, two or more first horizontally elongated slots 20 are formed in the first coupling plate 18, and appropriately provided third screws 21 can be associated therewith and are adapted to fix the hinge 1 for example to a first internal surface 22 which is formed in an appropriately provided seat 40 formed in one of the sides 33 of the door or shutter 2.

[0043] Advantageously, such means for connection and fixing to a surface further comprise a second coupling plate 23, which has a substantially rectangular plan shape and is fixed to the transverse end 4b of the lower arc-like element 3b, on the opposite side with respect to the first coupling plate 18; advantageously, the second

coupling plate 23 is fixed to the respective lower arc-like element 3b by means of appropriately provided fourth screws 24, for example of the Allen type, which are inserted in appropriately provided second horizontally elongated slots 25 which allow to adjust the horizontal position of the second coupling plate 23 with respect to the respective lower arc-like element 3b.

[0044] Advantageously, fifth screws 26 are associated with the second coupling plate 23 and are adapted to allow the fixing of said second coupling plate to an upright 27 of a frame 28 which can be associated with the perimetric edge of an opening, not shown in the accompanying figures, to be closed by means of the door or shutter 2.

[0045] The upright 27 is constituted preferably by a first profiled element 29, which is approximately S-shaped in plan view so as to form a second end face 30, which is approximately flat and, when the hinge 1 is in the closed position, faces and is substantially parallel to the side 33 of the door or shutter 2 in which the seats 40 are formed.

[0046] A first wing 31 and a second wing 32 extend from the ends of the second end face 30 approximately at right angles and on mutually opposite sides.

[0047] One or more openings 34 are formed on the second end face 30, at the seats 40 formed in the side 33 of the door or shutter 2, preferably have an approximately rectangular plan shape, and have such dimensions as to allow the passage of the arc-like elements 3 and of the second coupling plate 23 of the hinge 1.

[0048] The hinge therefore can be associated with the upright 27 by fixing the second coupling plate 23 to the second wing 32 of said upright by means of the fifth screws 26.

[0049] Advantageously, a second profiled element 35 which is approximately C-shaped in plan view is associated to the second wing 32 on the opposite side with respect to the second coupling plate 23.

[0050] Operation is therefore as follows: with reference to Figures 1 to 16, two or more hinges 1 can be associated for example with a door or shutter 2 by fixing the first coupling plate 18 of the hinges 1, by means of the third screws 21, to the first internal surface 22 which is formed in the appropriately provided seat 40 formed in one of the sides 33 of the door or shutter 2; the horizontal position of the door or shutter 2 with respect to the hinge 1 can be adjusted thanks to the presence of the first slots 20.

[0051] The second coupling plate 23 of each hinge 1 is then inserted in the opening 34 of the upright 27 which is located at the seat 40 formed in the door or shutter 2 with which the hinge 1 is associated; the hinge 1 is then fixed to the second wing 32 of the upright 27 by means of the fifth screws 26.

[0052] As shown in Figures 1 and 14, when the door or shutter 2 is in the closed position, all the arc-like elements 3 are exactly mutually superimposed and the hinge 1 is completely hidden from view.

[0053] Further, the door or shutter 2 lies approximately on the same plane of arrangement as the frame 28.

[0054] By turning the door or shutter 2 in the direction for opening it, the various arc-like elements 3 slide with respect to each other, mutually rotating until the second tab 14 of the plate 10 thereof abuts against the arm, of the arms 13a or 13b of the underlying plate 10, that lies at the transverse end which is opposite to the one provided with the second tab 14.

[0055] The position of the arms 13a and 13b and of the second tab 14 of the plates 10 is such that in the fully open position of the hinge 1 the arc-like elements 3 form in plan view, as a whole, approximately a round angle; in said fully open position, the first and second plates of the hinge 1 are advantageously approximately mutually parallel and mutually spaced.

[0056] In the fully open condition of the hinge 1, the door or shutter 2 is rotated through 180° with respect to when it is in the closed position, thus allowing full use of the clearance of the opening, not shown in the accompanying figures, to be closed by means of the door or shutter 2.

[0057] It has thus been found that the invention has achieved the intended aim and objects, a hinge, particularly for a door or shutter, having been devised which provides a safe and reliable support to said door or shutter while maintaining small radial dimensions; in this way, the hinge according to the invention reduces only by a very limited amount the passage clearance of the opening to be closed by means of said door or shutter.

[0058] Further, thanks to the presence of the first and second coupling plates and of the screws associated with them, the application of a hinge according to the invention to a door or shutter and to a frame is very easy and quick.

[0059] Moreover, the hinge according to the invention allows to obtain a full opening angle of the door or shutter of 180°, so as to be able to use the entire useful clearance of the opening.

[0060] Moreover, the hinge according to the invention is fully concealed from view in the closed condition of the door or shutter to which it is applied and therefore does not affect the overall aesthetics of the building to which said door or shutter is fixed.

[0061] Moreover, the hinge according to the invention allows to arrange the door or shutter, in their closed condition, on the same plane of arrangement as the frame, with a consequent additional benefit for the overall aesthetics of the building with which the door or shutter is associated.

[0062] Further, the production costs of the hinge according to the invention remain low, since it is provided only by means of components which are easy to manufacture and/or assemble.

[0063] The invention is of course susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0064] Thus, for example, with reference to Figures 17 to 24, a hinge 101 is shown particularly for a door of the

reinforced type or for a shutter, which are not shown in the accompanying figures.

[0065] The hinge 101 is constituted advantageously by two or more arc-like elements 103; in the embodiment shown in Figures 17 to 24, five arc-like elements 103, which are approximately annular sector-shaped in plan view, have been considered, such elements being mutually stacked and being slidably associated in pairs so that they can pass from a closed position (as in Figure 17), in which all of the arc-like elements 103 are exactly mutually superimposed, to a fully open position, in which the arc-like elements 103 are mutually offset so as to form as a whole, in plan view, approximately a round angle.

[0066] Advantageously, the upper arc-like element, also designated by the reference numeral 103a, and the lower arc-like element, also designated by the reference numeral 103b, are higher than the other arc-like elements 103 which are interposed between them.

[0067] A guide 106 is provided on the upper surface 105 of the arc-like elements 103, except for the upper arc-like element 103a, and follows, in plan view, the shape of the respective arc-like element 103, affecting it along its entire longitudinal extension; the guide 106 has a preferably approximately inverted-T shaped cross-section along a transverse plane.

[0068] Advantageously, a complementarily shaped first tab 108 is slidably associable within the guide 106 of each arc-like element 103 and protrudes approximately at right angles from the lower surface of the arc-like elements 103, except for the lower arc-like element 103b.

[0069] The tabs 108 are therefore shaped, in plan view, approximately like an annular sector, and have an approximately inverted-T shaped cross-section, along a transverse plane, which is shaped complementarily with respect to the guide 106.

[0070] The arc-like elements 103 are provided with means which are adapted to limit mutual sliding, such as stroke limits which are suitable to prevent them from mutually separating during their mutual rotations.

[0071] Advantageously, such means comprise third slots 150, which are formed on the lower surface of the first tabs 108 which during use is directed toward the bottom of the guide 106 of the respective underlying arc-like element 103; the slots have an arc-like shape which follows the shape of the corresponding first tab 108; conveniently, the third slots 150 have, at their tips, two wider regions, designated by the reference numerals 151a and 151b, which have a polygonal and advantageously circular shape in plan view.

[0072] Advantageously, a first through hole 152 is formed in the arc-like elements 103, except for the upper arc-like element 103a, along an axis which is perpendicular to the plane of arrangement of the arc-like elements 103.

[0073] Advantageously, the first holes 152 of the various arc-like elements 103, including the hole of the lower arc-like element 103b, in the closed condition of the hinge

101 are substantially mutually aligned.

[0074] Advantageously, in the arc-like elements 103 arranged in an intermediate position the first hole 152 is formed at one of the wider regions 151a or 151b provided at the ends of the third slots 150, so that said first hole 152 passes through the first tab 108 and ends at the bottom of the respective guide 106.

[0075] Advantageously, in the lower arc-like element 103b the first hole 152 is formed starting from the lower surface of the lower arc-like element 103b and ends at the bottom of the guide 106 formed in said arc-like element.

[0076] The position of the first holes 152, respectively proximate to the wider regions 151a or 151b, determines the opening direction of the hinge 101; in the examples shown in Figures 17 to 24, the holes 152 are arranged at the left wider region 151b and therefore determine, for the hinge 101, a clockwise opening direction.

[0077] Advantageously, second through holes 153 which intersect transversely the contiguous first hole 152 are formed along an axis which is perpendicular to the first holes 152 and proximate to their end which lies on the lower surface of the arc-like element 103 which lies opposite the surface of arrangement of the guide 106.

[0078] Advantageously, such means adapted for limiting the mutual sliding of the arc-like elements 103 comprise appropriately provided pins 154, which are preferably cylindrical and can be inserted axially within the first holes 152 and can be locked therein by means of appropriately provided grubs 155, which can be inserted by pushing within the second holes 153; advantageously, the pins 154 protrude with their upper end approximately at right angles from the bottom of the guide 106 of the respective arc-like element 103 and enter slidingly the third slot 150 of the overlying arc-like element 103.

