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(54) **INVISIBLE HINGE**

(57) Invisible hinge for rotatably connecting a movable panel (100) to a fixed frame (200), comprising two hinge bodies (2, 3) embedded within corresponding cavities of the movable panel (100) and of the fixed frame (200) and rotatably connected to each other by means for articulation (4). The latter comprise a first panel connecting rod (7), which is housed within the containment seat (20) of the first hinge body (2) and is pivoted at a first end (7A) thereof to a first internal wall (2A) of the latter and at its second end (7B) to a first termination (8A) of a first curved lever (8). The latter in turn is pivoted at

its second termination (8B) to the second external wall (3B) of the second hinge body (3). The articulation means (4) also comprise a second frame connecting rod (9), which is housed within the second containment seat (30) of the second hinge body (3) and is pivoted at a third end (9A) thereof to the second external wall (3B) of the latter and at its fourth end (9B) to a third termination (10A) of at least one second curved lever (10). The latter in turn is pivoted at its fourth termination (10B) to the first external wall (2B) of the first hinge body (2).

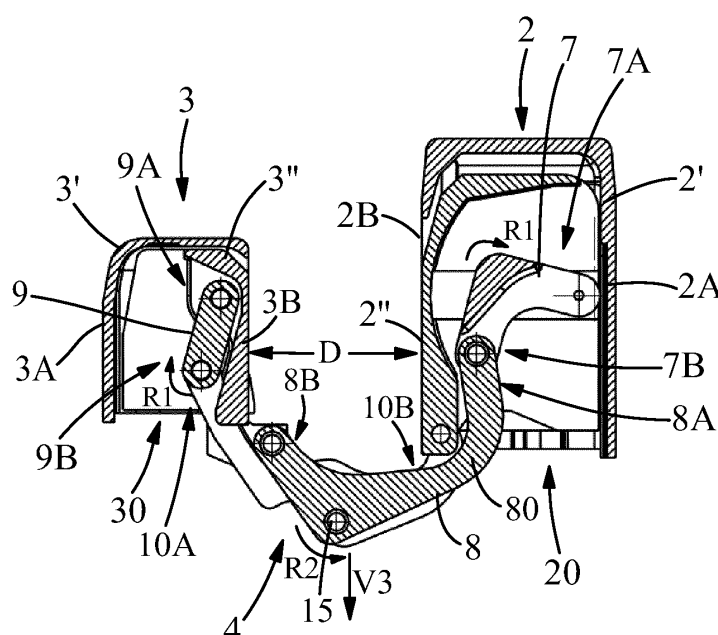


Fig. 5

Description

Field of application

[0001] The present invention regards an invisible hinge for furniture pieces or doors/windows/shutters, according to the preamble of the main independent claim.

[0002] The present hinge is intended to be employed in order to rotatably associate a movable member, such as the panel of a door or of a furniture piece, with a fixed frame, such as the jamb of a door or the support structure of a furniture piece.

[0003] The hinge, object of the present invention, is of the type termed "invisible" or even "embedded", in the technical jargon of the field, since it is not visible from outside once the movable member is arranged in a closed position, since all the elements that compose the hinge are situated substantially completely embedded inside the movable member and the fixed frame.

[0004] More particularly, the hinge, object of the present invention, has advantageous but not exclusive application when it is associated with fixed frames of doors provided with finishing elements, commonly termed in the technical jargon of the field "staff beads".

[0005] The hinge, object of the present invention, is therefore inserted in the field of doors/windows/shutters, in the field of production of accessories for doors/windows/shutters and more generally in the field of interior decoration.

State of the art

[0006] As has been known for some time, in particular in field of doors/windows/shutters, hinges usually consist of two hinge bodies - of which one is fixed to the fixed frame of the door/window/shutter (such as the jamb of a door) and one is fixed to the movable member of the door/window/shutter, such as a panel of a door - which are mechanically connected to each other by one or more articulation arms in order to allow a rotation of the movable member with respect to the fixed frame, usually 180° around a hinging axis.

[0007] In the case of the present invention, reference will be mainly made to a hinge of invisible type, in which the bodies of the same hinge are embedded inside cavities of the structure of the movable member and of the fixed frame such that only portions of the articulation arms between the two bodies of the hinge itself project beyond their shape.

[0008] More in detail, each hinge body comprises a casing body, which is intended to be embedded in a cavity made in the movable panel or in the fixed frame, delimits a seat in which the articulation arms are at least partially housed and is generally provided with two fixing flanges which are extended towards the exterior of the seat along its main extension direction, for fixing the movable panel to the fixed frame, e.g. with screws.

[0009] Also known in the field of doors/windows/shut-

ters are numerous type of invisible hinges, which are differentiated from each other mainly by the different technical choices employed in the levers that constitute the articulation arms, and which can employ pins that can only rotate or also slidable elements or elements provided with rotation-translation, and also differ from each other due to the different sizes of the casing bodies which can allow housing more complex articulations but simultaneously involve limitations in the selection of the panels or frames.

[0010] A type of invisible hinge is known which comprises a central articulation and two lateral articulations. More in detail, the central articulation consists of a first connecting rod, hinged to a first casing body associated with the panel and contained inside the first seat of the latter, and of a first lever pivoted at one end to the first connecting rod and at the other end to a second casing body associated with the frame. Each lateral articulation is in turn composed of a second connecting rod, which is hinged to the second casing body associated with the frame and is contained inside the second seat of the latter, and of a second lever pivoted at one end to the second connecting rod and at the other end to the first casing body associated with the panel.

[0011] Several examples of hinges of the above-indicated type are described in the documents DE 268641, FR 756458, US 1,280,357, US 7,197,790, ES 1073279 and EP 2476836.

[0012] Such known hinge type, as briefly described above, has in practice demonstrated that it does not lack drawbacks, regarding which it is first necessary to consider the present needs in the doors/windows/shutters market.

[0013] Doors/windows/shutters are known on the market which comprise a movable panel and a fixed frame with hinges mounted thereon having bodies non-aligned with each other, with the fixed frame recessing with respect to the external face of the panel.

[0014] Associated with such recessing fixed frame is an overlapped profile, as is better explained in the following description, so to bring it flush with the external face of the panel in order to comply with the common architectural and design requirements in the doors/windows/shutters field. Presently, the size in the thicknesses of the panels, the size in the thicknesses of the overlapped panels and the needs for standardization of the production processes of the doors/windows/shutters do not allow that versatility necessary for freely associating the frames with the desired overlapped profile (for example for architectural and design reasons) and involve limitations in the selection of the hinges or long operations for modifying the profile of the fixed frame.

[0015] More in detail, a first requirement of the field of doors/windows/shutters requires that the panels of the doors be made of reversible type, i.e. the hinges can be associated with both long sides of the panel (right or left) by rotating the panel with respect to a middle vertical axis thereof, or by rotating the panel with respect to a central

horizontal axis thereof, orthogonal to the position defined by the panel itself. This allows a standardization in the production of the panels with clear economic savings; however, it involves that the panels be mirrored with respect to a middle plane parallel to the position of the panels themselves. This circumstance involves a clear limitation of the versatility for freely mounting hinges and overlapped profiles to the fixed frame of doors/windows/shutters.

[0016] In addition, doors often have, in order to minimize production costs, thicknesses on the market that are rather standardized and for example mainly 40 and 44 mm.

[0017] It must also be considered that the architectural and design requirements often oblige, as stated above, that the panels of the doors be mounted flush with respect to the fixed frame, i.e. they require making a continuous surface without interruption with the frame (without steps) when the door is in closed position.

