

(19)



(11)

**EP 3 683 390 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:

**09.11.2022 Bulletin 2022/45**

(51) International Patent Classification (IPC):

**E05D 5/02** (2006.01) **E05D 5/06** (2006.01)

(21) Application number: **19219868.7**

(52) Cooperative Patent Classification (CPC):

**E05D 5/023; E05D 5/06; E05D 3/02; E05D 5/0223;**  
**E05Y 2600/41; E05Y 2800/455**

(22) Date of filing: **27.12.2019**

(54) **CONCEALED HINGE FOR A WINDOW OR DOOR AND WINDOW OR DOOR EQUIPPED WITH  
SUCH AND METHOD FOR MANUFACTURING OF SUCH HINGE**

VERDECKTES SCHARNIER FÜR EIN FENSTER ODER EINE TÜR UND FENSTER ODER TÜR MIT  
EINEM SOLCHEN SCHARNIER UND VERFAHREN ZUR HERSTELLUNG EINES SOLCHEN  
SCHARNIERS

CHARNIÈRE DISSIMULÉE POUR UNE FENÊTRE OU UNE PORTE ET FENÊTRE OU PORTE  
ÉQUIPÉE DE CELLE-CI ET PROCÉDÉ DE FABRICATION D'UNE TELLE CHARNIÈRE

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB  
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO  
PL PT RO RS SE SI SK SM TR**

(72) Inventor: **VAN PARYS, Emmanuel**

**9790 Wortegem-Petegem (BE)**

(30) Priority: **16.01.2019 BE 201905025**

(74) Representative: **Donné, Eddy et al**

**Bureau De Rycker nv  
Arenbergstraat 13  
2000 Antwerpen (BE)**

(43) Date of publication of application:

**22.07.2020 Bulletin 2020/30**

(56) References cited:

**EP-A1- 3 321 458 DE-U1- 20 021 406**

(73) Proprietor: **SOBINCO,  
naamloze vennootschap  
9870 Zulte (BE)**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

**EP 3 683 390 B1**

## Description

**[0001]** The present invention relates to a concealed hinge for a door or window, particularly for a door or window with a fixed frame and a leaf that is suspended rotatably around a vertical shaft in the fixed frame by means of one or more concealed hinges.

**[0002]** More specifically, the invention relates to a hinge for a door or window the fixed frame of which is made up of hollow profiles.

**[0003]** The frame profiles and the leaf profiles are provided with a lip with which these profiles overlap in closed condition of the door or window and to which a seal is fitted for the sealing between the frame profiles and the leaf profiles.

**[0004]** A concealed hinge refers to a hinge that is built into the space between the leaf and the fixed frame, more specifically in the rebate which in a closed door or window is delimited between the opposite walls of the frame and of the leaf and said lips, such that the hinge is not visible when the door or window is closed.

**[0005]** Known concealed hinges are made from a frame section which is attached on the frame and a leaf section which is attached on the leaf, more specifically on the level of said opposite walls of the frame and of the leaf, whereby both parts are hingeably connected by means of a shaft.

**[0006]** Hinges are already known whereby the frame section is essentially made as a box-shaped injection moulded body which fits in a pre-fitted recess in the wall of the frame profile facing the rebate, said box-shaped body being open toward the rebate and whereby the leaf section is provided with a curved hook-shaped part which with a closed window or door essentially extends in the box-shaped body and along its free edge is hingeably connected to it by means of a shaft which is attached in the box-shaped body at a depth.

**[0007]** When opening the window or the door the hook-shaped part hinges outward relative to the box-shaped body.

**[0008]** The fact that in the closed condition of the window or the door, the hook-shaped part of the leaf section together with the box-shaped body of the hinge is concealed in the hollow frame profile, offers the advantage that the width of the rebate between the frame and the leaf can be minimal, such that slimmer profiles can be applied, which is a trend in the field of windows and doors with a slimmer look of the frame.

**[0009]** For mounting the hinge on the frame, holes are drilled in the known way on the site in said wall of the frame, in which for example blind rivet nuts or clip anchors are attached with a female thread, in which screws can be screwed for attaching the frame section of the hinge on the frame.

**[0010]** For this purpose the box-shaped body is provided at both ends with longitudinal laterally extending flanges which are provided with holes for bolts or screws, which can be screwed in said blind rivet nuts or clip an-

chors to tighten the flanges against the wall of the frame profile facing the rebate.

**[0011]** At the same time a height adjustment is provided on the known hinges to be able to adjust the height of the leaf in relation to the frame by adjusting the position of the frame section upward. For such height adjustment, several extra components are usually provided which, moreover, are visible when a window or door is open, which is not very aesthetic and moreover may encourage fiddling with the height adjustment, which is not desired of course.

**[0012]** A disadvantage of the known hinges is that the frame section is manufactured by injection moulding, which makes said component relatively expensive, particularly in view of the high cost of the cast to make said frame section.

**[0013]** Moreover, the frame profile and therefore the corresponding cast must be adjusted for every form of frame profile.

**[0014]** DE20021406U1 discloses an arrangement comprising a frame binding section that is fixed to the frame of a door or window, as well as a wing binding section that is fixed to the wing of the door or window. Vertically, there is hinge section of the binding section that has binding bolts for forming a hinge-like turnable connection for the binding section. There is an adjustment system for adjusting the height level of the wing binding section opposite the frame binding section.

**[0015]** The purpose of the present invention is to provide a solution to one or more of the aforementioned and other disadvantages. To this end, the invention relates to a concealed hinge for attaching a leaf of a window or door in a fixed frame that is composed of hollow frame profiles, whereby the hinge contains a frame section and a leaf section and whereby the leaf section is intended to be attached to the leaf and is provided with a hook-shaped part for connecting with the frame section and whereby the frame section is intended to be attached to a wall of the frame profile and to this end is provided at each end with a flange and whereby the frame section is provided with a recess for the hook-shaped part of the leaf section which is hingeably connected with the frame section by means of a shaft, wherein the frame section is manufactured from one piece of an extruded basic profile with a first wall and at least a first channel at a distance from said first wall, whereby the basic profile is removed at both its head ends over a length up to said first wall to form said flanges and whereby the first wall and the first channel are removed in a central section to form the said recess for the hook-shaped part of the leaf section and whereby the remaining section of the first channel forms a passage for the shaft of the hinge, whereby the frame section is intended to be mounted in a recess of the frame profile provided for this purpose, whereby the hinge and the recess are dimensioned such that the hinge is slideable upward over a certain length in the recess of the frame profile, whereby in said flanges, holes are provided for screws or bolts for attachment of the flanges against

the frame profile, whereby at least one of the holes in the flanges is a slotted hole which extends longitudinally (X-X') relative to the basic profile for a possible height adjustment of the frame section in mounted condition, wherein for the height adjustment of the frame section the basic profile is provided with a second channel which is removed on the level of the central recess in the frame section and in which an adjusting screw is mounted.

**[0016]** Such a hinge according to the invention ensures that the frame section can be manufactured relatively easily, quickly and affordably by milling or the like of a one-piece extruded profile.

**[0017]** With suitable milling operations the basic profile can also serve for the manufacture of a frame section, suitable for frame profiles with divergent sizes and forms. This results in a greater flexibility in the production to switch between the production of different hinges for different forms of frame profiles, whereby the optimum rotation point can always be set depending on the type of profile.

**[0018]** By starting from a one-piece profile the frame section consists of one robust component which benefits the stability of the hinge.

**[0019]** The shaft of the concealed hinge can be mounted through the remaining sections of the first channel, whereby the shaft can be longitudinally secured at its ends by means of a locknut or other locking means.

**[0020]** This provides the advantage that the seats for the shaft of the hinge are already integrated in the basic profile, said seats being realisable by a simple milling or other operation with which material can be removed.

**[0021]** Preferably a height adjustment for the leaf is provided in the frame section by adjusting the height of the frame section in the recess of the frame profile in which the frame section is mounted.

**[0022]** For this purpose the basic profile, which is the basis for the manufacture of the frame section, is preferably provided with a second channel which is removed on the level of the recess in the frame section and in which an adjusting screw is fitted.

**[0023]** The second channel is positioned such that in mounted condition of the frame section the adjusting screw is located in the recess of the frame profile opposite a rib or other detailing of the frame profile.

**[0024]** The concealed hinge with the leaf attached thereto rests on the opposite rib or other detailing of the frame profile with the adjusting screw.

**[0025]** By screwing the adjusting screw in or out, the position of the leaf in the fixed frame can be adjusted upward.

**[0026]** According to a preferred embodiment the basic profile from which the frame section is manufactured possesses a second wall opposite said first wall. Both walls are connected by two connecting walls, a first and a second connecting wall respectively, to delimit an enclosed chamber, which benefits the robustness and stability of the frame section of the hinge.

**[0027]** Moreover, one connecting wall can be formed

such that it is located in the extension of the hook-shaped part of the leaf section in the open condition of the concealed hinge, such that said connecting wall forms an integrated protective cover for the recess in the frame profile in which the frame section of the hinge is mounted.

**[0028]** Thanks to the integration of a protective cover in the extrusion profile of the basic profile, no separate protective cover needs to be provided as in known hinges and said protective cover cannot be lost either or fall out in the way this can happen with the known hinges.