[0079] The abutment of the pins 154 against the ends of the third slot 150 of the overlying arc-like element 103 acts as a stroke limit, both for opening and for closure, for the mutual sliding of the arc-like elements 103.

[0080] The upper arc-like element 103a and the lower arc-like element 103b are provided with appropriate means for connection and fixing to a surface which are constituted by two recesses 156a, 156b, which are formed at one end, and along part of their height, of the upper arc-like element 103a and the lower arc-like element 103b; a first lateral abutment surface 157a and a second lateral abutment surface 157b are thus formed which are mutually parallel and substantially perpendicular to the plane of arrangement of the guides 106.

[0081] Advantageously, along an axis which is approximately perpendicular to the first lateral abutment surface 157a formed in the upper arc-like element 103a there are one or more third through holes 158, within which a corresponding number of sixth screws, not shown in the accompanying figures, can be inserted; said screws are adapted to fix the hinge 101 to an appropriately provided support, not shown in the accompanying figures, which is associated with a side of a door or shutter, again not

shown.

[0082] Advantageously, along an axis which is approximately perpendicular to the second lateral abutment surface 157b formed in the lower arc-like element 103b there are one or more fourth through holes 159, within which a corresponding number of seventh screws, not shown in the accompanying figures, can be inserted; said screws are adapted to fix the hinge 101 to a frame, not shown in the accompanying figures, which can be associated with the perimetric edge of an opening, again not shown, to be closed by means of said door or shutter.

[0083] The operation of the hinge 101 is substantially similar to the operation of the hinge 1 described with reference to Figures 1 to 16.

[0084] The materials used, as well as the dimensions that constitute the individual components of the invention, may be more pertinent according to specific requirements.

[0085] The various means for performing certain different functions need not certainly coexist only in the illustrated embodiments but can be present per se in many embodiments, including ones that are not illustrated.

[0086] The characteristics indicated as advantageous, convenient or the like may also be omitted or be replaced with equivalents.

[0087] The disclosures in Italian Patent Application No. TV2006A000034 from which this application claims priority are incorporated herein by reference.

[0088] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A hinge, particularly for a door, in particular of the reinforced type, or for a shutter, **characterized in that** it is constituted by two or more arc-like elements, which are approximately annular sector-shaped in plan view and are mutually stacked and slidingly associated, said two or more arc-like elements having means which are adapted to limit their mutual sliding from a closed position, in which they are mutually superimposed, to an open position, in which they are mutually offset so as to determine as a whole, in plan view, an angle which can vary from approximately 180° to approximately 360°.
2. The hinge according to claim 1, **characterized in that** it comprises an upper arc-like element and a lower arc-like element, said upper and lower arc-like elements being provided with means for connection and fixing to a fixed surface of a frame and to said door or shutter.

3. The hinge according to claims 1 and 2, **characterized in that** the tips of each of said arc-like elements are substantially flat and lie approximately on mutually parallel planes.
4. The hinge according to claims 1 and 2, **characterized in that** the tips of each of said arc-like elements are substantially flat and lie at a same plane.
5. The hinge according to one or more of the preceding claims, **characterized in that** at least one additional arc-like element is arranged between said upper arc-like element and said lower arc-like element.
6. The hinge according to one or more of the preceding claims, **characterized in that** said upper arc-like element and said lower arc-like element are higher than the remaining arc-like elements which constitute said hinge.
7. The hinge according to one or more of the preceding claims, **characterized in that** a guide is formed on the upper surface of said two or more arc-like elements, except for said upper arc-like element, has the same shape and affects the entire longitudinal extension of said arc-like element.
8. The hinge according to claims 1 and 7, **characterized in that** said guide preferably has an approximately inverted-T cross-section along a transverse plane.
9. The hinge according to one or more of the preceding claims, **characterized in that** a complementarily shaped first tab is slidingly associable within said guide of each of said two or more arc-like elements and protrudes approximately at right angles from the lower surface of an additional one of said arc-like elements except for said lower arc-like element.
10. The hinge according to claims 1 and 9, **characterized in that** said tabs are approximately annular sector-shaped in plan view and have an approximately inverted-T cross-section along a transverse plane.
11. The hinge according to one or more of the preceding claims, **characterized in that** said means adapted to limit the mutual sliding of said arc-like elements comprise stroke limits which are suitable to prevent said arc-like elements from mutually separating axially from each other during their mutual rotations.
12. The hinge according to claims 1 and 11, **characterized in that** said means adapted to limit mutual sliding are constituted by at least one plate, which has an arc-like profile which partially follows the profile of the inner lateral surface of the respective arc-like element and a height which is approximately equal thereto, each of said plates being fixed to said inner lateral surface by way of appropriately provided fixing means.
13. The hinge according to claims 1 and 12, **characterized in that** said plates are approximately U-shaped and have a first end face, which has an approximately rectangular plan shape and from the transverse ends of which two arms protrude, preferably toward the arc-like element which lies above the one with which said plate is associated.
14. The hinge according to claims 1 and 13, **characterized in that** the ends of said arms lie approximately flush with the upper perimetric edge of said upper surface.
15. The hinge according to one or more of the preceding claims, **characterized in that** a second tab protrudes proximate to one of the two transverse ends of said plate, approximately at right angles and on the opposite side with respect to said arms, and is shaped so as to protrude below said arc-like element, so as to be arranged slidingly, during use, between the space formed between the arms of an underlying plate which is associated with an underlying arc-like element.
16. The hinge according to claims 1 and 15, **characterized in that** the abutment of said second tab against said arms between which said tab is slidingly positioned acts as a stroke limit, both for opening and for closure, for the mutual sliding of said arc-like elements.
17. The hinge according to claims 1 and 16, **characterized in that** the position of said second tab, respectively proximate to one transverse end or the other of said plate, determines the clockwise or counter-clockwise opening direction of said hinge.
18. The hinge according to one or more of the preceding claims, **characterized in that** said plate associated with said upper arc-like element does not have said arms.
19. The hinge according to one or more of the preceding claims, **characterized in that** said plate associated with said lower arc-like element does not have said tab.
20. The hinge according to one or more of the preceding claims, **characterized in that** said plate associated with said lower arc-like element has only one of said arms.
21. The hinge according to claims 1 and 20, **characterized in that** said plate associated with said lower

arc-like element has only the arm, of said arms, which is arranged on the opposite side with respect to the tab of the overlying plate which is associated with the overlying arc-like element.

22. The hinge according to claims to 1 and 21, **characterized in that** the closure stroke limit for the one of said arc-like elements which is associated above said lower arc-like element is determined by the abutment of said arc-like element with an upright of said frame which can be associated with the perimetric edge of an opening to be closed with said door or shutter.
23. The hinge according to one or more of the preceding claims, **characterized in that** said means for connection and fixing to a surface comprise a first coupling plate, which has a substantially square plan shape and is fixed to the tip of said tips of said upper arc-like element which lies furthest from the second tab of said plate which is associated with said arc-like element.
24. The hinge according to claims 1 and 23, **characterized in that** said first coupling plate is fixed to said upper arc-like element by way of known fixing means, such as preferably second screws, for example of the Allen type.
25. The hinge according to claims 1 and 24, **characterized in that** two or more horizontally elongated first slots are provided in said first coupling plate, third screws being associable therewith and being adapted for fixing said hinge to a first internal surface formed in an appropriately provided seat formed in one of the sides of said door or shutter.
26. The hinge according to one or more of the preceding claims, **characterized in that** said means for connection and fixing to a surface comprise a second coupling plate, which has a substantially rectangular plan shape and is fixed to the transverse end of said lower arc-like element on the opposite side with respect to said first coupling plate.
27. The hinge according to claims 1 and 26, **characterized in that** said second coupling plate is fixed to said lower arc-like element by way of known fixing means, such as preferably fourth screws, for example of the Allen type, which are inserted in second slots which are preferably elongated horizontally.
28. The hinge according to claims 1 and 27, **characterized in that** fifth screws are associated with said second coupling plate and are adapted to allow the fixing of said coupling plate to said upright of said frame.

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29. The hinge according to one or more of the preceding claims, **characterized in that** said upright is constituted by a first profiled element, which is approximately S-shaped in plan view so as to form a second approximately flat end face which, when said hinge is in the closed position, faces and is substantially parallel to a said side of said door or shutter, a first wing and a second wing protruding respectively from the ends of said second end face approximately at right angles and on mutually opposite sides, one or more openings being formed in said second end face, at said seats formed in said side of said door or shutter, said openings having such dimensions as to allow the passage of said arc-like elements and of said second coupling plate.
30. The hinge according to claims 1 and 29, **characterized in that** said second coupling plate can be associated with said upright by fixing it to said second wing by way of said fifth screws.
31. The hinge according to claims 1 and 30, **characterized in that** a second profiled element which is approximately C-shaped in plan view is associated with said second wing on the opposite side with respect to said second coupling plate.
32. The hinge according to one or more of the preceding claims, **characterized in that** it is constituted by five of said arc-like elements.
33. The hinge according to one or more of the preceding claims, **characterized in that** a first bevel which forms a first inclined plane is provided on said upper surface of said arc-like elements at one of their two tips.
34. The hinge according to one or more of the preceding claims, **characterized in that** a second bevel which forms a second inclined plane is provided on the lower surface of said tabs at the tip of said arc-like element which lies opposite the end provided with said first inclined surface.
35. The hinge according to one or more of the preceding claims, **characterized in that** said means adapted to limit the mutual sliding of said arc-like elements comprise third slots, which are formed on the lower surface of said first tabs which, during use, is directed toward the bottom of said guide of said respective underlying arc-like element, and have an arc-like shape which follows the shape of said corresponding first tab.
36. The hinge according to claims 1 and 35, **characterized in that** said third slots have two wider regions at their tips.