[0018] This involves the requirement of fixing, on the external side of the frame (i.e. the side towards which the door is opened), the abovementioned overlapped profile i.e. an element termed in the technical jargon of the field "staff bead" (i.e. a frame profile generally made of wood for concealing the external side of the frame) or even a plasterboard panel. The staff bead and the plasterboard panel are therefore fixed on the external side of the frame in order to fill the projecting thickness of the panel with respect to the frame and recreate that required aesthetic continuity by bringing the frame flush with the panel.

[0019] Different types of staff beads are present on the market, each provided with its own architectural and aesthetic value and above all each provided with a different thickness.

[0020] Consequently, presently, there is the particular need to be able to select the staff bead as well as the thickness of the panel of the door (usually 40 or 44 mm) depending on the design needs of the interior designer or on the client's taste. Such freedom of choice however contrasts with the fact that the above-described hinges of known type do not allow reaching a maximum extension (i.e. a distance between the casing bodies of the hinge in open panel position) such to be able to mount high staff bead thicknesses.

[0021] Consequently, today, in order to be able to comply with the aforesaid requirements it is necessary to arrange customized frames as a function of the designer or client choices, with clear increases of the production costs of the frames and generally of the doors/windows/shutters.

[0022] In addition and more generally, there is the particular need in the field to reach high maximum extensions between the casing bodies of the hinge, simultaneously maintaining the size of the casing bodies quite limited, in order to allow the insertion thereof in frames and panels of limited thickness.

[0023] The need to have a high maximum extension

between the hinge bodies upon opening the panel is inserted in the market needs to increase the versatility of use of staff beads with desired sizes and thicknesses.

5 Presentation of the invention

[0024] Therefore, in this situation, the problem underlying the present invention is to overcome the drawbacks of the abovementioned prior art by providing an invisible hinge for furniture pieces or doors/windows/shutters, which is able to make a high maximum extension between the casing bodies of its hinge bodies, while limiting the size for the same hinge bodies.

[0025] A further object of the present invention is to provide an invisible hinge for furniture pieces or doors/windows/shutters which allows meeting - in a more versatile manner - the market needs of associating panels and staff beads with different sizes and characteristics.

[0026] A further object of the present invention is to provide an invisible hinge for furniture pieces or doors/windows/shutters which allows attaining a perfect coplanarity between the frame provided with staff bead and the external face of the panel.

[0027] A further object of the present invention is to provide an invisible hinge for furniture pieces or doors/windows/shutters which is inexpensive to achieve.

[0028] A further object of the present invention is to provide an invisible hinge for furniture pieces or doors/windows/shutters which is safe and entirely reliable in operation.

Brief description of the drawings

[0029] The technical characteristics of the invention, according to the aforesaid objects, are clearly found in the contents of the enclosed claims and the advantages thereof will be more evident in the following detailed description, made with reference to the enclosed drawings, which represent a merely exemplifying and non-limiting embodiment of the invention, in which:

- figure 1 shows an invisible hinge for furniture pieces or doors/windows/shutters, object of the present invention, in a perspective view;
- figures 2 and 3 show the hinge of figure 1, object of the present invention, associated with a fixed frame and with a movable panel of a door illustrated only partially and respectively with the panel in closed position and in open position;
- figure 4 shows a front of the invisible hinge, object of the present invention;
- figure 5 shows a first sectional view of the hinge of figure 4 made along the trace V-V of the same figure 4;
- figure 6 shows a second sectional view of the hinge of figure 4 made along the trace VI-VI of the same figure 4;

- figure 7 shows a detail of the hinge of figure 1, object of the present invention, relative to a first panel connecting rod in a perspective view;
- figure 8 shows a detail of the hinge of figure 1, object of the present invention, relative to articulation means in a perspective view;
- figure 9 shows a detail of the hinge of figure 1, object of the present invention, relative to a support body of the pins of the hinge body associated with the frame in a perspective view;
- figure 10 shows the sectional view of the hinge of figure 5 with the panel in closed position;
- figure 11 shows the hinge, object of the present invention, in different positions taken during the movement of the panel between the closed position and the open position;
- figure 12 shows an enlargement of a detail of the hinge of figure 11 contained inside the circle XII depicted in figure 11 itself.

Detailed description

[0030] With reference to the enclosed drawings, reference number 1 overall indicates the invisible hinge, object of the present invention.

[0031] The hinge 1 according to the invention is intended to be employed for rotatably connecting a movable member 100, e.g. the panel of a door or of a furniture piece, to a fixed frame 200, e.g. constituted by a frame of a door or by the support structure of a furniture piece.

[0032] Hereinbelow, the invention will be illustrated with reference to the preferred embodiment which provides for the use of the hinge in the field of doors/windows/shutters in order to connect the panel 100 of a door to its frame 200 fixed with the walling.

[0033] The invisible hinge 1, to which the present invention refers, is not visible from the outside once the movable panel 100 is arranged in a closed position, since all the elements which compose the hinge 1 are substantially embedded inside the same panel 100 and the same fixed frame 200, as will be better explained hereinbelow.

[0034] The invisible hinge 1 comprises, in a per se entirely conventional manner, two hinge bodies 2 and 3 rotatably mechanically connected by means of articulation means 4.

[0035] More in detail, a first hinge body 2, delimiting a corresponding first containment seat 20, is intended to be embedded within a corresponding first cavity 5 made in the movable panel 100 and a second hinge body 3, delimiting a corresponding second containment seat 30, is intended to be embedded within a corresponding second cavity 6 made in the fixed frame 200.

[0036] Each of the two hinge bodies 2, 3 advantageously consists of an elongated casing body (indicated in the figures with reference numbers 2', 3'), intended to be fixed respectively to the movable panel 100 and to the fixed frame 200, and of a support body 2'', 3'' fixed inside the respective elongated casing body, and intended

to attain the fulcra with the means for articulation 4. Advantageously, moreover, in accordance with the embodiment illustrated in the enclosed figures, the support bodies 2'' and 3'' form the external walls of the respective first and second hinge body 2, 3.

[0037] More in detail, each elongated casing body 2', 3' is preferably made of metal material, and appears as a box-like body provided with an open side defining a passage for the traversing of the articulation means 4. The latter are pivoted inside the elongated casing body 2', 3' to the support bodies 2'' and 3'' and serve for rotatably supporting the movable panel 100 with respect to the fixed frame 200, as will be specified in detail hereinbelow.

[0038] Each elongated casing body 2', 3' is also advantageously provided, in a known manner, with two fixing flanges, e.g. flat, which are extended outside the casing body along its main extension direction and are provided with through holes for the insertion of check screws aimed to fix the casing body respectively on the panel or on the frame.

[0039] Each hinge body 2, 3 also comprises an internal wall 2A, 3A and an external wall 2B, 3B, by internal and external it being intended the side of the hinge body 2, 3 intended to be directed respectively towards the internal and external face of the door/window/shutter. In addition, by external side of the door/window/shutter it must be intended that direction towards which the panel 100 is opened, or that which, as explained hereinbelow, has the fixed frame 200 covered with an overlapped profile 13.

[0040] The definition of the sides of the hinge bodies 2 and 3 is necessary for indicating the fulcrum positions of the members which compose the abovementioned articulation means 4. The latter allow operatively moving the first hinge body 2 and the second hinge body 3 rotatably with respect to each other, between a closed position A and an open position B of the two hinge bodies which of course correspond to the closed and open positions of the panel 100 with respect to the fixed frame 200.