**[0029]** Thanks to the integration of a protective cover in the extrusion profile of the basic profile, the frame section consists of one robust component, which benefits the stability.

**[0030]** In further preferred embodiments of a concealed hinge according to the invention, the hinge comprises the following characteristics.

**[0031]** The recess in the central section of the first wall extends from one side edge of said first wall to a distance from the opposite side edge of said first wall.

**[0032]** The length (E) of the recess is slightly longer than the length (F) of the hook-shaped part of the leaf section of the concealed hinge.

**[0033]** The first wall is a flat wall.

**[0034]** The shaft of the concealed hinge extends through the remaining sections of the first channel and the shaft is longitudinally secured at its ends by means of a locknut or other locking means.

**[0035]** Holes are provided in said flanges for screws or bolts for attachment of the flanges against the frame profile.

**[0036]** The second channel is positioned such that the adjusting screw is located in mounted condition of the frame section in the recess of the frame profile opposite a rib or other detailing of the frame profile.

**[0037]** At one end the adjusting screw is provided with a seat for a socket head wrench or another tool with which the adjusting screw can be screwed in or out, whereby said end is oriented toward the central recess of the frame section.

**[0038]** At its other end the adjusting screw is provided with a support foot which extends outward relative to the remaining section of the second channel.

**[0039]** The basic profile from which the frame section is manufactured possesses a second wall opposite said first wall and both walls are connected with each other by two connecting walls, a first connecting wall and a second connecting wall respectively, to delimit an enclosed chamber.

**[0040]** The connecting walls are located at a distance from the side edges of the first wall of the basic profile from which the frame section of the hinge is manufactured.

**[0041]** The first channel is provided in the first connecting wall.

**[0042]** The section of the first connecting wall between the first channel and the first wall is shifted toward the second connecting wall, said section of the first connect-

ing wall being located in the extension of the hook-shaped part of the leaf section in the open condition of the concealed hinge.

**[0043]** The second channel is located in the enclosed chamber of the basic profile from which the frame section is manufactured.

**[0044]** On the level of the central section of the basic profile that is removed to form the recess for the hook-shaped part of the leaf section, at least a section of the second wall and of the second connecting wall remains.

**[0045]** The invention also relates to a door or window with a fixed frame in which a leaf is hingeably suspended by means of concealed hinges according to the invention, with a frame section manufactured from a basic profile, whereby the frame section of the concealed hinges is partially fitted in a recess of the frame profile.

**[0046]** The invention also relates to a method for manufacturing a concealed hinge, as described above, with a frame section and leaf section which are hingeably connected by means of a shaft, whereby the frame section is provided with a recess for a hook-shaped part of the leaf section with which it is hingeably connected and a flange at each end of the frame section for attaching on a frame profile, characterised in that the manufacture of the frame section is based on a length of an extruded basic profile with a first wall and at least a first channel at a distance from said first wall, whereby the method comprises the following steps:

- removing the material of the basic profile over a certain length at both head ends of the basic profile up to the first wall to form said flanges;
- removing the first wall and the first channel in a central section of the basic profile to form a recess for the hook-shaped part of the leaf section, whereby the remaining section of the first channel forms a passage for the shaft of the hinge.

**[0047]** Preferably, the method is based on a basic profile which next to the first channel contains another second channel which is removed on the level of said recess and whereby in the remaining section an adjusting screw is screwed at least in one end of the recess.

**[0048]** Preferably, the method is also based on a basic profile the second channel of which is positioned such that when the frame section is mounted in a recess of the frame profile provided for this purpose, the adjusting screw is located opposite a rib or other detailing of the frame profile.

**[0049]** The invention also relates to a concealed hinge for attaching a leaf of a window or door in a fixed frame which is composed of hollow frame profiles with internal ribs, whereby the hinge contains a frame section and a leaf section and whereby the leaf section is intended to be attached to the leaf and is provided with a hook-shaped part to connect with the frame section and whereby the frame section is intended to be attached in a recess of the frame profile, whereby the frame section is provided

ed with an adjusting screw for the height adjustment of the recess which in a mounted condition of the frame section is positioned in the recess opposite a rib of the frame profile and rests on it.

**[0050]** In a preferred embodiment of a concealed hinge of the invention, the adjusting screw is provided at one end with a seat for a socket head wrench or another tool with which the adjusting screw can be screwed in or out, whereby said end is oriented toward the central recess of the frame section.

**[0051]** In another preferred embodiment of a concealed hinge of the invention, the adjusting screw is provided with a support foot at its other end which extends outward relative to the remaining section of the second channel.

**[0052]** With the intention of better showing the characteristics of the invention, hereinafter, by way of an example without any limiting nature, a preferred embodiment is described of a concealed hinge according to the invention for a window or door and of a preferred method to manufacture such hinge, at least of the frame section of such hinge according to the invention, with reference to the accompanying drawings, wherein:

figure 1 schematically shows a perspective view of a concealed hinge according to the invention in opened condition, ready for mounting between a frame profile and a leaf profile of a window or door; figure 2 shows the concealed hinge of figure 1 seen from the back, in accordance with the closed condition of the window or door; figure 3 shows the concealed hinge of figure 2 in a disassembled condition; figure 4 shows a lateral view according to the arrow F4 in figure 2; figure 5 shows a lateral view of a basic profile from which a frame section of a hinge according to the invention can be manufactured by milling away the parts shown in dashed line; figure 6 shows a cross-section according to line VI-VI in figure 5; figure 7 shows the basic profile of figure 5 after milling the sections indicated in figure 5; figure 8 shows the frame profile indicated in figure 1 with F8 and which is provided with a recess for mounting the frame section of figure 7; figure 9 shows the frame section of figure 8 in mounted condition in the frame profile of figure 8; figure 10 shows a cross-section according to the line X-X in figure 9, but with a mounted leaf section; figure 11 shows a cross-section according to line XI-XI of figure 10; figure 12 shows the cross-section of figure 11 but with a different height adjustment.

**[0053]** Figure 1 shows a concealed hinge 1 according to the invention positioned between a frame profile 2 of a fixed frame of a window or door and a leaf profile 3 of

a rotatable leaf 6 of the window or of the door 4.

**[0054]** The frame profile 2 in the shown example is a profile with several hollow chambers which are separated from each other by ribs or partitions 4.

**[0055]** In the closed condition of the window or door, the walls 5 and 6 of the frame profile 2 and of the leaf profile 3 respectively, are oriented toward each other and delimit the rebate or open space between the frame and the leaf in which the hinge 1 is mounted in a concealed way.

**[0056]** As shown in figures 2 to 4, the hinge 1 is composed of a frame section 7 for attaching on the frame profile 2 and a leaf section 8 for attaching on the leaf profile 3, said parts 7 and 8 being hingeably connected by means of a shaft 10.

**[0057]** The frame section 7 is formed by a box-shaped body 10 with length A and at both ends a flange 11 with screw holes 12 which extend in a parallel way with the longitudinal direction X-X' of the shaft 9.

**[0058]** For the mounting of the frame section 7, the frame profile 2 is provided with a recess 13 with a length B and width C, which is milled to a certain depth from the wall 5, whereby the frame section 7 fits with its body 10 in the recess 13 in such a way that in the mounted condition of the frame section 7 the body 10 is still slideable longitudinally X-X' in the recess 13 for the height adjustment of the hinge 1.

**[0059]** Furthermore, four holes are provided in the wall 5 in which clip anchors 14 or blind rivet nuts are attached for attaching the frame section 7 by means of screws (not shown) which are screwed through the screw holes 12 in the clip anchors 14.

**[0060]** To make the height adjustment possible, the length A of the body 10 is less than the length B of the recess 13 and the screw holes 12 are executed as slotted holes.

**[0061]** The leaf section 9 of the hinge 1 contains a hinge leaf 15 which is attached on said wall 6 of the leaf profile 3 by means of screws (not shown) which are tightened through screw holes 16 in clip anchors 14 in the leaf profile 3.

**[0062]** The leaf section 9 further contains a hook-shaped part 17 which is attached on the hinge leaf 15 and in the example shown in the figures is executed as a loose component but which alternatively can also be executed in one piece with the hinge leaf 15.

**[0063]** The hook-shaped part 17 extends in the body 10 of the frame section 7 with its free end and is hingeably connected with it by means of the shaft 9 which is attached at a depth D from the wall 5 in the body 10 and which extends through a shaft passage 18 in the free end of the hook-shaped part 17.

**[0064]** The special aspect of the invention is that the frame section 7 is manufactured from an extruded basic profile 19, as shown in the figures 5 and 6, by removing parts 20 and 21 as shown in dashed line in figure 5, for example by means of milling or other material removing operations.

**[0065]** The basic profile 19 contains a first, preferably flat wall 22 and an opposite second wall 23 which are connected to each other by two connecting walls, a first connecting wall 24 and a second connecting wall 25 respectively to delimit an enclosed chamber 26.

**[0066]** The connecting walls 24 and 25 are located at a distance from the side edges 27 of the first wall 22 of the basic profile 19.

**[0067]** In the example shown a first channel 28 is provided in a thickened section in the profiling of the first connecting wall 24 which in the profile direction extends at said distance D relative to the first wall 22. Alternatively, it is not excluded that the extruded basic profile 19 does not contain a channel 28 but only a thickened section in the profiling in which such channel can be provided, for example by drilling.