37. The hinge according to claims 1 and 36, **characterized in that** said wider regions have a polygonal and advantageously circular plan shape.
38. The hinge according to one or more of the preceding claims, **characterized in that** a first through hole is formed in said arc-like elements, except for said upper arc-like element, along an axis which is perpendicular to the plane of arrangement of said arc-like elements.
39. The hinge according to claims 1 and 38, **characterized in that** said first holes of said arc-like elements are substantially mutually aligned in the closed condition of said hinge.
40. The hinge according to claims 1 and 39, **characterized in that** said first hole, in said arc-like elements arranged in an intermediate position, is provided at one of said wider regions provided at said ends of said third slots, said first hole crossing said first tab and ending at the bottom of said respective guide.
41. The hinge according to claims 1 and 40, **characterized in that** said first hole, in said lower arc-like element, is provided starting from the lower surface of said lower arc-like element and ends at the bottom of said guide which is formed therein.
42. The hinge according to one or more of the preceding claims, **characterized in that** the position of said first holes, respectively proximate to said wider regions, determines the clockwise or counterclockwise opening direction of said hinge.
43. The hinge according to one or more of the preceding claims, **characterized in that** second through holes are formed along an axis which is perpendicular to said first holes and proximate to their end which lies on said lower surface of said arc-like element which lies opposite the surface on which said guide is arranged, said holes intersecting transversely said contiguous first hole.
44. The hinge according to one or more of the preceding claims, **characterized in that** said means adapted to limit the mutual sliding of said arc-like elements comprise pins which can be inserted axially within said first holes and can be locked therein by way of appropriately provided grubs which can be inserted by pushing into said second holes, said pins protruding with their upper end approximately at right angles from said bottom of said guide of said respective arc-like element and being inserted slidingly in said third slot of said overlying arc-like element.
45. The hinge according to claims 1 and 44, **characterized in that** the abutment of said pins against said ends of said third slot of said overlying arc-like element acts as a stroke limit both for opening and for closure for the mutual sliding of said arc-like elements.
46. The hinge according to one or more of the preceding claims, **characterized in that** said means for connection and fixing to a surface are constituted by two recesses, which are formed at one end and along part of their height respectively of said upper arc-like element and of said lower arc-like element, said recesses forming respectively a first lateral abutment surface and a second lateral abutment surface which are mutually parallel and are substantially perpendicular to the plane of arrangement of said guides.
47. The hinge according to claims 1 and 46, **characterized in that** one or more third through holes are formed along an axis which is approximately perpendicular to said first lateral abutment surface formed in said upper arc-like element, sixth screws being insertable therein and being adapted to fix said hinge to a support which is associated with said side of said door or shutter.
48. The hinge according to claims 1 and 47, **characterized in that** one or more fourth through holes are formed along an axis which is approximately perpendicular to said second lateral abutment surface formed in said lower arc-like element and seventh screws adapted to fix said hinge to said frame can be inserted in said holes.