[0041] In the aforesaid closed position A, as can be appreciated in figure 2, the first and the second containment seat 20, 30 of the casing bodies 2', 3' of the relative first and second hinge body 2, 3 are arranged in opposite position with respect to each other, i.e. with respective cavities substantially directed against each other.

[0042] In addition, in such closed position A, the first internal wall 2A and the first external wall 2B of the first hinge body 2 are respectively substantially side-by-side (according to a direction orthogonal to the position of the panel 100) the second internal wall 3A and the second external wall 3B of the second hinge body 3, as can be appreciated in the enclosed figure 2. In addition, always in such closed position A, the two internal walls 2A, 3A and the two external walls 2B, 3B are oriented towards same directions - respectively internal V1 and external V2 - of the door/window/shutter, illustrated with arrows in the same figure 2.

[0043] Otherwise, in the open position B, as can be appreciated in figures 3, 5 and 6, the first and the second containment seat 20, 30 of the casing bodies 2', 3' are directed in a common direction V3 with the first external wall 2B of the first hinge body 2 facing the second external wall 3B of the second hinge body 3.

[0044] In accordance with the idea underlying the present invention, the hinging means 4 of the invisible hinge 1 comprise at least one first panel connecting rod 7, which is contained within the first containment seat 20 of the first hinge body 2 and is pivoted at a first end 7A thereof to the first internal wall 2A of the latter and at its second end 7B to a first termination 8A of at least one first curved lever 8. The latter is also pivoted at its second termination 8B to the second external wall 3B of the second hinge body 3.

[0045] According to the invention, moreover, the hinging means 4 of the invisible hinge 1 also comprise at least one second frame connecting rod 9, which is contained within the second containment seat 30 of the second hinge body 3 and is pivoted at a third end 9A thereof to the second external wall 3B of the latter, and at its fourth end 9B to a third termination 10A of at least one second curved lever 10. The latter is also pivoted at its fourth termination 10B to the first external wall 2B of the first hinge body 2.

[0046] In accordance with such configuration, the first panel connecting rod 7 and the second frame connecting rod 9 rotate between the closed A and open B positions of the two hinge bodies 2, 3 with respect to the respective first hinge body 2 and second hinge body 3 with equivalent rotation sense R1, which is opposite the rotation sense R2 of the first curved lever 8 and of the second curved lever 10 respectively with respect to the second hinge body 3 and to the first hinge body 2, at which such levers 8 and 10 are pivoted at their second and fourth terminations 8B and 10B.

[0047] Due to the aforesaid configuration, the distance D between the first external wall 2B of the first hinge body 2 and the second external wall 3B of the second hinge body 3, when the hinge has the hinge bodies 2, 3 in open position B, is much greater than that of conventional invisible hinges.

[0048] Advantageously, the claimed configuration of the first panel connecting rod 7 and of the second frame connecting rod 9 (and in particular the pivoting position respectively of their first end 7A and third end 9A) involves that, during the movement of the panel 100, the rotation of such connecting rods 7, 9 (in particular with equivalent rotation sense R1 with respect to the corresponding hinge bodies 2, 3) causes a movement of the first hinge body 2 (and hence of the panel 100) which delineates a trajectory of the edge of the panel 100 (illustrated in the embodiment of figures 11 and 12) which allows overcoming the bulk of the fixed frame 200 (and in particular of the overlapped profile 13) and thus arranging the hinge bodies 2, 3 in open position B with a distance D (between the first external wall 2B of the first hinge body 2 and the

second external wall 3B of the second hinge body 3) that is greater than that of the solutions of known type, which provide for a conventional radial rotation of the panel.

[0049] For example, it was observed that with a first hinge body 2 having depth P1 of 51-55 mm and width L1 of 30-34 mm as well as with a second hinge body having depth P2 of 28.5-32.5 mm and width L2 of 23-27 mm it was possible to obtain a distance D between the bodies of 25.5-29.5 mm.

[0050] Such high distance allows the hinge to open the panel even in the case of doors with high thickness (e.g. 44 mm) and with staff beads fixed on the external face of the fixed frame 200 with particularly high thickness.

[0051] Preferably, in order to further increase the aforesaid distance D between the hinge bodies 2 and 3, the second hinge body 3 comprises a projecting appendage 11, which is raised from the external face 3B' of the second external wall 3B and projects towards the exterior of the second containment seat 30. The first curved lever 8 is thus pivoted at its second termination 8B to the aforesaid projecting appendage 11 of the second external wall 3B of the second hinge body 3.

[0052] In accordance with the embodiment of the enclosed figures, the aforesaid projecting appendage 11 substantially forms a step with the second external wall 3B of the second hinge body 3; in addition, this is advantageously composed of two side-by-side portions 11' and 11'' separated by a notch 12, within which the second termination 8B of the first curved lever 8 is pivoted.

[0053] Advantageously, such projecting appendage 11 remains completely embedded inside the first containment seat 20 of the first hinge body 2, when the two hinge bodies 2, 3 are in closed position A.

[0054] Preferably, mainly for stability reasons, two second curved levers 10 are provided, each of which pivoted at its third termination 10A and at its fourth termination 10B respectively to the fourth end 9B of the second frame connecting rod 9 and to the second external wall 2B of the first hinge body 2. Such second curved levers 10 are parallel to each other and are at the side of the first curved lever 8 on opposite sides (in the longitudinal extension sense of the hinge bodies 2, 3). More clearly, when the hinge 1 is mounted on the door/window/shutter, the three levers are arranged in succession one on top of the other.

[0055] The first curved lever 8 and the two second curved levers 10 are advantageously transversely pivoted together by a pin 15, in particular inserted in through holes at second convex portions 101 of the second curved levers.

[0056] Advantageously, moreover, the second frame connecting rod 9 has T-shaped form (see figure 8) obtained with an enlarged base 9', from which a projecting portion 9'' is extended in middle position. The enlarged base 9' is pivoted on its opposite sides to the third terminations 10A of the two second curved levers 10, while the projecting portion 9'' is pivoted at its free end to the second external wall 3B of the second hinge body 3.

[0057] Of course, without departing from the protective

scope of the present patent, in the case of two second curved levers 10, also two separate second frame connecting rods 9 can be provided for.

[0058] In accordance with an advantageous embodiment of the present invention, the first panel connecting rod 7 has a shape designed for minimizing the bulk and for increasing the distance D between the hinge bodies 2 and 3. For such purpose, it comprises two undercut-shaped portions 71, 72, parallel to each other and joined in single body at the respective corners 73 by a spacer 74.

[0059] The free ends 7A and 7B of the two undercut-shaped portions of the first panel connecting rod 7 are two-by-two spaced and opposite. Of these, a first pair of free ends 7A forms the aforesaid first end 7A of the first panel connecting rod 7 and is pivoted at the first hinge body 2 to the first internal wall 2A, while the second pair of free ends 7B forms the aforesaid second end 7B of the first panel connecting rod 7 and receives the first termination 8A of the first curved lever 8 interposed, pivoting it (see figure 5).

[0060] Such conformation of the first connecting rod 7 confers particular stability and mechanical strength to the hinge 1 according to the invention.

[0061] Preferably, the undercut-shaped portions 71, 72 of the first panel connecting rod 7 define, together with the spacer 74, a recess 75 which is intended to receive, substantially with shape engagement, a first convex portion 80 of the first curved lever 8, when the first and the second hinge body 2, 3 are in the closed position A.

[0062] Such conformation of the first connecting rod 7 with the recess 75 allows minimizing the bulk of the articulation means 4 inside the first containment seat 20 of the first hinge body, allowing the maintenance of reduced sizes thereof.