**[0068]** The section of the first connecting wall 24 between the thickened section with the first channel 28 and the first wall is shifted to the second connecting wall 25 over a distance, such that the chamber 26 is smaller on the side of the first wall 22 than on the opposite second wall 23.

**[0069]** A profiling 29 is located in the chamber 26 in which a second channel 30 is formed by extrusion or in which such channel can be fitted by drilling or the like.

**[0070]** For manufacturing the frame section 7, at each of the head ends of the basic profile 19, a section 20 of the basic profile 19 is removed over a length up to said first wall 22 to form said flanges 11, after which the slotted holes 16 are made in these flanges 11.

**[0071]** In the central section of the basic profile 19, a section 21 of the first wall 22 and of the first connecting wall 24 with the first channel 28, as well as of the profiling 29 with the second channel 30, is removed over a length E to form a recess for the hook-shaped part 17 of the leaf section 8 of the hinge 1, said recess extending through the first wall 22 from one side edge 27 of said first wall 22 to a distance from the opposite side edge 27 of said first wall 22, for example up to the second connecting wall 25, whereby at least a section of the second wall 23 and of the second connecting wall 25 remains.

**[0072]** The length E of the removed section 21 is slightly longer than the length F of the hook-shaped part 17.

**[0073]** The remaining sections of the first channel 28 form passages for the shaft 9 of the hinge 1 which in a mounted condition extends through said passages and through the shaft passage 18 in the hook-shaped part 17.

**[0074]** The shaft 9 is secured longitudinally, for example by means of a locknut 32 at each end of the shaft 9 or by any other suitable locking means.

**[0075]** For the height adjustment of the frame section 7 an adjusting screw 33 is fitted in one of both remaining sections of the profiling 29 with the second channel 30.

**[0076]** At one end the adjusting screw 33 is provided with a seat 34 for a socket head wrench or other tool with which the adjusting screw can be screwed in or out, whereby the adjusting screw 33 is screwed with said end in the second channel 30 in the direction of the central

recess 31.

**[0077]** The other end of the adjusting screw is provided with a widened support foot 35 which extends outward relative to the remaining section of the second channel 30.

**[0078]** The second channel 30 is positioned such that the adjusting screw in a mounted condition of the frame section 7 is located opposite said rib 4 or other detailing of the frame profile 3, more specifically in the extension thereof, such that in a mounted condition the frame section 7 rests on said rib with the support foot 35 of the adjusting screw 33.

**[0079]** It is clear that by screwing the adjusting screw 33 in or out the height of the frame section 7 in the recess 13 of the frame profile 3 can be adjusted and with it also the height of the hinge 1 and the leaf attached to it.

**[0080]** Figure 12 shows a situation whereby in relation to the situation of figure 11 the adjusting screw is screwed out downward, such that the frame section 7 is moved upward.

**[0081]** It is clear that said height adjustment is completely invisible from the outside.

**[0082]** It is also clear that the remaining walls 23, 24 and 25 completely cover the milling thanks to which the recess 13 was realised in the frame section 2.

**[0083]** It is clear that in this way a strong and stable frame section 7 of a concealed hinge 1 can be simply made which is manufactured from one piece, based on an extruded basic profile 29 and that an invisible height adjustment can be simply integrated using a simple adjusting screw 33.

**[0084]** The invention also relates to a height adjustment as described above with an adjusting screw 33 which rests on a rib 4 of the frame profile 2, whereby it is not necessary for this purpose that the frame section 7 is manufactured from an extruded profile, but for example can also be manufactured as an injection moulded component in which an adjusting screw is screwed longitudinally relative to the frame section 7 or slightly diagonally in relation to said longitudinal direction.

**[0085]** The present invention is by no means limited to the embodiments described as an example and shown in the drawings, but a concealed hinge according to the invention and a method for the manufacture thereof can be realised in all kinds of variants, without departing from the scope of the invention as defined by the appended claims.

## Claims

1. Concealed hinge for attaching a leaf of a window or door in a fixed frame that is composed of frame profiles (2), whereby the hinge (1) contains a frame section (7) and a leaf section (8) and whereby the leaf section (8) is intended to be attached to the leaf and is provided with a hook-shaped part (17) for connecting with the frame section (7) and whereby the frame

section (7) is intended to be attached to a wall (5) of the frame profile (2) and to this end is provided at each end with a flange (11) and whereby the frame section (7) is provided with a recess (31) for the hook-shaped part (17) of the leaf section (8) which is hingeably connected with the frame section (7) by means of a shaft (9), whereby the frame section (7) is manufactured from an extruded basic profile (19) with a first wall (22) and at least a first channel (28) at a distance (D) from said first wall (22) for the shaft (9) of the hinge or a profiling of the first wall (22) in which such channel (28) can be provided, whereby the basic profile (19) is removed at both its head ends over a length up to said first wall (22) to form said flanges (11) and whereby the first wall (22) and the first channel (28) or the profiling provided for said channel (28) are removed in a central section to form said recess (31) for the hook-shaped part (17) of the leaf section (8) and whereby the remaining section of the first channel (28) or of the profiling after fitting a first channel (28) forms a passage for the shaft (9) of the hinge (1), whereby the frame section (7) is intended to be mounted in a recess (13) of the frame profile (2) provided for this purpose, whereby the hinge (1) and the recess (13) are dimensioned such that the hinge (1) is slideable upward over a certain length in the recess (13) of the frame profile (2), whereby in said flanges (11), holes (12) are provided for screws or bolts for attachment of the flanges (11) against the frame profile (2), whereby at least one of the holes (12) in the flanges (11) is a slotted hole which extends longitudinally (X-X') relative to the basic profile (19) for a possible height adjustment of the frame section (7) in mounted condition, wherein for the height adjustment of the frame section (7) the basic profile (19) is provided with a second channel (30) which is removed on the level of the central recess (31) in the frame section (7) and in which an adjusting screw is fitted.

2. Concealed hinge according to claim 1, **characterised in that** the recess (31) in the central section of the first wall (22) extends from one side edge (27) of said first wall (22) up to a distance from the opposite side edge (27) of said first wall (22).
3. Concealed hinge according to claim 1 or 2, **characterised in that** the length (E) of the recess (31) is slightly longer than the length (F) of the hook-shaped part (17) of the leaf section (8) of the concealed hinge (1).
4. Concealed hinge according to any one of the previous claims, **characterised in that** the first wall (22) is a flat wall.
5. Concealed hinge according to any one of the previous claims, **characterised in that** the shaft (9) of

the concealed hinge (1) extends through the remaining sections of the first channel (28) and that the shaft (9) is longitudinally secured by means of a lock-nut (32) or other locking means at its ends.

6. Concealed hinge according to any one of the previous claims, **characterised in that** the second channel (30) is positioned such that the adjusting screw (33) is located in a mounted condition of the frame section (7) in the recess (13) of the frame profile (2) opposite a rib (4) or other detailing of the frame profile (2). 5
7. Concealed hinge according to any one of the previous claims, **characterised in that** the adjusting screw (33) is provided with a seat (34) at one end for a socket head wrench or other tool with which the adjusting screw (33) can be screwed in or out, whereby said end is oriented toward the central recess (31) of the frame section (7). 10
8. Concealed hinge according to claim 7, **characterised in that** at the other end the adjusting screw (33) is provided with a support foot (35) which extends outward relative to the remaining section of the second channel (30). 15
9. Concealed hinge according to any one of the previous claims, **characterised in that** the basic profile (19) from which the frame section (7) is manufactured possesses a second wall (23) opposite said first wall (22) and that both walls (22, 23) are connected to each other by two connecting walls, a first connecting wall (24) and a second connecting wall (25) respectively to delimit an enclosed chamber (26). 20
10. Concealed hinge according to claim 9, **characterised in that** the connecting walls (24, 25) are located at a distance from the side edges (27) of the first wall (22) of the basic profile (19) from which the frame section (7) of the hinge (1) is manufactured. 25
11. Concealed hinge according to claim 9 or 10, **characterised in that** the first channel (28) is provided in the first connecting wall (24). 30
12. Concealed hinge according to claim 11, **characterised in that** the section of the first connecting wall (24) between the first channel (28) and the first wall (22) is shifted to the second connecting wall (25), said section of the first connecting wall (24) being located in the extension of the hook-shaped part (17) of the leaf section (8) in the open condition of the concealed hinge (1). 35
13. Concealed hinge according to any one of the claims 9 to 12, **characterised in that** the second channel 40

(30) is located in the enclosed chamber (26) of the basic profile (19) from which the frame section (7) is manufactured.