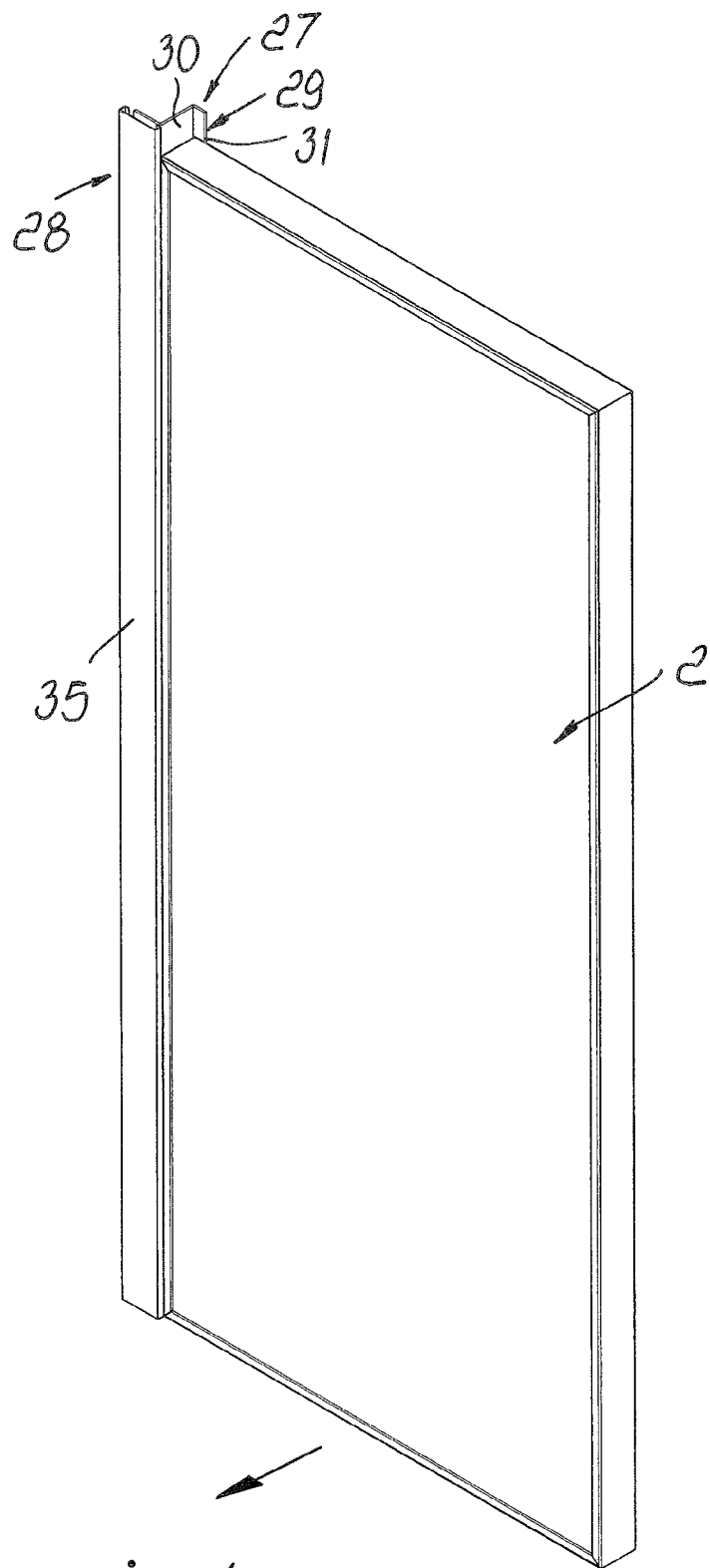


Fig. 1

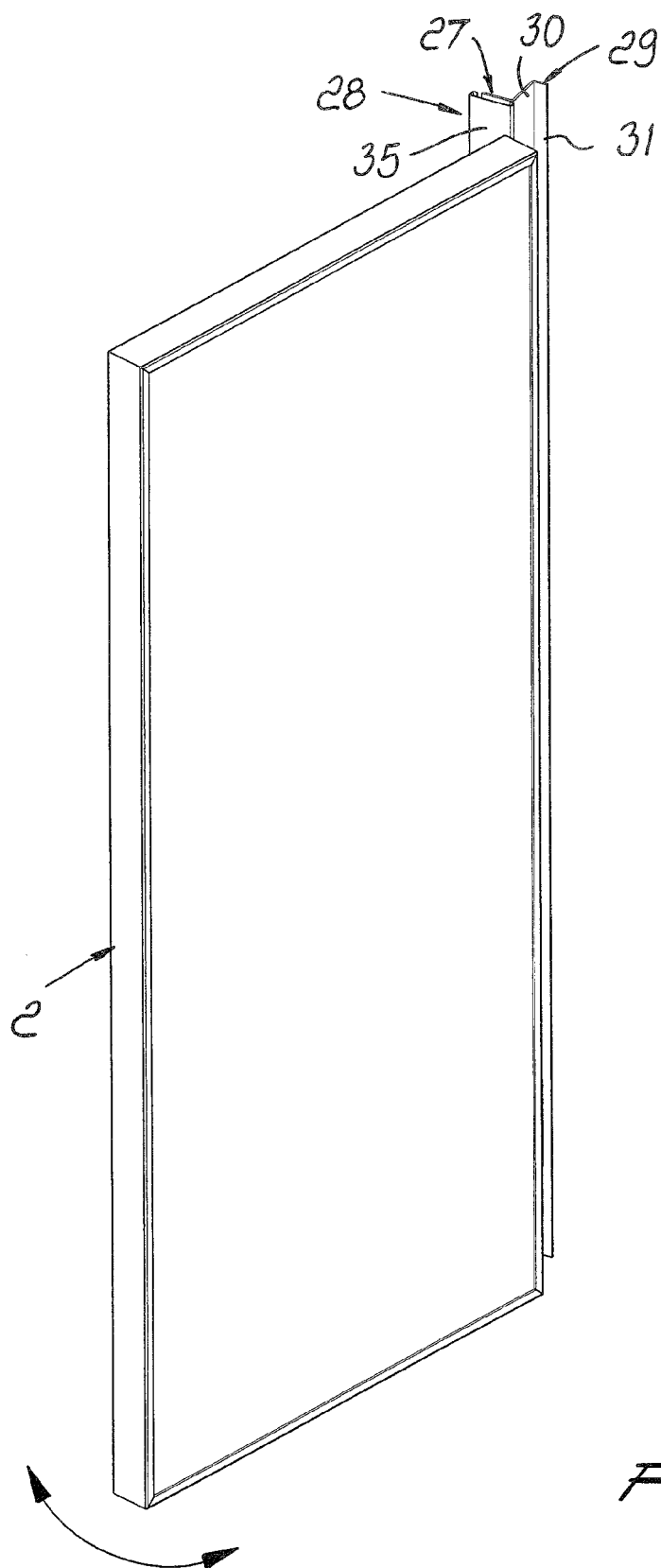


Fig. 2

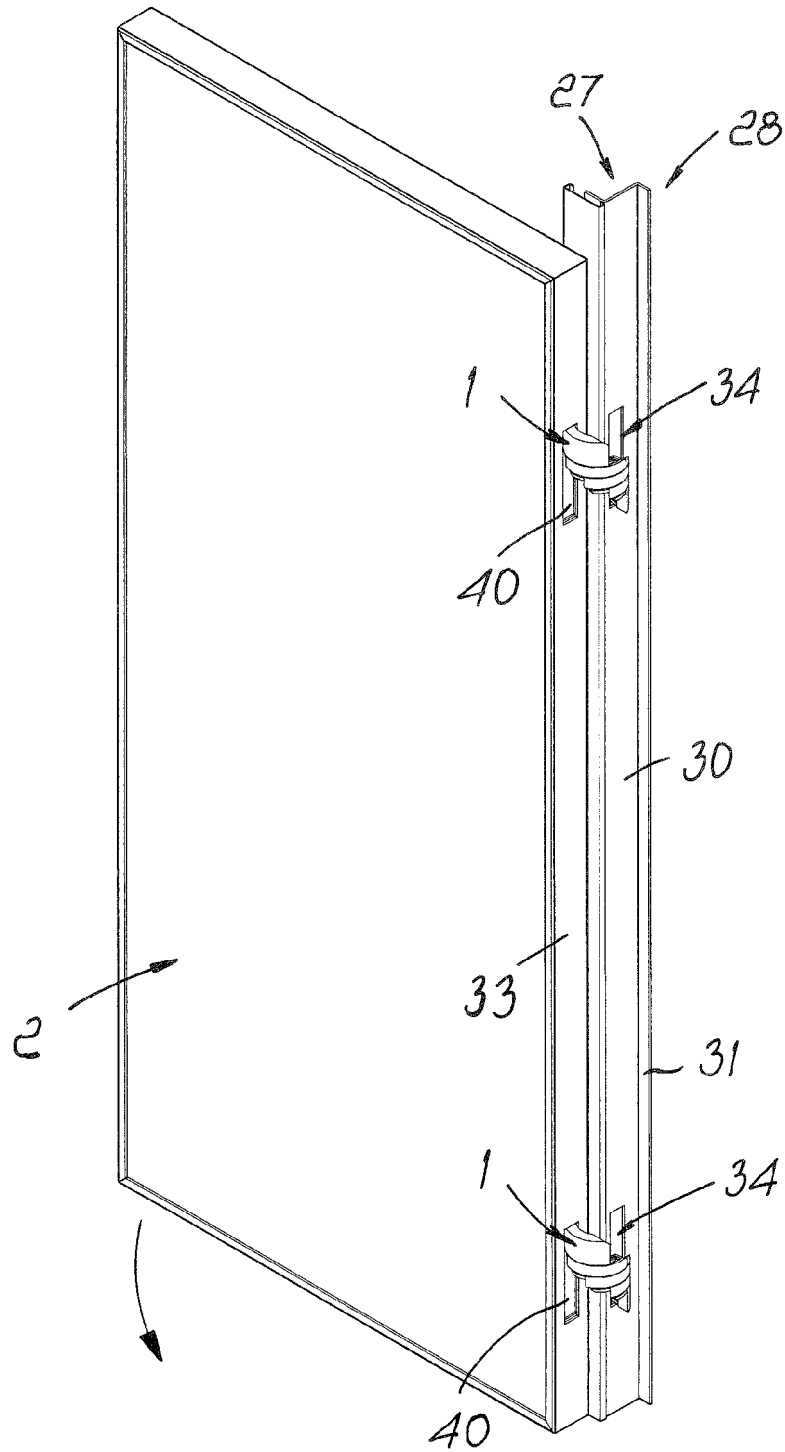
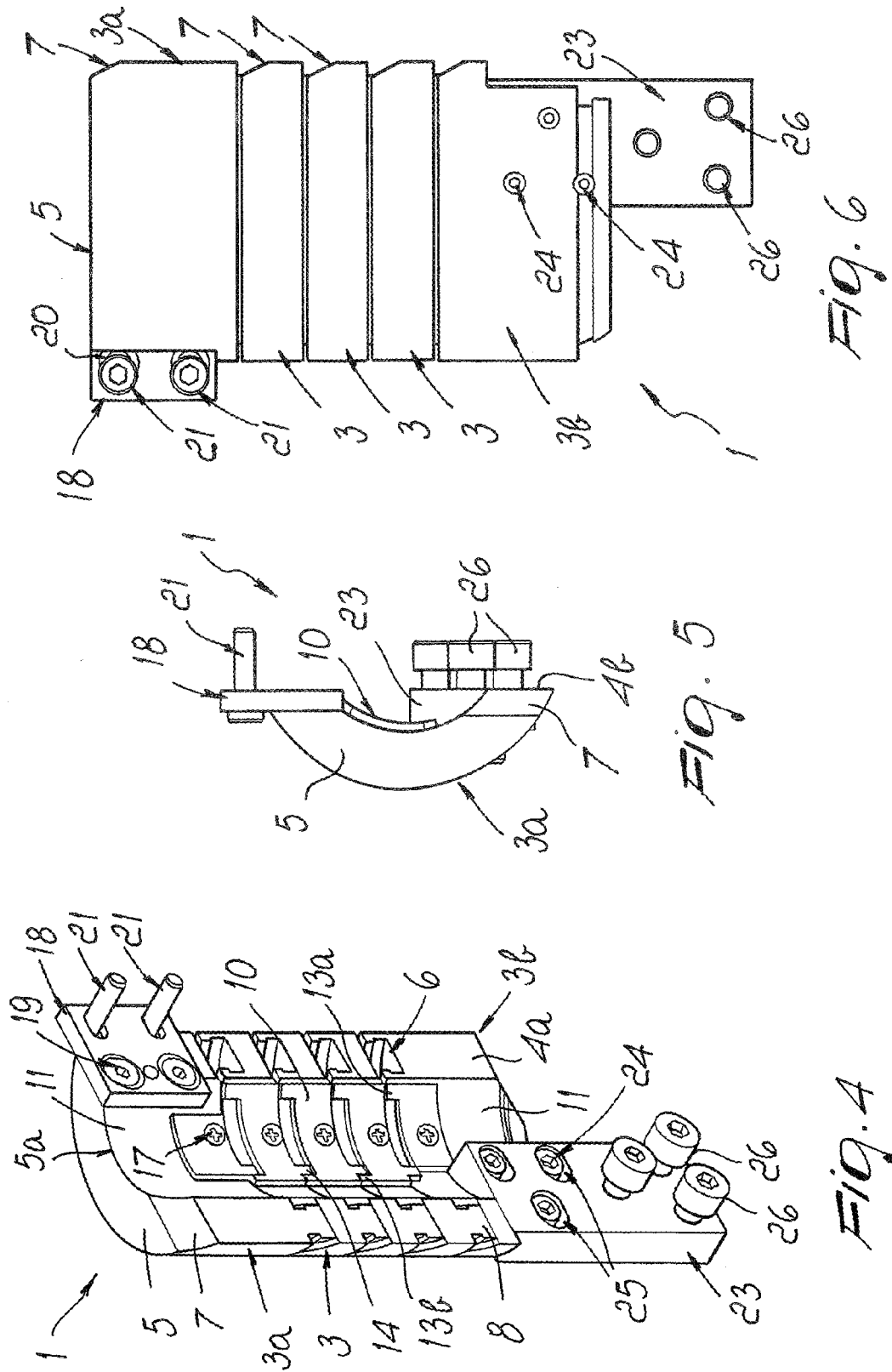