[0063] The door/window/shutter that makes use of the invention according to the above-reported description advantageously comprises a movable panel, such as that of a door, and a fixed frame 200 such as the frame of a door, which are rotatably connected to each other by means of one or more of the aforesaid invisible hinges 1.

[0064] As can be appreciated in the enclosed figures 2 and 3, the first hinge body 2 is embedded within the first cavity 5 made in the thickness of the movable panel 100 in a centered position. As already indicated above, this allows using reversible panels during installation, i.e. which can receive the hinges on both right and left sides by rotating the panel with respect to a middle vertical axis thereof, or by rotating the panel with respect to a central horizontal axis thereof, orthogonal to the position defined by the panel itself.

[0065] In turn, the second hinge body 3 is embedded within the corresponding second cavity 6 made in the fixed frame 200.

[0066] As can be appreciated in the enclosed figure 2, the middle plane D1 of the first hinge body 2, which coincides with the middle plane of the panel 100, is non-aligned by a non-alignment distance S with respect to the middle plane D2 of the second hinge body 3, which

in turn is embedded in the fixed frame 200.

[0067] Such non-alignment between the planes of two hinge bodies 2, 3 involves a recess of the frame 200 which can be advantageously compensated for by fixing, on the external face 200A of the frame 200 itself, an overlapped profile 13, e.g. constituted by a plasterboard panel or by a staff bead whose visible face 13A is arranged aligned flush with the external face 100A of the panel 100. The door/window/shutter, object of the present invention, due to a hinge 1 having a high maximum extension between its two bodies 2, 3 allows an improved versatility of use of the hinge itself with the variation the thickness of the panel (indicated with M in figure 10 and for example equal to 40 or 44 mm) and with the variation of the thickness of the overlapped profile 13.

[0068] The finding thus conceived therefore attains the pre-established objects.

Claims

1. Invisible hinge for rotatably connecting a movable member (100) to a fixed frame (200), which comprises:

- a first hinge body (2) delimiting a corresponding first containment seat (20), intended to be embedded within a corresponding first cavity (5) obtained in said movable member (100);
- a second hinge body (3) delimiting a corresponding second containment seat (30), intended to be embedded within a corresponding second cavity (6) obtained in said fixed frame (200);
- means for articulation (4), which rotatably connect said first hinge body (2) and said second hinge body (3), between a closed position (A) in which said first and second containment seat (20, 30) are opposite each other with the first internal wall (2A) and the first external wall (2B) of said first hinge body (2) respectively substantially side-by-side the second internal wall (3A) and the second external wall (3B) of said second hinge body (3) and oriented towards same directions (V1, V2); and an open position (B), in which said first and second containment seat (20, 30) are directed in a common direction (V3) with the first external wall (2B) of said first hinge body (2) facing the second external wall (3B) of said second hinge body (3);

characterized in that said articulation means (4) comprise:

- at least one first panel connecting rod (7), which is housed within the first containment seat (20) of said first hinge body (2) and is pivoted at a first end (7A) thereof to said first internal wall (2A) of the latter and at its second end (7B) to a

- first termination (8A) of at least one first curved lever (8), which is pivoted at its second termination (8B) to the second external wall (3B) of said second hinge body (3);
- at least one second frame connecting rod (9), which is housed within the second containment seat (30) of said second hinge body (3) and is pivoted at a third end (9A) thereof to the second external wall (3B) of the latter and at its fourth end (9B) to a third termination (10A) of at least one second curved lever (10), which is pivoted at its fourth termination (10B) to the first external wall (2B) of said first hinge body (2).
2. Invisible hinge according to claim 1, **characterized in that** said first panel connecting rod (7) and said second frame connecting rod (9) rotate between said closed (A) and open (B) positions of said hinge bodies (2, 3), with respect to said respective first hinge body (2) and second hinge body (3) with equivalent rotation sense (R1), which is opposite the rotation sense (R2) of said first curved lever (8) and of said second curved lever (10) respectively relative to said second hinge body (3) and first hinge body (2) to which said first and second curved lever (8, 10) are pivoted at their respective second and fourth terminations (8B and 10B).
 3. Invisible hinge according to claim 1, **characterized in that** said second hinge body (3), comprises at least one projecting appendage (11), which is raised from the external face (3B') of said second external wall (3B) and projects towards the exterior of said second containment seat (30); said first curved lever (8) being pivoted at its second termination (8B) to the projecting appendage (11) of the second external wall (3B) of said second hinge body (3).
 4. Invisible hinge according to claim 3, **characterized in that** said projecting appendage (11) comprises two side-by-side portions (11', 11'') separated by a notch (12) within which the second termination (8B) of said first curved lever (8) is pivoted.
 5. Invisible hinge according to claim 3, **characterized in that** said projecting appendage (11) is embedded inside the first containment seat (20) of said first hinge body (2) with said hinge bodies (2, 3) in said closed position (A).
 6. Invisible hinge according to any one of the preceding claims, **characterized in that** it comprises at least two second curved levers (10), each of which pivoted at its third termination (10A) and at its fourth termination (10B) respectively to the fourth end (9B) of said second frame connecting rod (9) and to the second external wall (2B) of said first hinge body (2); said two second curved levers (10) being side-by-side on sides opposite said first curved lever (8).
 7. Invisible hinge according to claim 6, **characterized in that** said second frame connecting rod (9) has T-shaped form obtained with an enlarged base (9'), which is pivoted on its opposite sides to the third terminations (10A) of said two second curved levers (10), and with a projecting portion (9''), which is extended from a middle position of said enlarged base (9') and is pivoted at its free end to the second external wall (3B) of said second hinge body (39).
 8. Invisible hinge according to any one of the preceding claims, **characterized in that** said first panel connecting rod (7) comprises two undercut-shaped portions (71, 72), parallel to each other and joined at the respective corners (73) by a spacer (74); the free ends (7A, 7B) of said undercut-shaped portions being two-by-two spaced and opposite, of which a first pair of free ends forms the first end (7A) of said first panel connecting rod (7) and receives the first termination (8A) of said first curved lever (8) interposed, pivoting it; and the second pair of free ends forms the second end (7B) of said first panel connecting rod (7) and is pivoted to said first hinge body (2) at said first internal wall (2A).
 9. Invisible hinge according to claim 8, **characterized in that** the undercut-shaped portions of said first panel connecting rod (7) define, with said spacer (74), a recess (75) intended to receive a first convex portion (80) of said first curved lever (8) with said first and second hinge body (2, 3) in closed position (A).
 10. Invisible hinge according to any one of the preceding claims, **characterized in that** said first and said second hinge body (2, 3) each comprise a casing body (2', 3'), intended to be fixed respectively to said movable panel (100) and to said fixed frame (200) and a support body (2'', 3'') fixed inside said casing body (2', 3') and in particular forming the external walls (2B, 3B) of said respective first and second hinge body (2,3).
 11. Door/window/shutter comprising a movable panel (100) and a fixed frame (200) that are rotatably connected to each other by means of at least one invisible hinge (1), made according to any one of the preceding claims, wherein:
 - said first hinge body (2) is embedded within a first cavity (5) made in the thickness of said movable panel (100) in centered position;
 - said second hinge body (3) is embedded within a corresponding second cavity (6) made in said fixed frame (200); the middle plane (D1) of said first hinge body (2) coinciding with the middle

plane (D2) of said movable panel (100) and being non-aligned with respect to the middle plane (D2) of said second hinge body (3) housed in said fixed frame (200);

- said fixed frame (200) being provided with an external face (200A) covered with an overlapped profile (13), whose visible face (13A) is aligned flush with the external face (100A) of said movable panel (100).