14. Concealed hinge according to any one of the claims 9 to 13, **characterised in that** on the level of the central section (21) of the basic profile (19) which is removed to form the recess (31) for the hook-shaped part (17) of the leaf section (8), at least a section of the second wall (23) and of the second connecting wall (25) remains. 45
15. Door or window with a fixed frame (3) in which a leaf is hingeably suspended by means of concealed hinges (1) according to any one of the previous claims, with a frame section (7) manufactured from a basic profile (19), whereby the frame section (7) of the concealed hinges (1) is partially mounted in a recess (13) of the frame profile (2). 50
16. Method to manufacture a concealed hinge with a frame section (7) and leaf section (8) according to any one of the claims 1 to 14, whereby the frame section (7) is provided with a recess (31) for a hook-shaped part (17) of the leaf section (8) with which it is hingeably connected by means of a shaft (9) and a flange (11) at each end of the frame section (7) for attaching on a frame profile (2), **characterised in that** the manufacture of the frame section (7) is based on a length of an extruded basic profile (19) with a first wall (22) and at least a first channel (28) at a distance (D) from said first wall 22, whereby the method comprises the following steps: 55
  - removing the material of the basic profile (19) over a certain length at both head ends of the basic profile (19) up to the first wall (22) to form said flanges (11);
  - removing the first wall (22) and the first channel (28) in a central section (21) of the basic profile (19) to form a recess (31) for the hook-shaped part (17) of the leaf section (8), whereby the remaining section of the first channel (28) forms a passage for the shaft (9) of the hinge (1).
17. Method according to claim 16, **characterised in that** the basic profile (19) from which the manufacture starts, contains another second channel (30) which is removed on the level of said recess (31) and whereby an adjusting screw (33) is screwed into the remaining section at one end of the recess at least.
18. Method according to claim 17, **characterised in that** a basic profile (19) is used to start from, the second channel (30) of which is positioned such that, when the frame section (7) is mounted in a recess (13) of the frame profile (2) provided for this purpose, the adjusting screw (33) is located opposite a rib (4) or

other detailing of the frame profile (2).

### Patentansprüche

1. Verdecktes Scharnier zum Anbringen eines Flügels eines Fensters oder einer Tür an einem fixierten Rahmen, der aus Rahmenprofilen (2) zusammengesetzt ist, wobei das Scharnier (1) einen Rahmenbereich (7) und einen Flügelbereich (8) enthält, und wobei der Flügelbereich (8) vorgesehen ist, an dem Flügel angebracht zu werden und mit einem hakenförmigen Teil (17) zum Verbinden mit dem Rahmenbereich (7) versehen ist, und wobei der Rahmenbereich (7) vorgesehen ist, an einer Wand (5) des Rahmenprofils (2) angebracht zu werden, und an diesem Ende, an jedem Ende mit einem Flansch (11) versehen ist, und wobei der Rahmenbereich (7) mit einer Aussparung (31) für den hakenförmigen Teil (17) des Flügelbereichs (8) versehen ist, der einhängbar mit dem Rahmenbereich (7) mittels einer Welle (9) verbunden ist, wobei der Rahmenbereich (7) aus einem Strangpressbasisprofil (19) hergestellt ist, mit einer ersten Wand (22) und mindestens einem ersten Kanal (28) mit einem Abstand (D) von der ersten Wand (22) für die Welle (9) des Scharniers oder einer Profilierung der ersten Wand (22), in der ein solcher Kanal (28) bereitgestellt werden kann, wobei das Basisprofil (19) an beiden seiner Kopfenden über eine Länge bis zu der ersten Wand (22) entfernt wird, um die Flansche (11) auszubilden, und wobei die erste Wand (22) und der erste Kanal (28) oder die erste Profilierung, die für den Kanal (28) bereitgestellt ist, in einem zentralen Bereich entfernt werden, um die Aussparung (31) für den hakenförmigen Teil (17) des Flügelbereichs (8) auszubilden, und wobei der verbleibende Bereich des ersten Kanals (28) oder die erste Profilierung nach einem Einbauen eines ersten Kanals, einen Durchgang für die Welle (9) des Scharniers (1) ausbildet, wobei der Rahmenbereich (7) vorgesehen ist, um in einer Aussparung (13) des Rahmenprofils (2), die für diesen Zweck bereitgestellt ist, montiert zu werden, wobei das Scharnier (1) und die Aussparung (13) derart bemessen sind, dass das Scharnier (1) über eine gewisse Länge in der Aussparung (13) des Rahmenprofils (2) nach oben gleitbar ist, wobei in dem Flansch (11) Löcher (12) für Schrauben und Bolzen für ein Anbringen der Flansche (11) an dem Rahmenprofil (2), bereitgestellt sind, wobei mindestens eines der Löcher (12) in den Flanschen (11) ein Schlitzloch ist, das sich in Längsrichtung (X-X') relativ zu dem Basisprofil (19) für eine mögliche Höheneinstellung des Rahmenbereichs (7) in montiertem Zustand, erstreckt, wobei für die Höhenanpassung des Rahmenbereichs (7), das Basisprofil (19) mit einem zweiten Kanal (30) versehen ist, der auf dem Niveau der zentralen Aussparung (31) in dem Rahmenbereich (7) entfernt ist,

und in dem eine Einstellschraube eingebaut ist.

2. Verdecktes Scharnier nach Anspruch 1, **dadurch gekennzeichnet, dass** sich die Aussparung (31) in dem zentralen Bereich der ersten Wand (22) von einer Seitenkante (27) der ersten Wand (22) bis zu einem Abstand von der gegenüberliegenden Seitenkante (27) der ersten Wand (22) erstreckt.
3. Verdecktes Scharnier nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Länge (E) der Aussparung (31) geringfügig länger als die Länge (F) des hakenförmigen Teils (17) des Flügelbereichs (8) des verdeckten Scharniers (1) ist.
4. Verdecktes Scharnier nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die erste Wand (22) eine flache Wand ist.
5. Verdecktes Scharnier nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sich die Welle (9) des verdeckten Scharniers (1) durch die verbleibenden Bereiche des ersten Kanals (28) erstreckt, und dass die Welle (9) mittels einer Kontermutter (32) oder anderen Verriegelungsmitteln an ihren Enden in Längsrichtung befestigt ist.
6. Verdecktes Scharnier nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der zweite Kanal (30) derart positioniert ist, dass sich die Einstellschraube (33) in einem montierten Zustand des Rahmenbereichs (7) in der Aussparung (13) des Rahmenprofils (2) gegenüber einer Rippe (4) oder einer anderen Detaillierung des Rahmenprofils (2) befindet.
7. Verdecktes Scharnier nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Einstellschraube (33) mit einem Sitz (34) an einem Ende für einen Sechskant-Stiftschlüssel oder ein anderes Werkzeug versehen ist, mit dem die Einstellschraube (33) ein- oder ausgeschraubt werden kann, wobei das Ende zu der zentralen Aussparung (31) des Rahmenabschnitts (7) hin ausgerichtet ist.
8. Verdecktes Scharnier nach Anspruch 7, **dadurch gekennzeichnet, dass** an dem anderen Ende, die Einstellschraube (33) mit einem Stützfuß (35) versehen ist, der sich relativ zu dem verbleibenden Bereich des zweiten Kanals (30) nach außen erstreckt.
9. Verdecktes Scharnier nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Basisprofil (19), aus dem der Rahmenbereich (7) hergestellt ist, eine zweite Wand (23) gegenüber der ersten Wand (22) besitzt, und dass beide Wände (22, 23) durch zwei Verbindungswände, eine erste Verbindungswand (24) beziehungsweise eine zwei-

te Verbindungswand (25), miteinander verbunden sind, um eine geschlossene Kammer (26) zu begrenzen.

10. Verdecktes Scharnier nach Anspruch 9, **dadurch gekennzeichnet, dass** sich die Verbindungswände (24, 25) in einem Abstand von den Seitenkanten (27) der ersten Wand (22) des Basisprofils (19) befinden, von denen der Rahmenbereich (7) des Scharniers (1) hergestellt ist. 5
11. Verdecktes Scharnier nach Anspruch 9 oder 10, **dadurch gekennzeichnet, dass** der erste Kanal (28) in der ersten Verbindungswand (24) bereitgestellt ist. 10
12. Verdecktes Scharnier nach Anspruch 11, **dadurch gekennzeichnet, dass** der Bereich der ersten Verbindungswand (24) zwischen dem ersten Kanal (28) und der ersten Wand (22) zu der zweiten Verbindungswand (25) verschoben ist, wobei sich der Bereich der ersten Verbindungswand (24) in der Verlängerung des hakenförmigen Teils (17) des Flügelbereichs (8) in dem offenen Zustand des verdeckten Scharniers (1) befindet. 20
13. Verdecktes Scharnier nach einem der Ansprüche 9 bis 12, **dadurch gekennzeichnet, dass** sich der zweite Kanal (30) in der eingeschlossenen Kammer (26) des Basisprofils (19) befindet, von dem der Rahmenbereich (7) hergestellt ist. 25
14. Verdecktes Scharnier nach einem der Ansprüche 9 bis 13, **dadurch gekennzeichnet, dass** auf dem Niveau des zentralen Bereichs (21) des Basisprofils (19), das entfernt wird, um die Aussparung (31) für den hakenförmigen Teil (17) des Flügelbereichs (8) auszubilden, mindestens ein Bereich der zweiten Wand (23) und der zweiten Verbindungswand (25) verbleibt. 30
15. Tür oder Fenster mit einem fixierten Rahmen (3), in dem ein Flügel mittels verdeckter Scharniere (1) nach einem der vorhergehenden Ansprüche einhängbar aufgehängt ist, wobei ein Rahmenbereich (7) aus einem Basisprofil (19) hergestellt ist, wobei der Rahmenbereich (7) der verdeckten Scharniere (1) teilweise in einer Aussparung (13) des Rahmenprofils (2) montiert ist. 35
16. Verfahren zum Herstellen eines verdeckten Scharniers mit einem Rahmenbereich (7) und einem Flügelbereich (8) nach einem der Ansprüche 1 bis 14, wobei der Rahmenbereich (7) mit einer Aussparung (31) für einen hakenförmigen Teil (17) des Flügelbereichs (8) versehen ist, mit dem er mittels einer Welle (9) und eines Flansches (11) an jedem Ende des Rahmenbereichs (7) zum Anbringen an einem 40