Fig. 3



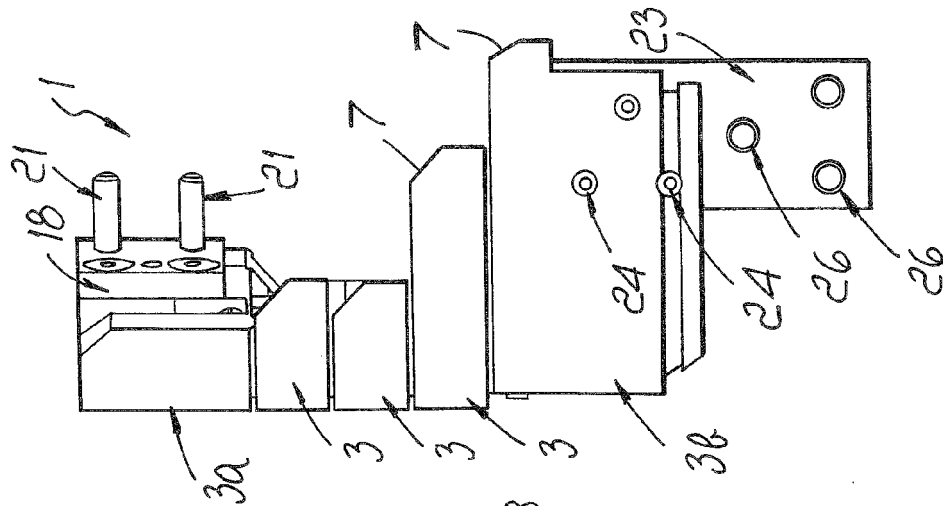


Fig. 9

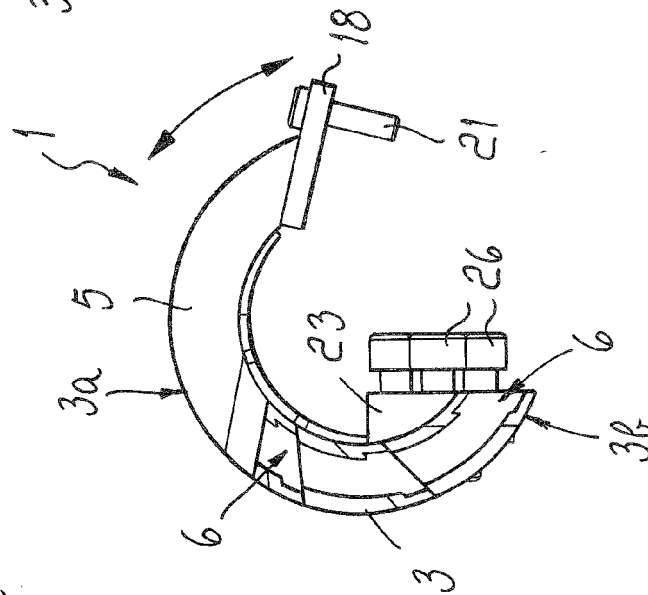


Fig. 8

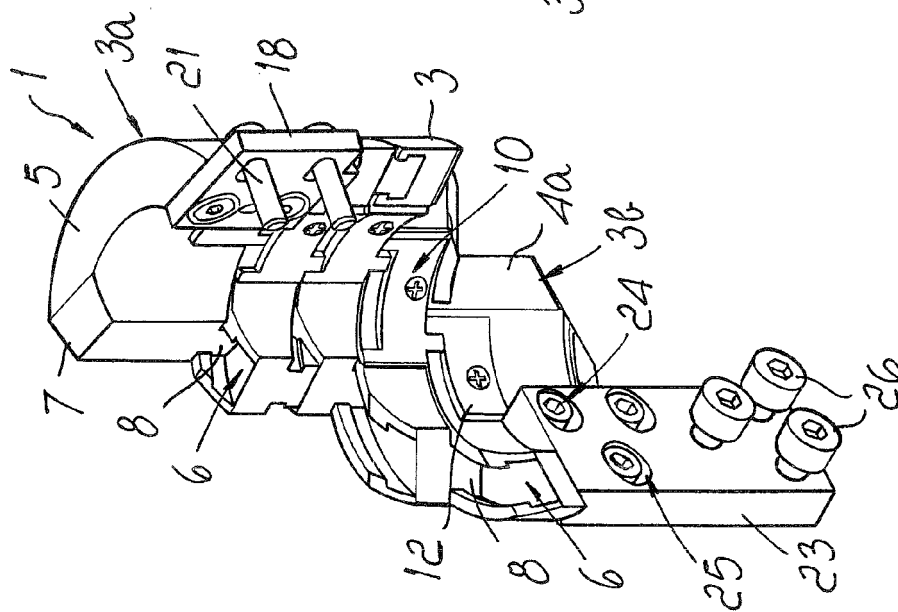


Fig. 7

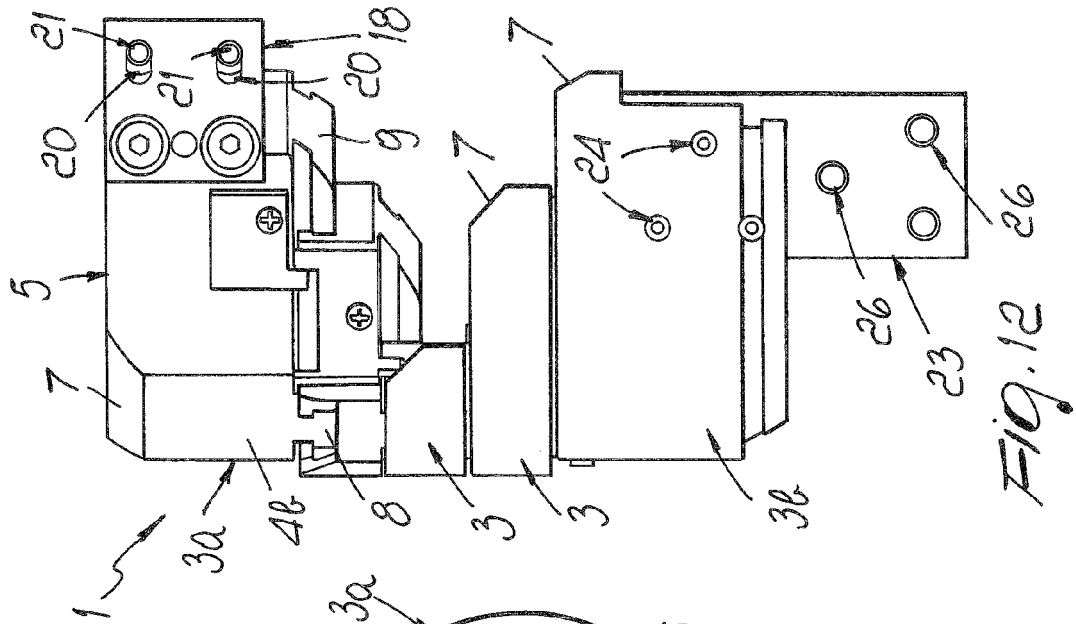


Fig. 10