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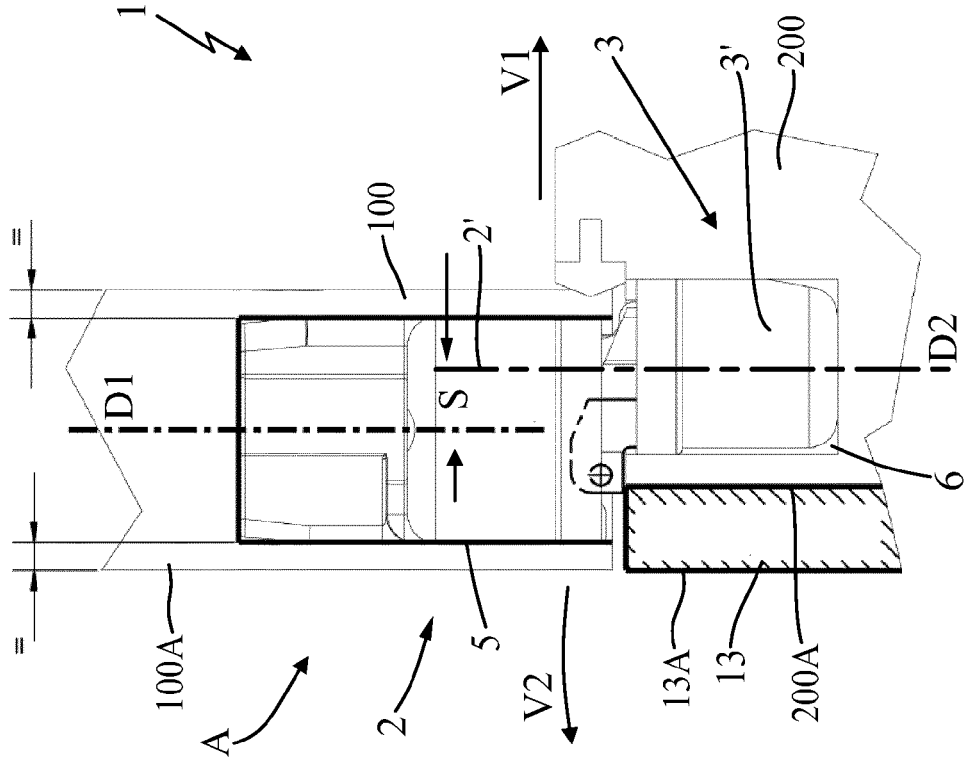
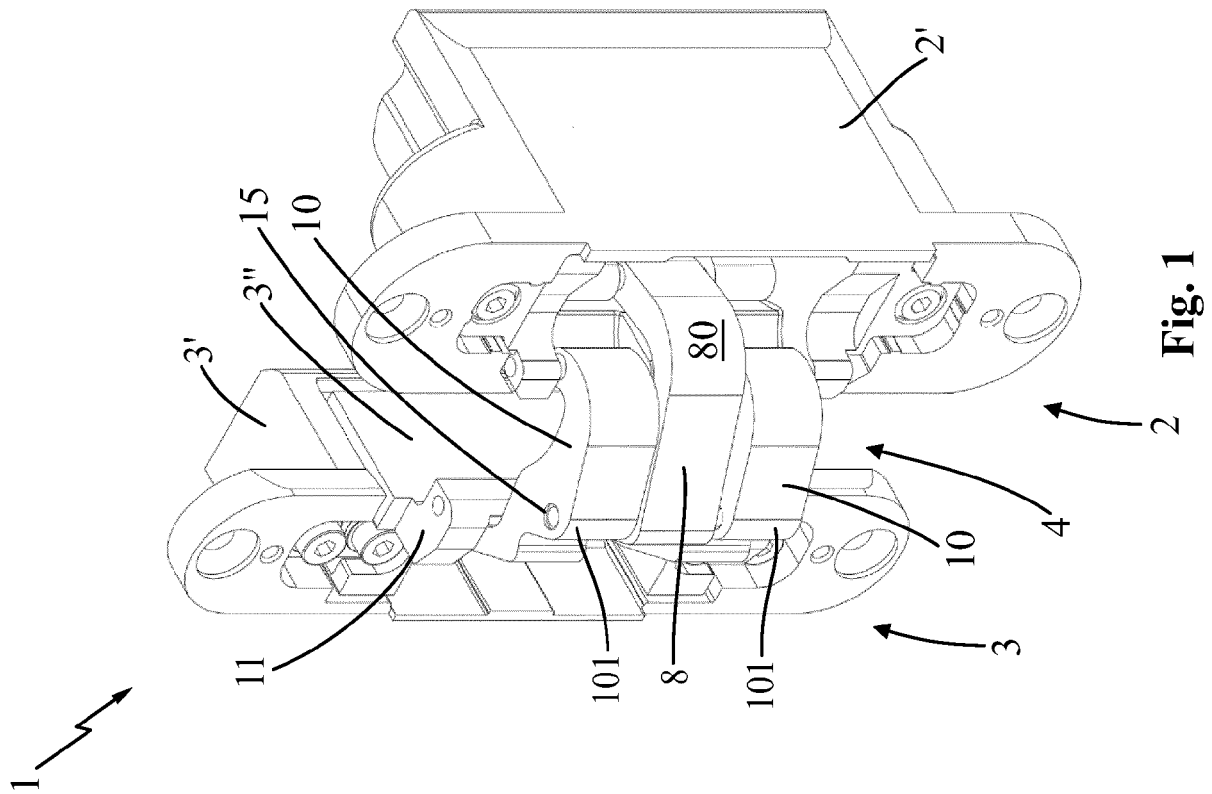
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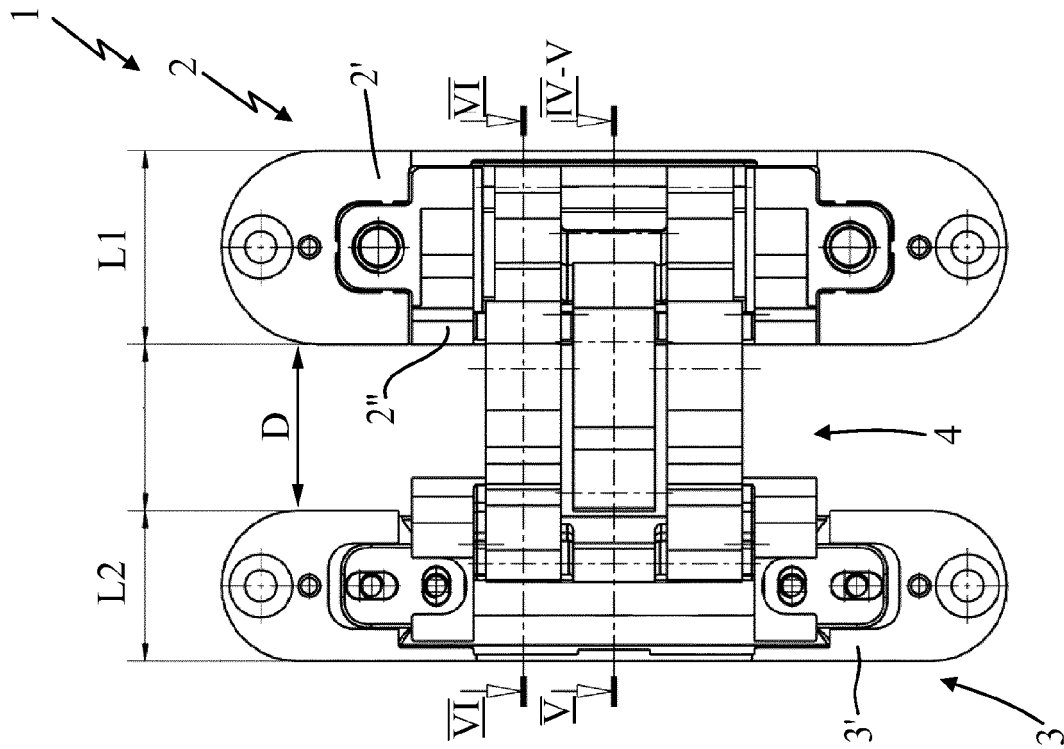