Rahmenprofil (2) einhängbar verbunden ist, **dadurch gekennzeichnet, dass** die Herstellung des Rahmenbereichs (7) auf einer Länge eines Strangpressbasisprofils (19) mit einer ersten Wand (22) und mindestens einem ersten Kanal (28) in einem Abstand (D) von der ersten Wand 22 basiert, wobei das Verfahren die folgenden Schritte umfasst:

- Entfernen des Materials des Basisprofils (19) über eine gewisse Länge an beiden Kopfenden des Basisprofils (19) bis zu der ersten Wand (22), um die Flansche (11) auszubilden;
- Entfernen der ersten Wand (22) und des ersten Kanals (28) in einem zentralen Bereich (21) des Basisprofils (19), um eine Aussparung (31) für den hakenförmigen Teil (17) des Flügelbereichs (8) auszubilden, wobei der verbleibende Bereich des ersten Kanals (28) einen Durchgang für die Welle (9) des Scharniers (1) ausbildet. 45

17. Verfahren nach Anspruch 16, **dadurch gekennzeichnet, dass** das Basisprofil (19), aus dem die Herstellung beginnt, einen weiteren zweiten Kanal (30) enthält, der auf dem Niveau der Aussparung (31) entfernt ist, und wobei eine Einstellschraube (33) in einen verbleibenden Bereich an einem Ende der Aussparung mindestens eingeschraubt ist. 50

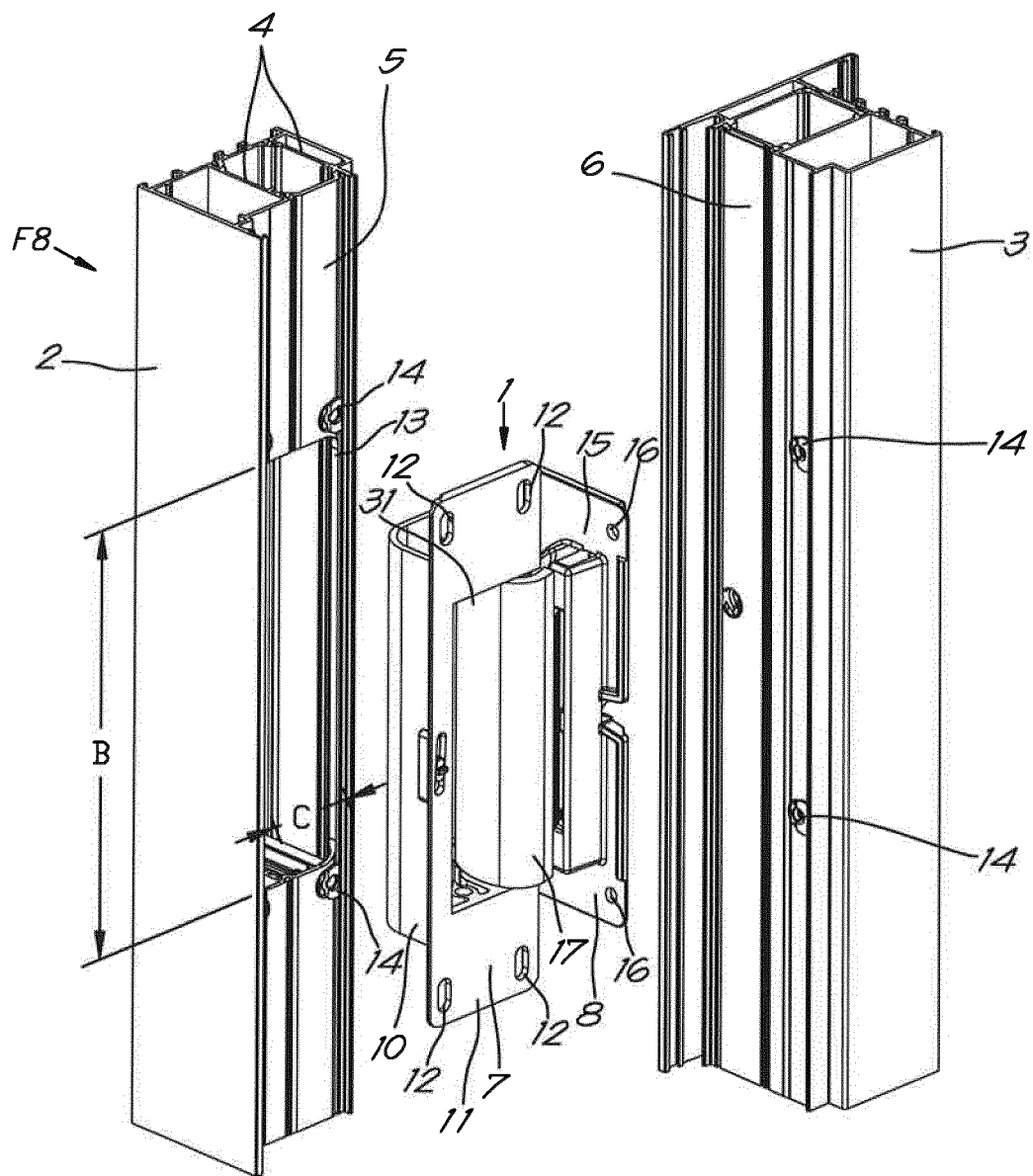
18. Verfahren nach Anspruch 17, **dadurch gekennzeichnet, dass** ein Basisprofil (19) verwendet wird, um von dem zweiten Kanal (30) zu beginnen, welcher derart positioniert ist, dass, wenn der Rahmenbereich (7) in einer Aussparung (13) des Rahmenprofils (2) montiert ist, die für diese Zweck bereitgestellt ist, die Einstellschraube (33) sich gegenüber einer Rippe (4) oder einer anderen Detaillierung des Rahmenprofils (2) befindet. 55

## Revendications

1. Articulation dissimulée destinée à la fixation d'un ouvrant d'une fenêtre d'une porte dans un cadre fixe qui est composé de profilés de cadre (2), dans laquelle l'articulation (1) comprend un tronçon de cadre (7) et un tronçon d'ouvrant (8) et dans laquelle le tronçon d'ouvrant (8) est destiné à être fixé un ouvrant et est équipé d'une partie (17) possédant une configuration en forme de crochet destinée à une liaison avec le tronçon de cadre (7) et dans laquelle le tronçon de cadre (7) est destiné à être fixé une paroi (5) du profilé de cadre (2) et, à cet effet, est équipé, à chaque extrémité, d'une bride (11) ; et dans laquelle le tronçon de cadre d'ouvrant (7) est équipé d'un évidement (31) pour la partie (17) possédant une configuration en forme de crochet, du tronçon d'ouvrant (8), qui est relié en articulation au tronçon de cadre (7) au moyen d'une tige (9), le tron-