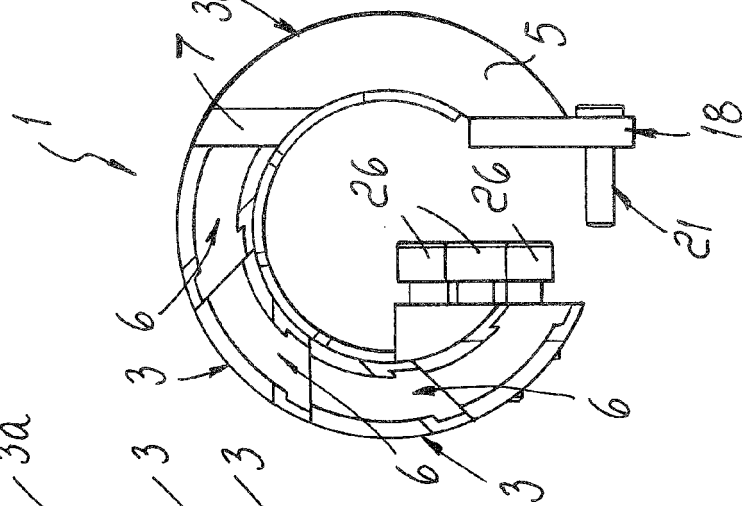


Fig. 11

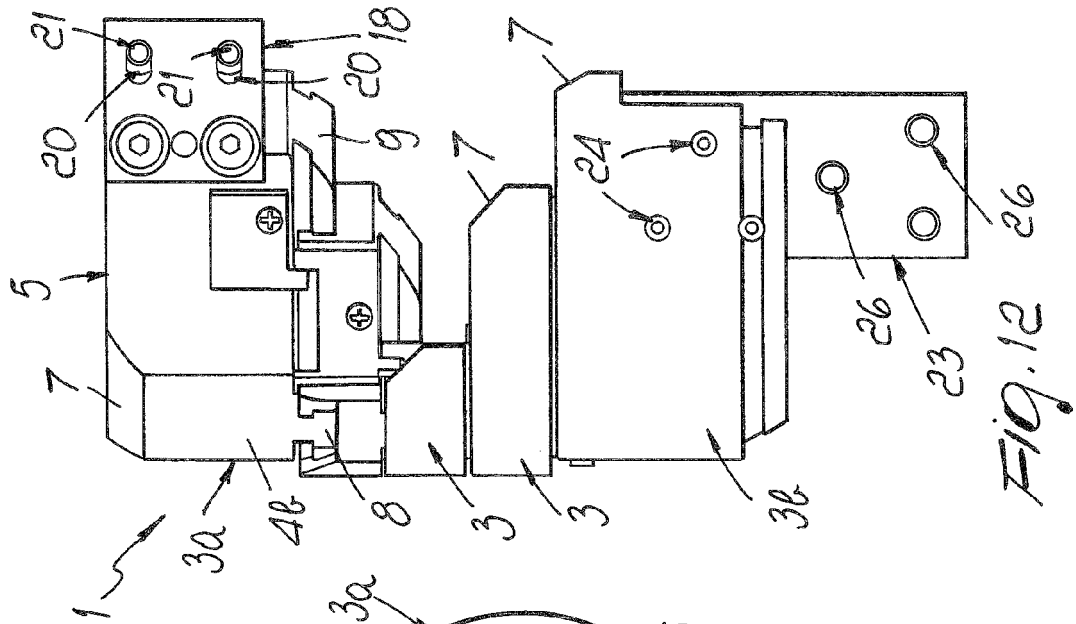


Fig. 12

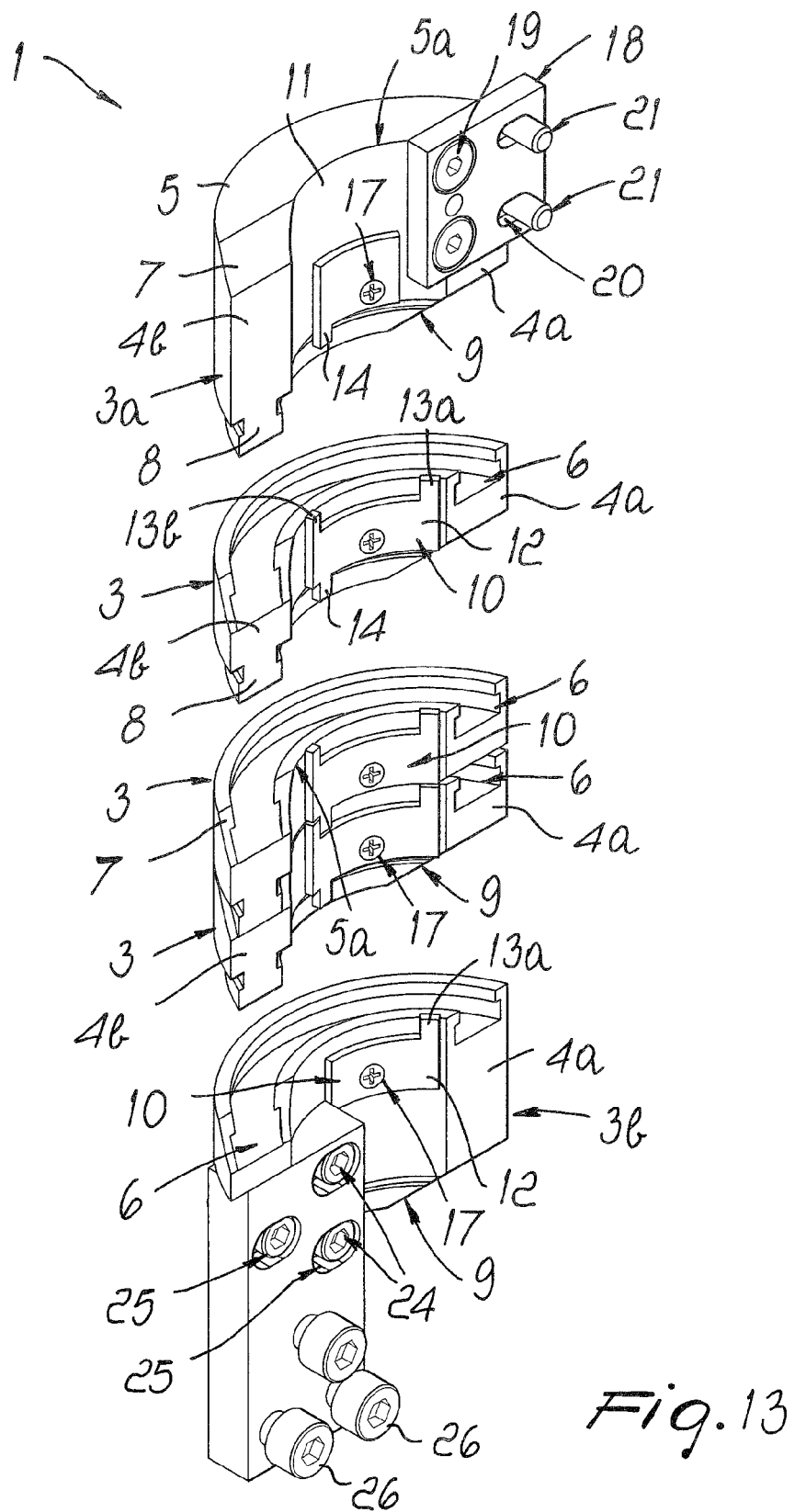


Fig. 13

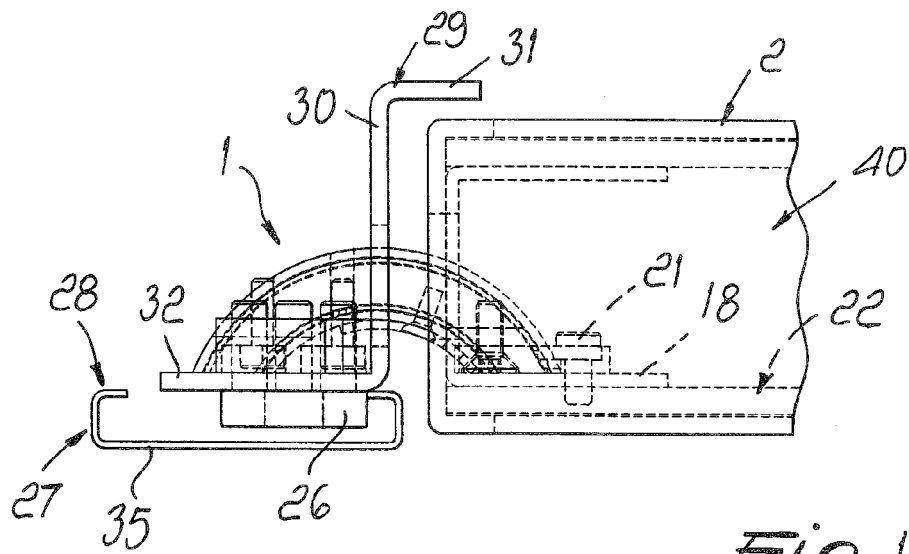


Fig. 14

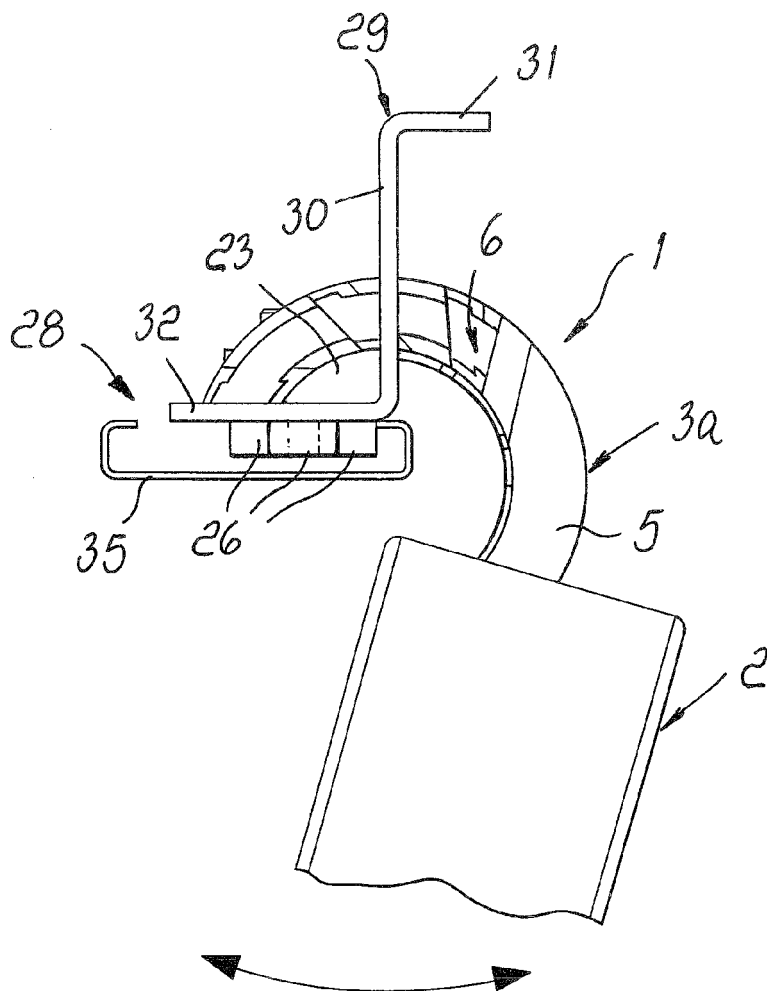