Fig. 4

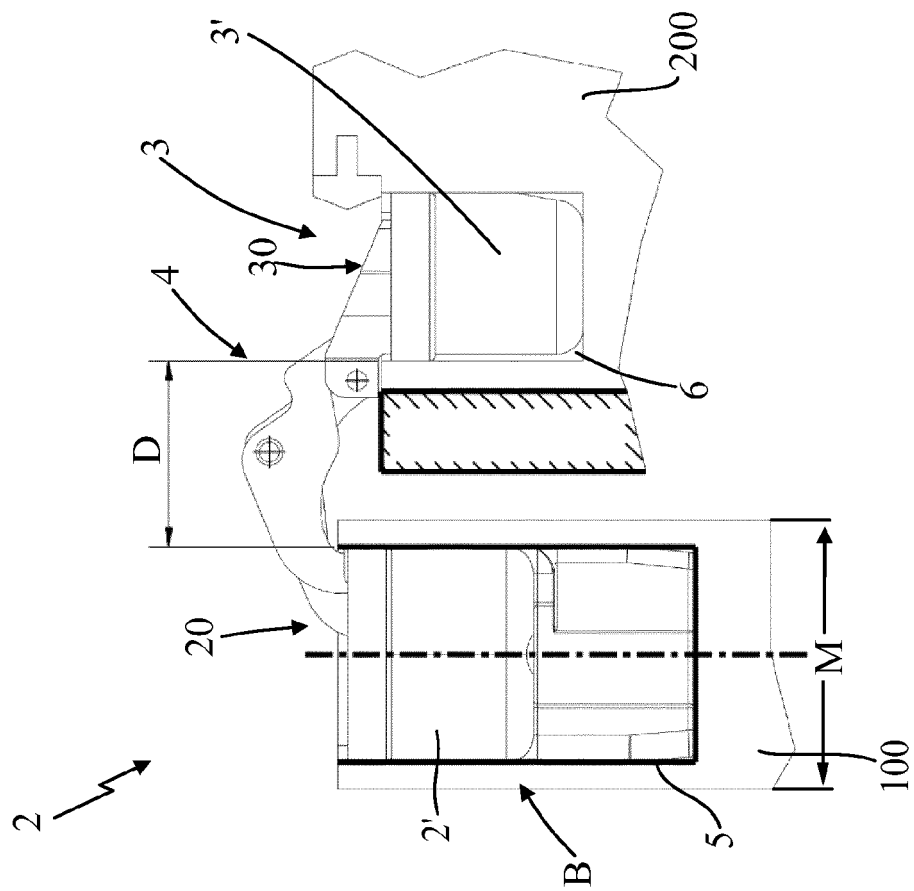
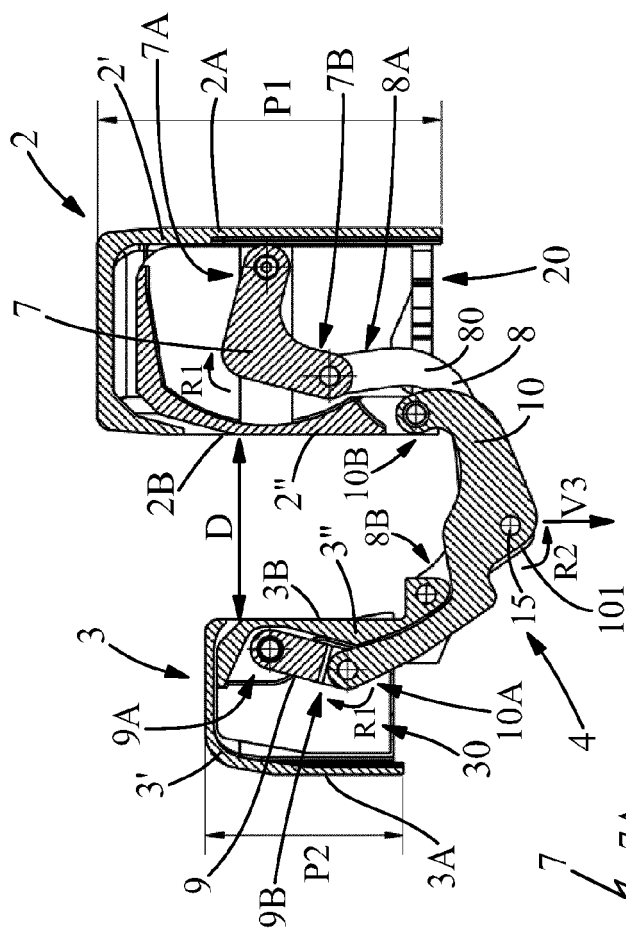
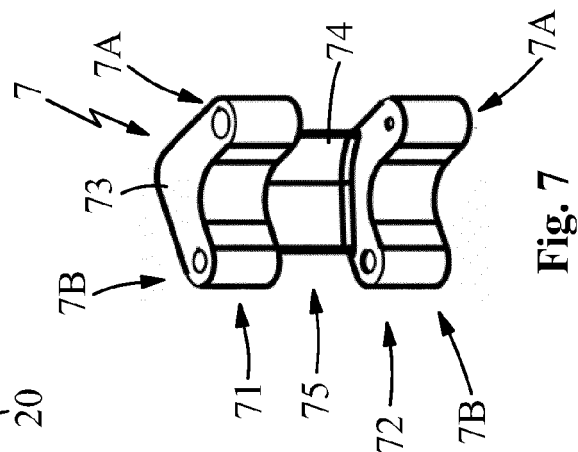