- çon de cadre (7) étant fabriqué à partir d'un profilé de base extrudé (19) qui comprend une première paroi (22) et au moins un premier canal (28) à une distance (D) de ladite première paroi (22) pour la tige (9) de l'articulation ou un profilage de la première paroi (22) dans laquelle un canal (28) de ce type peut être prévu ; dans laquelle le profilé de base (19) est supprimé à ses deux extrémités de tête sur une longueur qui s'étend jusqu'à ladite première paroi (22) dans le but de former lesdites brides (11) et dans laquelle la première paroi (22) et le premier canal (28) ou le profilage prévu pour ledit canal (28) sont supprimés dans un tronçon central dans le but de former ledit évidement (31) pour la partie (17) possédant une configuration en forme de crochet, du tronçon d'ouvrant (8) et dans laquelle le tronçon restant du premier canal (28) ou du profilage, après l'installation d'un premier canal (28), forme un passage pour la tige (9) de l'articulation (1), dans laquelle le tronçon de cadre (7) est destiné à être monté dans un évidement (13) du profilé de cadre (2) qui est équipé à cet effet, dans laquelle l'articulation (1) et l'évidement (13) sont dimensionnés d'une manière telle que l'articulation (1) est capable de coulisser vers le haut sur une certaine longueur dans l'évidement (13) du profilé de cadre (2), dans laquelle, dans lesdites brides (11), on prévoit des trous (12) pour des vis ou pour des boulons à des fins de fixation des brides (11) contre le profilé de cadre (2), dans laquelle au moins un des trous (12) dans les brides (11) représente un trou en forme de fente qui s'étend dans la direction longitudinale (X-X') par rapport au profilé de base (19) pour un réglage possible en hauteur du tronçon de cadre (7) à l'état monté, dans laquelle, pour le réglage en hauteur du tronçon de cadre (7), le profilé de base (19) est équipé d'un deuxième canal (30) qui est supprimé à la hauteur de l'évidement central (31) dans le tronçon de cadre (7) et dans lequel est insérée une vis de réglage.
2. Articulation dissimulée conformément à la revendication 1, **caractérisée en ce que** l'évidement (31) dans le tronçon central de la première paroi (22) s'étend à partir d'un premier côté latéral (27) de ladite première paroi (22) jusqu'à une distance qui le sépare du bord latéral opposé (27) de ladite première paroi (22).
  3. Articulation dissimulée conformément à la revendication 1 ou 2, **caractérisée en ce que** la longueur (E) de l'évidement (31) est légèrement supérieure à la longueur (F) de la partie (17) du tronçon d'ouvrant (8) de l'articulation dissimulée (1), qui possède une configuration en forme de crochet.
  4. Articulation dissimulée conformément à l'une quelconque des revendications précédentes, **caractérisée en ce que** la première paroi (22) représente une paroi de forme plate.
  5. Articulation dissimulée conformément à l'une quelconque des revendications précédentes, **caractérisée en ce que** la tige (9) de l'articulation dissimulée (1) s'étend à travers les tronçons du premier canal (28) qui restent et **en ce que** la tige (9) est fixée dans sa direction longitudinale au moyen d'un écrou de blocage (32) ou d'un autre moyen de verrouillage à ses extrémités.
  6. Articulation dissimulée conformément à l'une quelconque des revendications précédentes, **caractérisée en ce que** le second canal (30) est positionné d'une manière telle que la vis de réglage (33) est située, dans un état monté du tronçon de cadre (7) dans l'évidement (13) du profilé de cadre (2) à l'opposé d'une nervure (4) ou d'un autre détail du profilé de cadre (2).
  7. Articulation dissimulée conformément à l'une quelconque des revendications précédentes, **caractérisée en ce que** la vis de réglage (33) est équipée d'un siège (34) à une extrémité, qui est destiné à une clé à tête creuse ou à un autre outil avec laquelle ou avec lequel on peut visser ou dévisser la vis de réglage (33), dans lequel ladite extrémité est orientée dans la direction de l'évidement central (31) du tronçon de cadre (7).
  8. Articulation dissimulée conformément à la revendication 7, **caractérisée en ce que**, à l'autre extrémité, la vis de réglage (33) est équipée d'un pied de support (35) qui s'étend vers l'extérieur par rapport au tronçon du second canal (30) qui reste.
  9. Articulation dissimulée conformément à l'une quelconque des revendications précédentes, **caractérisée en ce que** le profilé de base (19), à partir duquel on fabrique le tronçon de cadre (7), possède une seconde paroi (23) qui est opposée à ladite première paroi (22), et **en ce que** les deux parois (22, 23) sont reliées l'une à l'autre par l'intermédiaire de deux parois de liaison, une première paroi de liaison (24) et une seconde paroi de liaison (25), respectivement, dans le but de délimiter une chambre close (26).
  10. Articulation dissimulée conformément à la revendication 9, **caractérisée en ce que** les parois de liaison (24, 25) sont situées à une certaine distance des bords latéraux (27) de la première paroi (22) du profilé de base (19) à partir duquel on fabrique le tronçon de cadre (7) de l'articulation (1).
  11. Articulation dissimulée conformément à la revendication 9 ou 10, **caractérisée en ce que** le premier canal (28) est prévu dans la première paroi de liaison (24).

12. Articulation dissimulée conformément à la revendication 11, **caractérisée en ce que** le tronçon de la première paroi de liaison (24), qui s'étend entre le premier canal (28) et la première paroi (22), est décalé dans la direction de la seconde paroi de liaison (25), ledit tronçon de la première paroi de liaison (24) étant situé dans le prolongement de la partie (17) du tronçon d'ouvrant (8), qui possède une configuration en forme de crochet, à l'état ouvert de l'articulation dissimulée (1). 5 10
13. Articulation dissimulée conformément à l'une quelconque des revendications 9 à 12, **caractérisée en ce que** le second canal (30) est situé dans la chambre close (26) du profilé de base (19) à partir duquel on fabrique le tronçon de cadre (7). 15
14. Articulation dissimulée conformément à l'une quelconque des revendications 9 à 13, **caractérisée en ce que**, au niveau du tronçon central (21) du profilé de base (19) qui a été supprimé pour former l'évidement (31) destiné à la partie (17) du tronçon d'ouvrant (8), qui possède une configuration en forme de crochet, au moins un tronçon de la seconde paroi (23) et un tronçon de la seconde paroi de liaison (25) subsistent. 20 25
15. Porte ou fenêtre qui comprend un cadre fixe (3) dans lequel est suspendu un ouvrant en articulation au moyen d'articulations dissimulées (1) en conformité avec l'une quelconque des revendications précédentes, comprenant un tronçon de cadre (7) fabriqué à partir d'un profilé de base (19), dans laquelle le tronçon de cadre (7) des articulations dissimulées (1) est monté en partie dans un évidement (13) du profilé de cadre (2). 30 35
16. Procédé destiné à la fabrication d'une articulation dissimulée qui comprend un tronçon de cadre (7) et un tronçon d'ouvrant (8) conformément à l'une quelconque des revendications 1 à 14, dans lequel le tronçon de cadre (7) est équipé d'un évidement (31) destiné à une partie (17) du tronçon d'ouvrant (8), qui possède une configuration en forme de crochet, avec lequel il est relié en articulation au moyen d'une tige (9) et d'une bride (11) à chaque extrémité du tronçon de cadre (7) à des fins de fixation à un profilé de cadre (2), **caractérisé en ce que** la fabrication du tronçon de cadre (7) se base sur une longueur d'un profilé de base extrudé (19) qui comprend une première paroi (22) et au moins un premier canal (28) à une distance (D) qui le sépare de ladite première paroi (22), dans lequel le procédé comprend les étapes suivantes dans lesquelles : 40 45 50 55
- on supprime la matière du profilé de base (19) sur une certaine longueur aux deux extrémités de tête du profilé de base (19) jusqu'à la première paroi (22) afin de former lesdites brides (11) ;
  - on supprime la première paroi (22) et le premier canal (28) dans un tronçon central (21) du profilé de base (19) afin de former un évidement (31) destiné à une partie (17) du tronçon d'ouvrant (8), qui possède une configuration en forme de crochet, dans lequel le tronçon du premier canal (28) qui reste forme un passage destiné à la tige (9) de l'articulation (1).
17. Procédé conformément à la revendication 16, **caractérisé en ce que** le profilé de base (19) à partir duquel on démarre la fabrication, contient un autre second canal (30) qui est supprimé au niveau dudit évidement (31), et dans lequel on introduit par vissage une vis de réglage (33) dans le tronçon qui reste, à une extrémité de l'évidement au moins.
18. Procédé conformément à la revendication 17, **caractérisé en ce que** l'on utilise un profilé de base (19) à partir duquel on démarre, dont le second canal (30) est disposé d'une manière telle que, lorsque le tronçon de cadre (7) est monté dans un évidement (13) du profilé de cadre (19) qui est prévu à cet effet, la vis de réglage (33) est située à l'opposé d'une nervure (4) ou d'un autre détail du profilé de cadre (2).