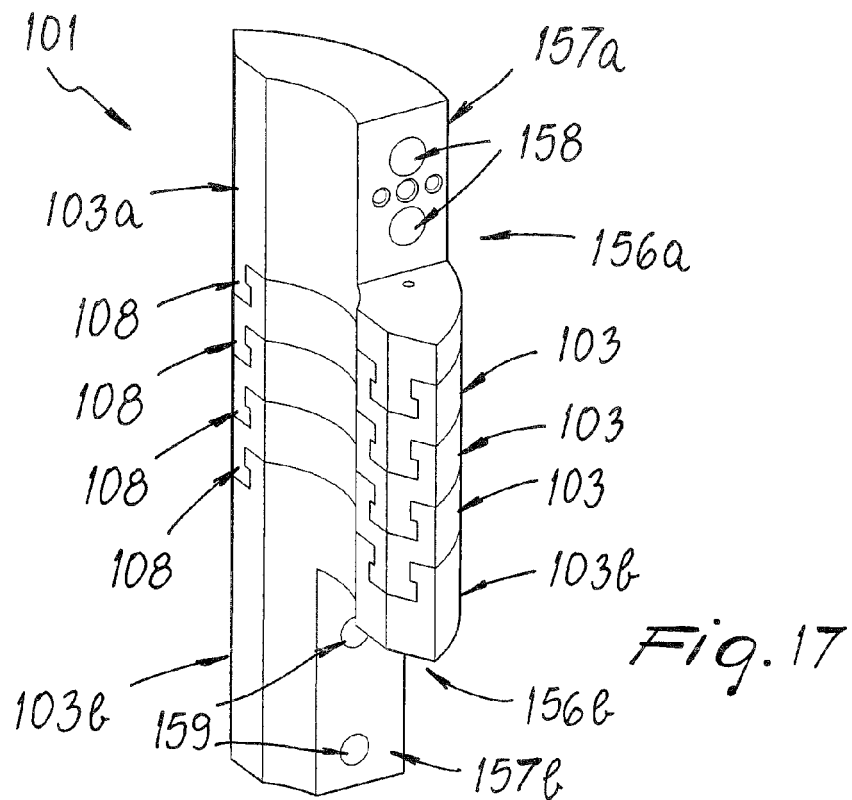
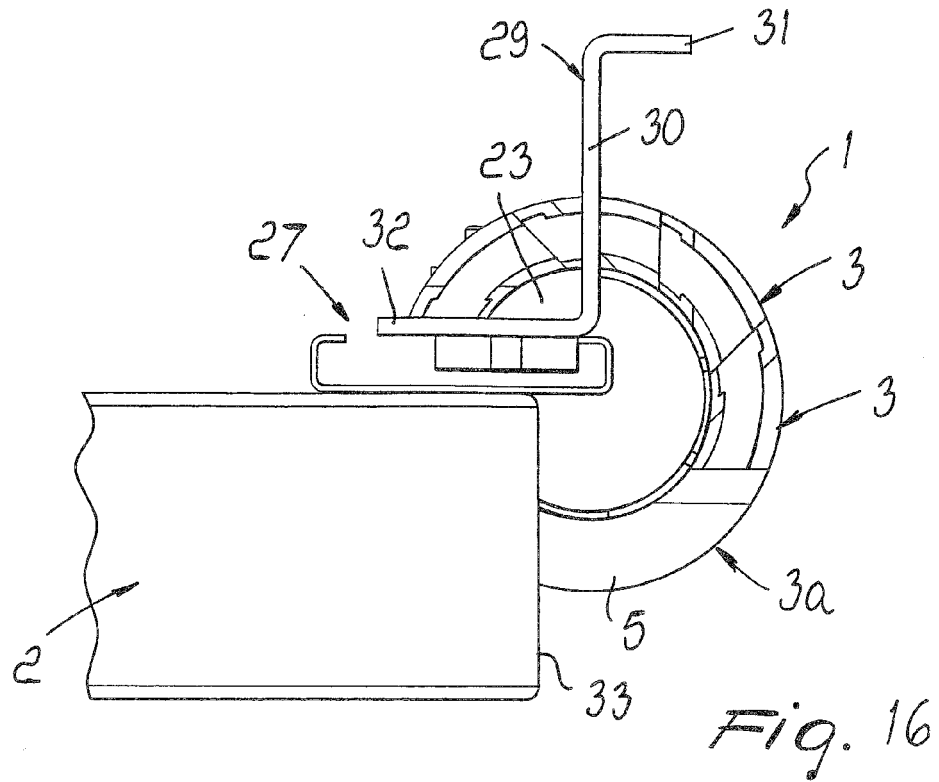
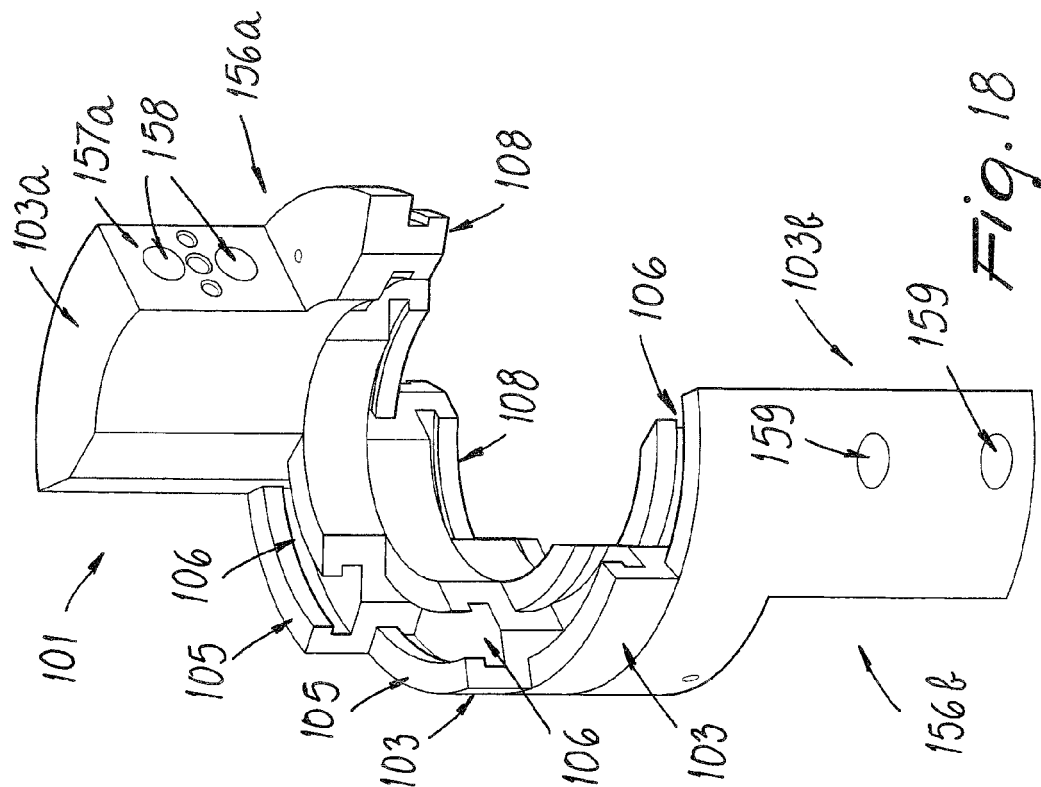
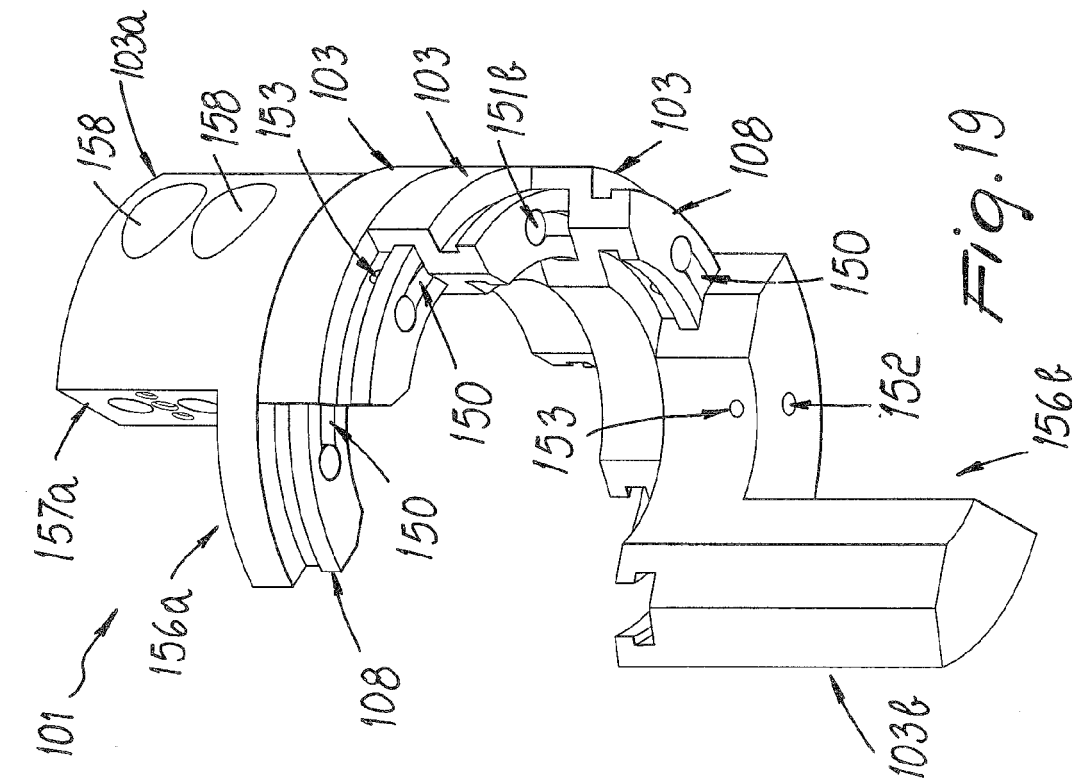
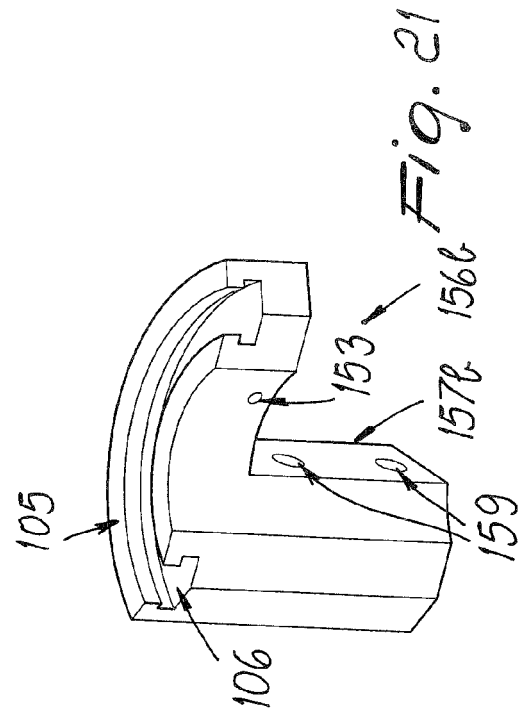
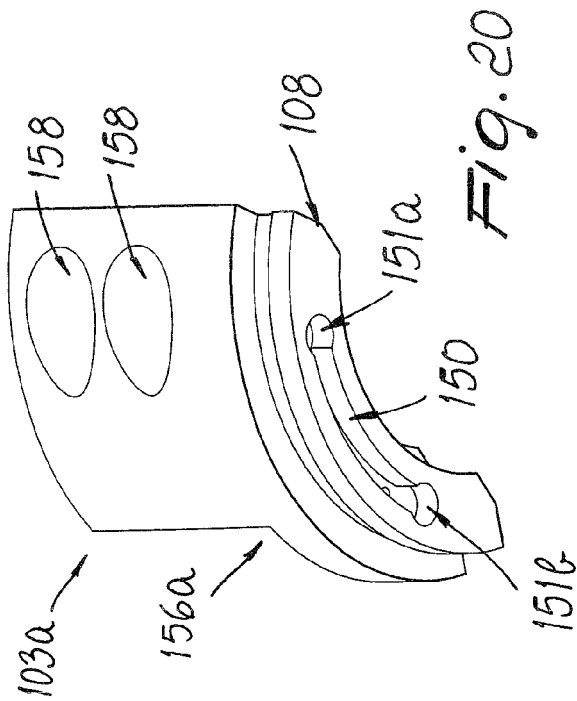