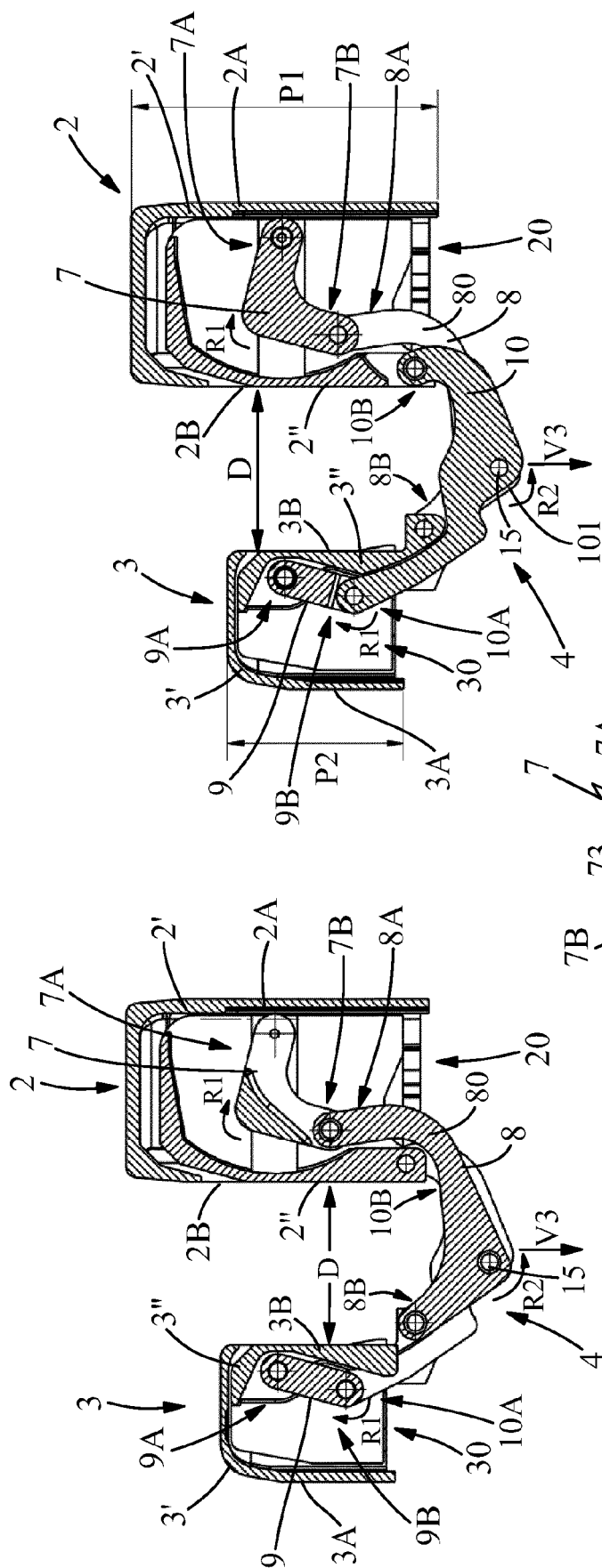
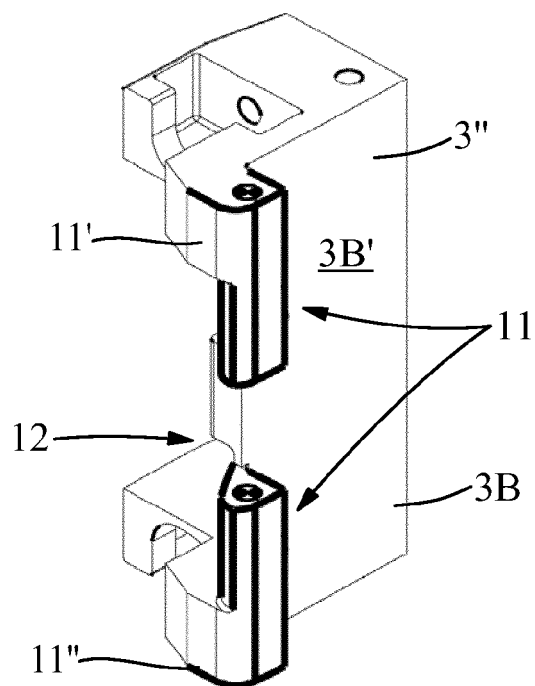
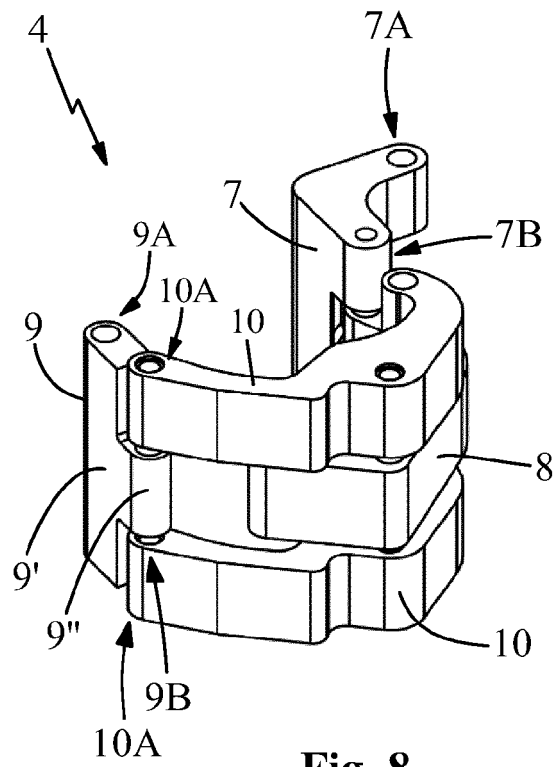