*Fig. 1*

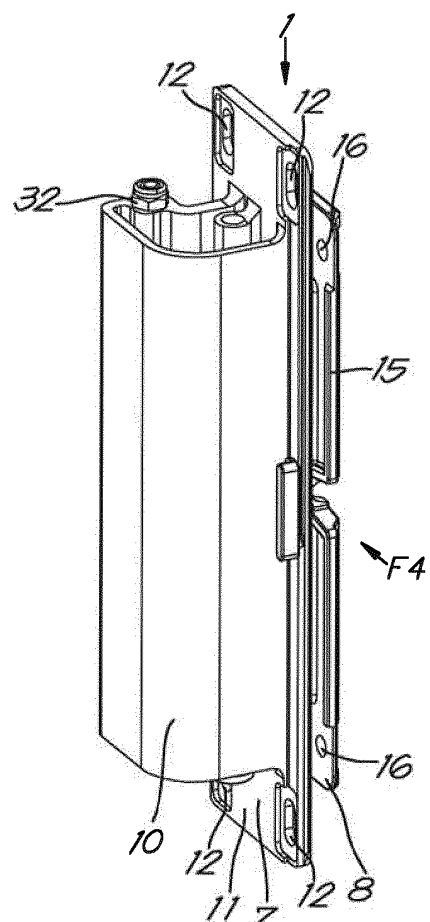
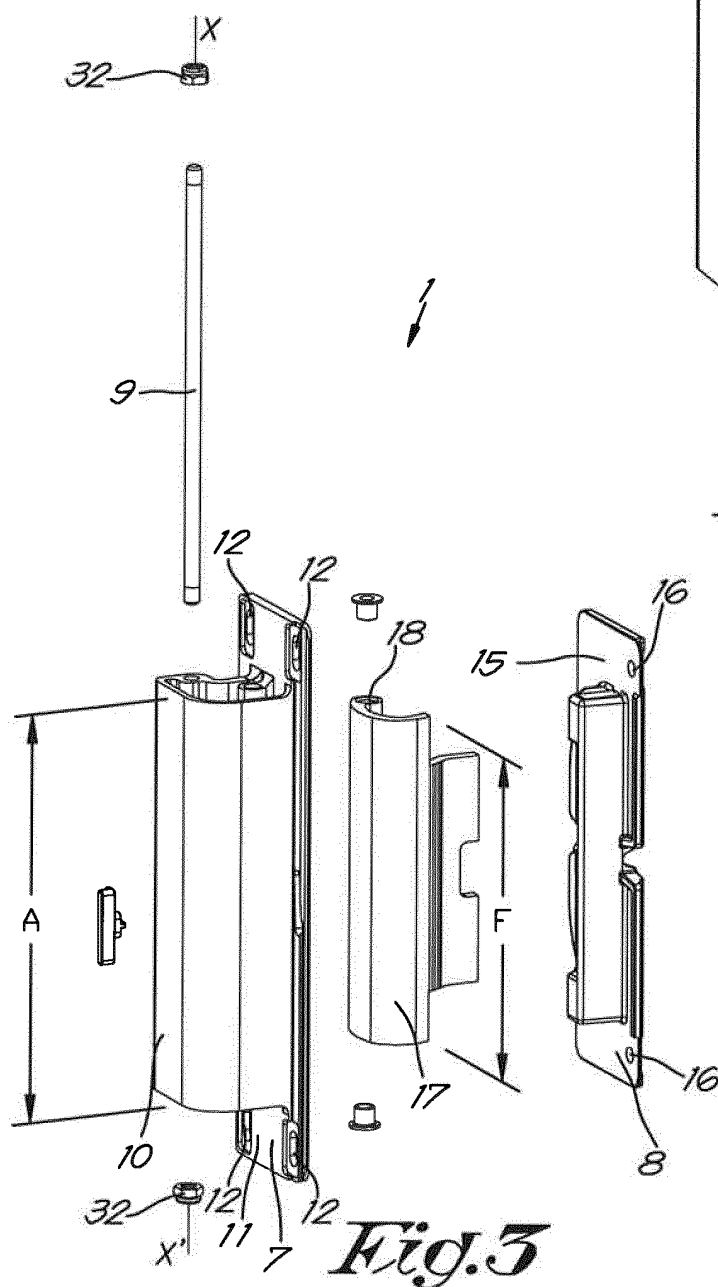
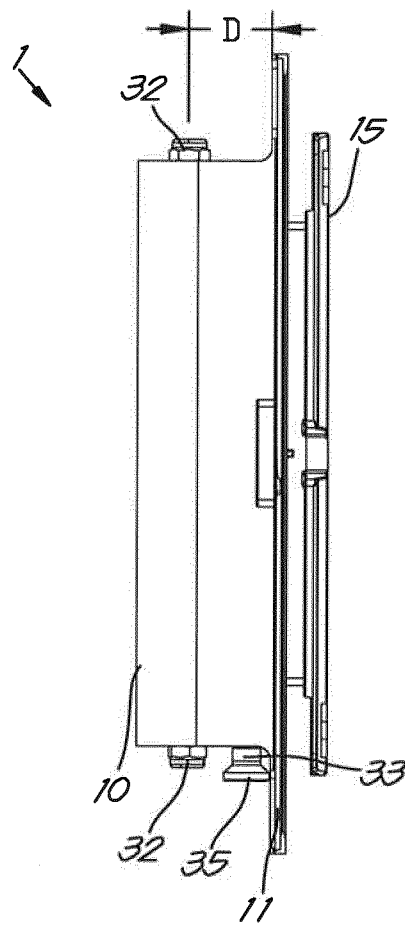