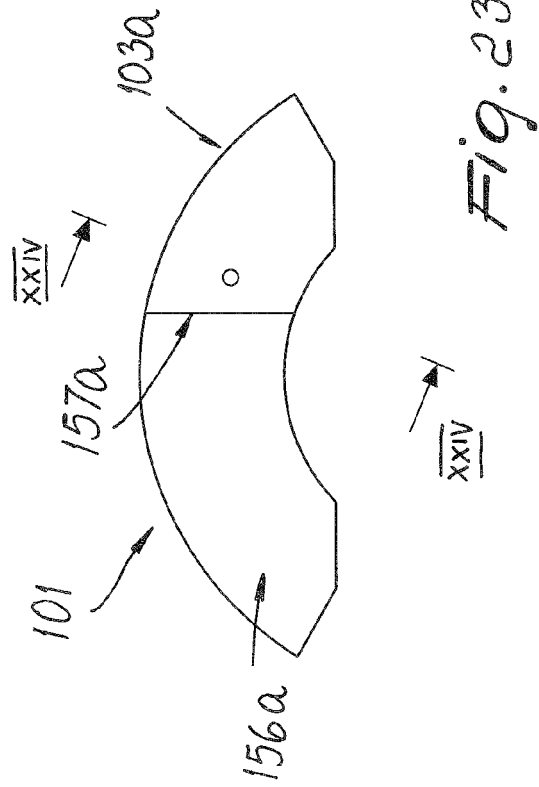
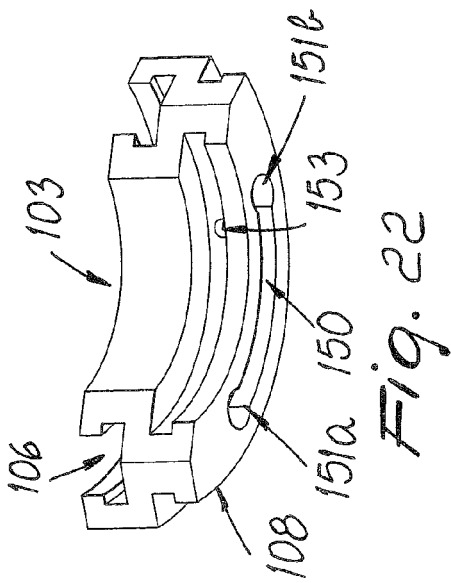
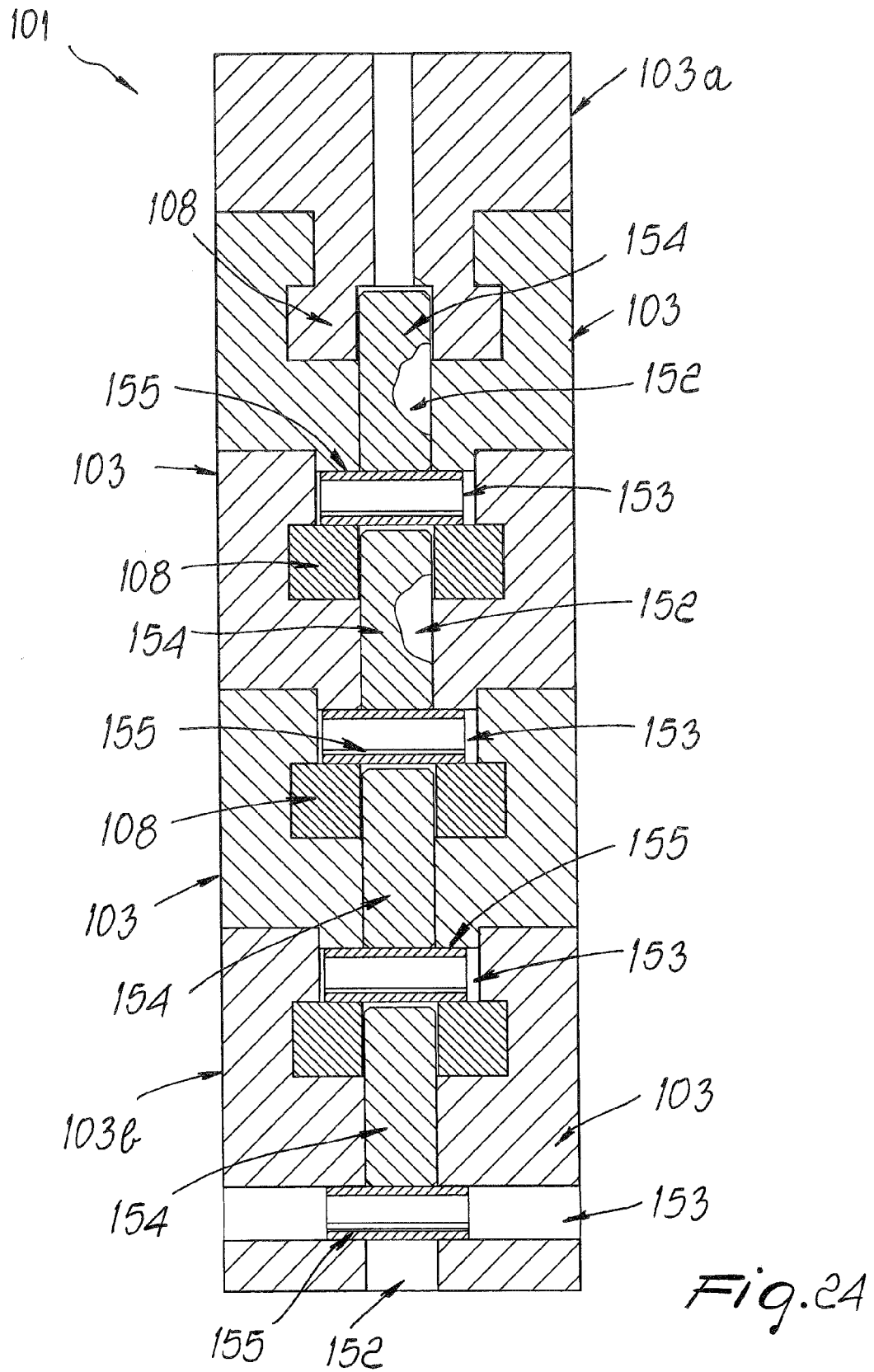


Fig. 15









REFERENCES CITED IN THE DESCRIPTION

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