Fig. 3





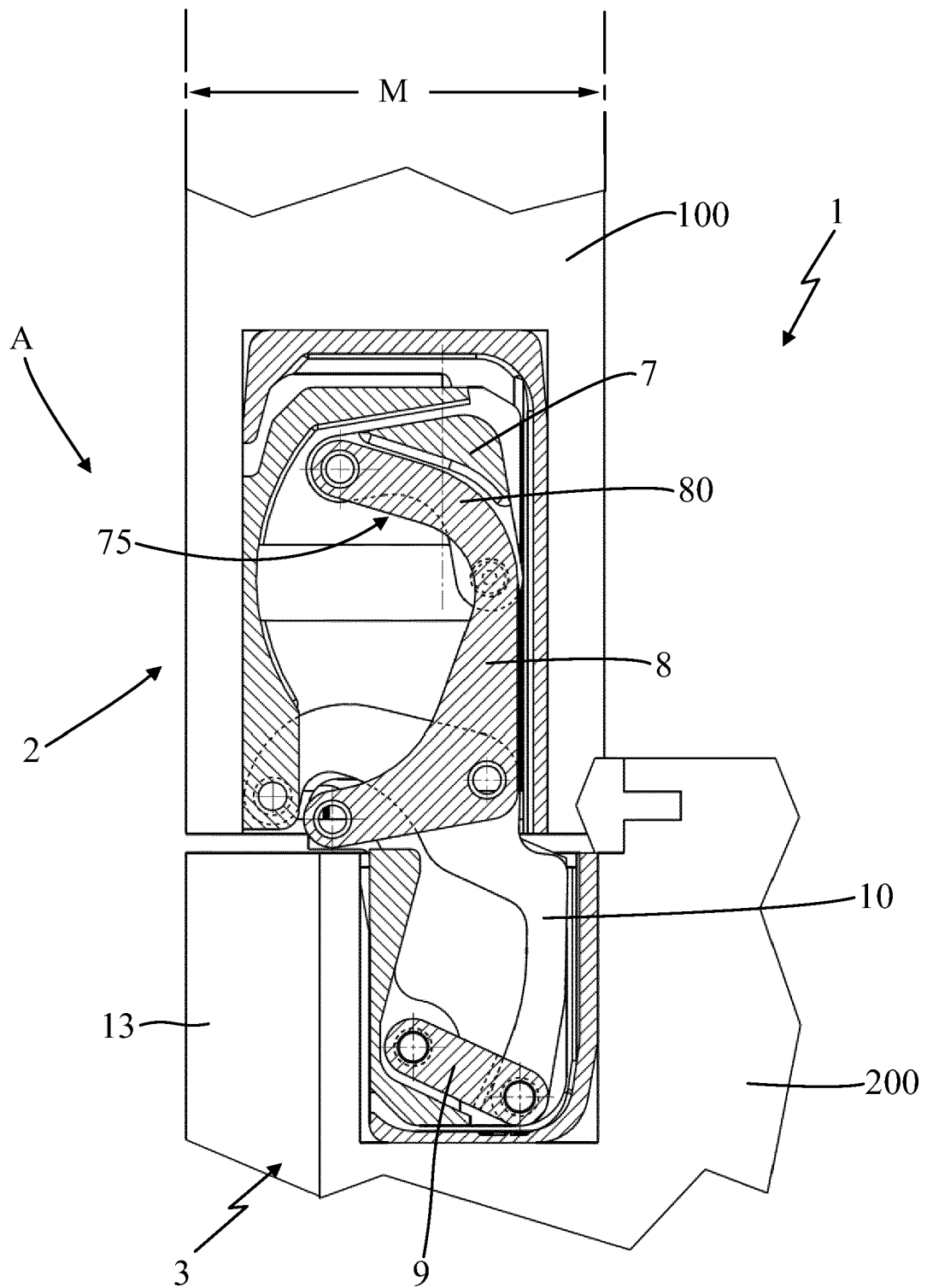
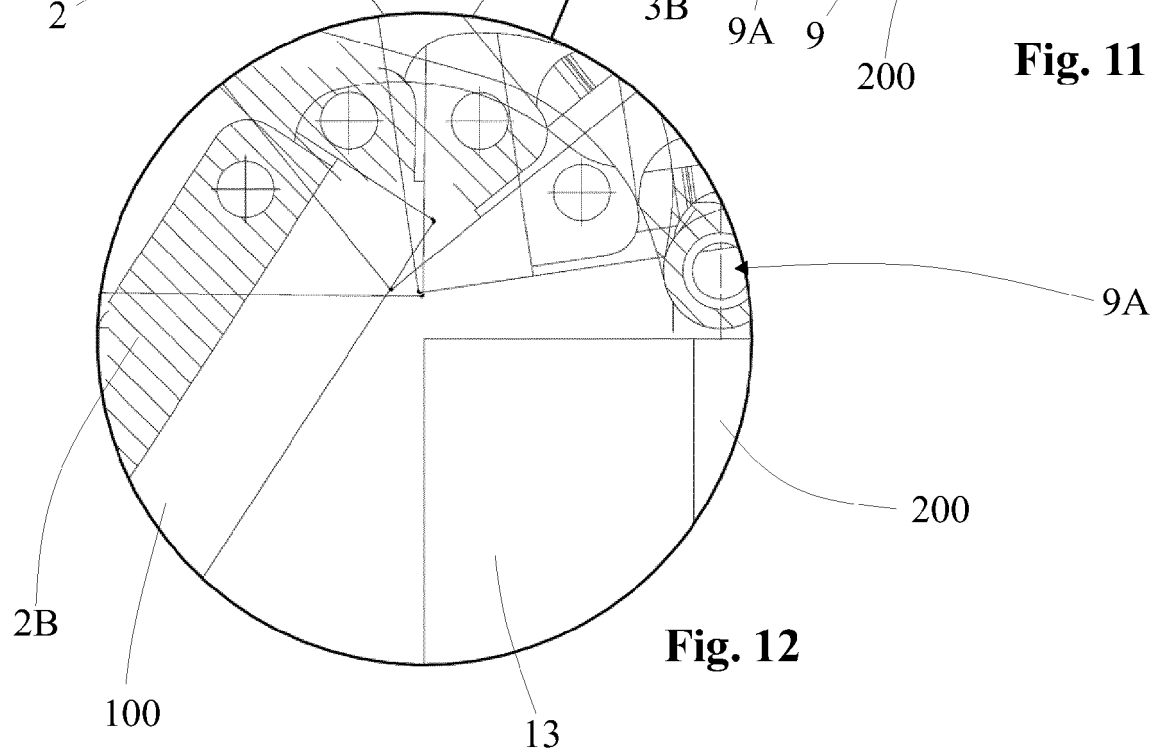
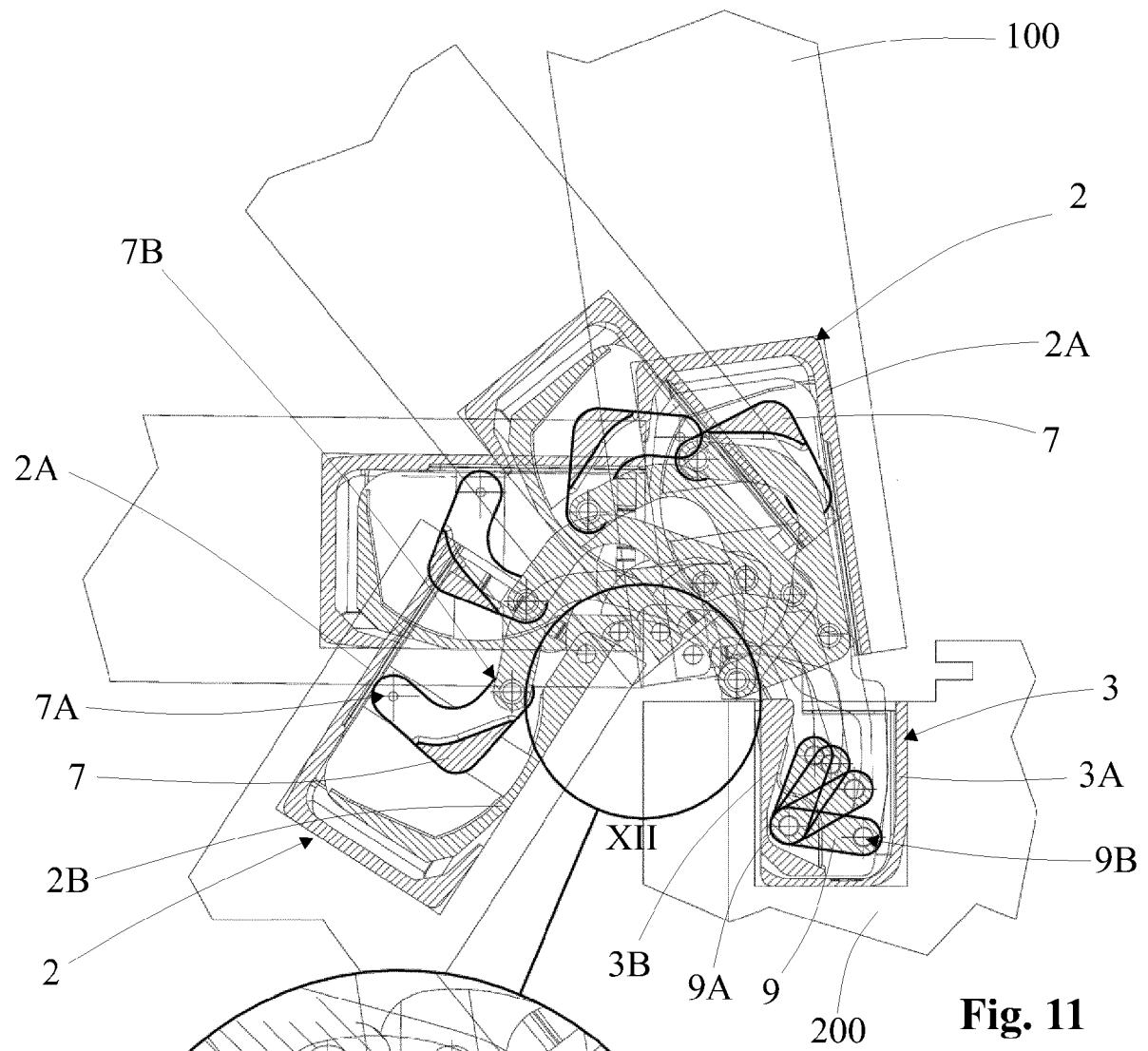


Fig. 10





EUROPEAN SEARCH REPORT

Application Number
EP 18 18 7386

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Place of search The Hague		Date of completion of the search 26 November 2018	Examiner Mund, André
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26-11-2018

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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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