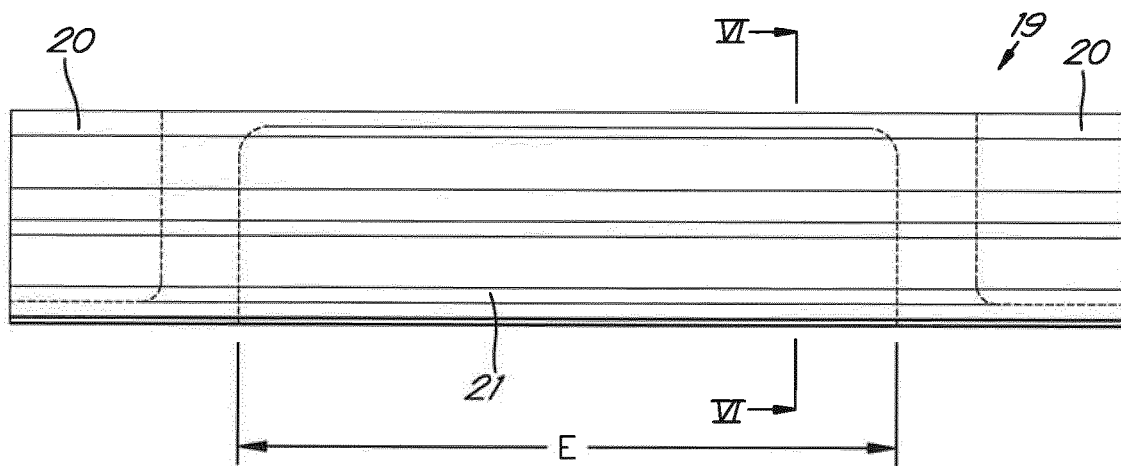
Fig. 2



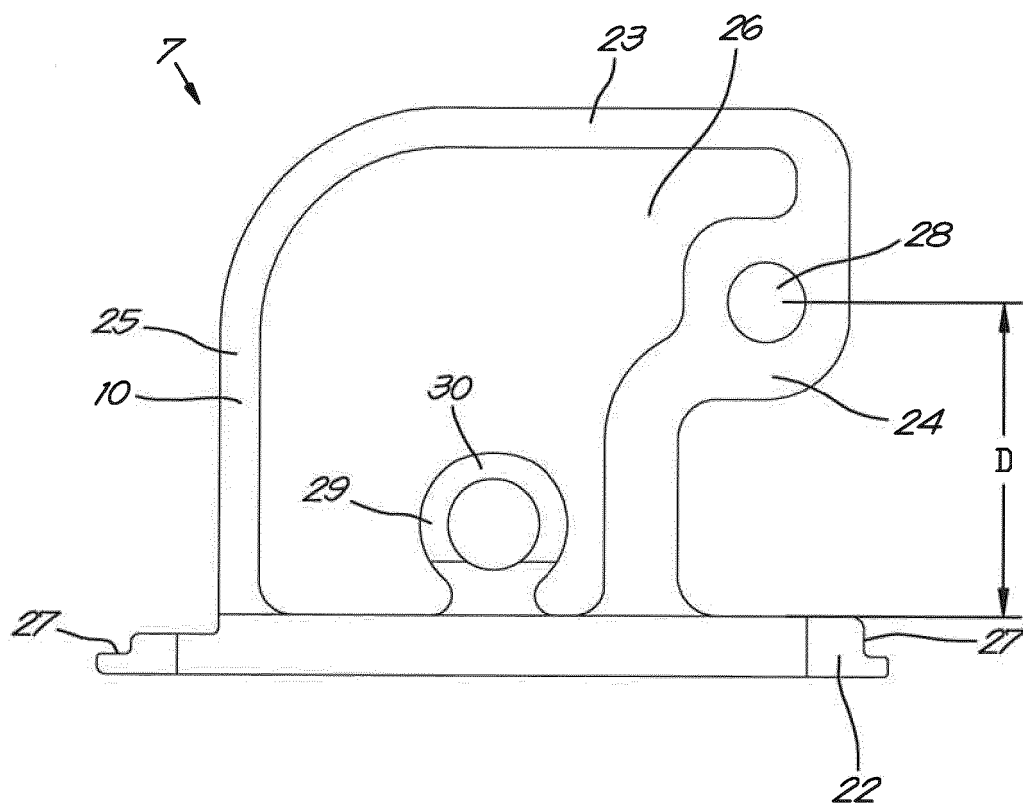
*Fig. 3*



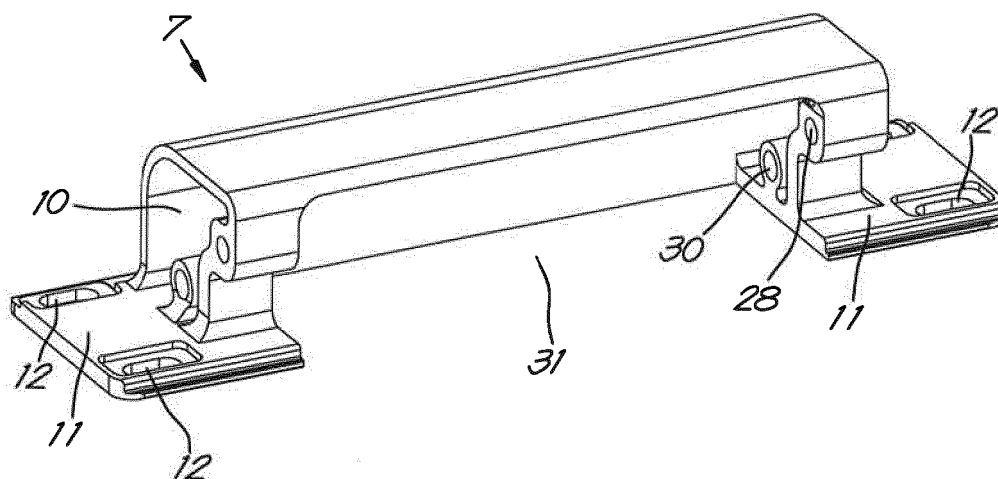
*Fig. 4*



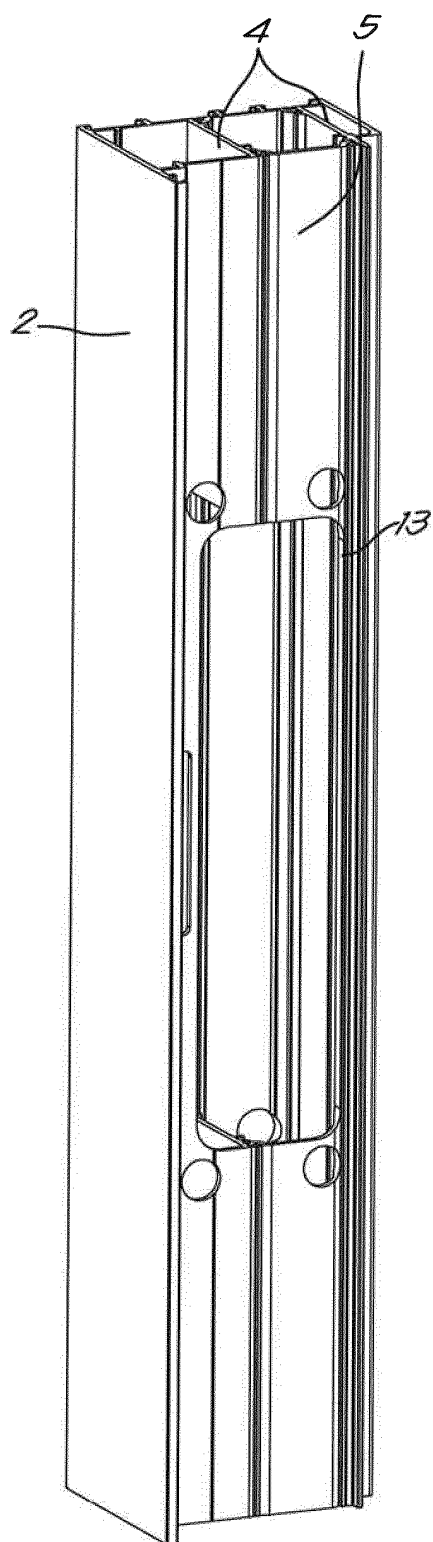
*Fig. 5*



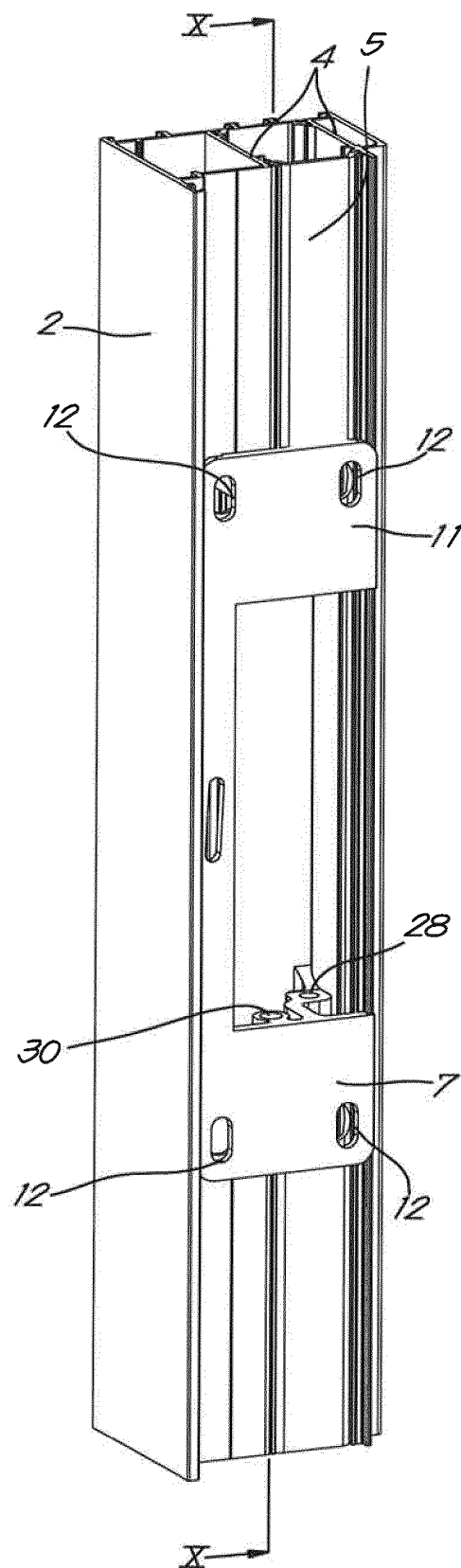
*Fig. 6*



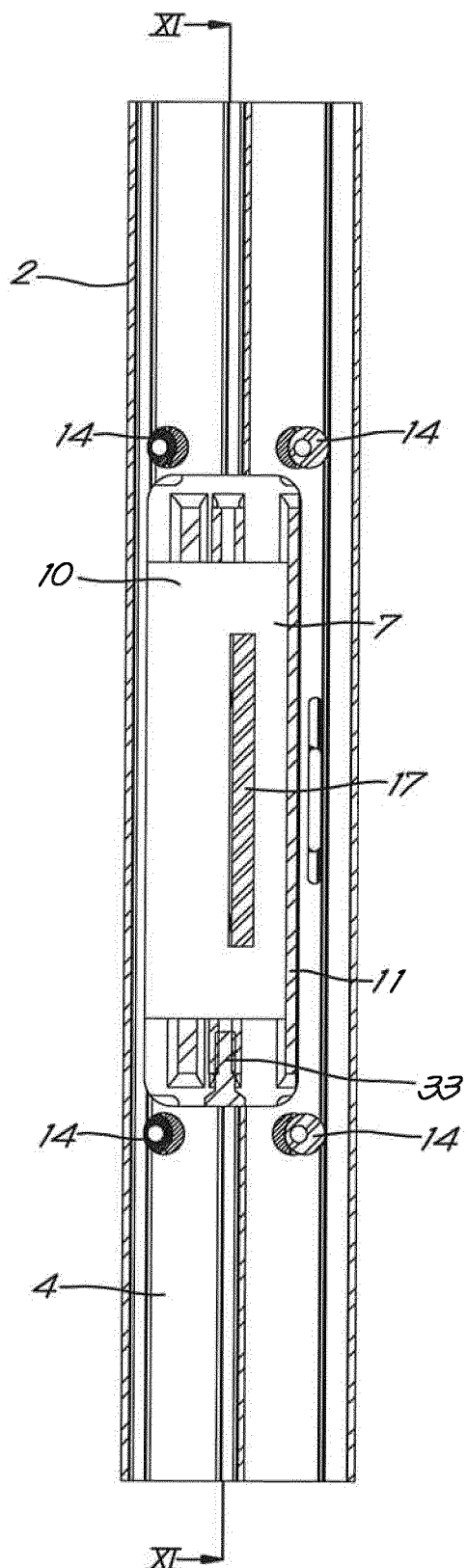
*Fig. 7*



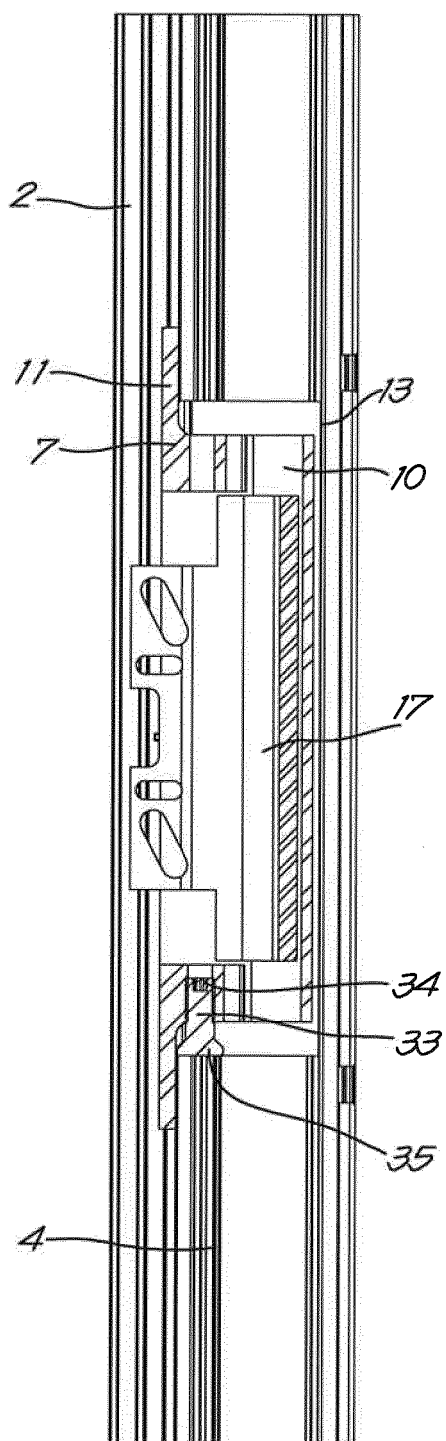
*Fig. 8*



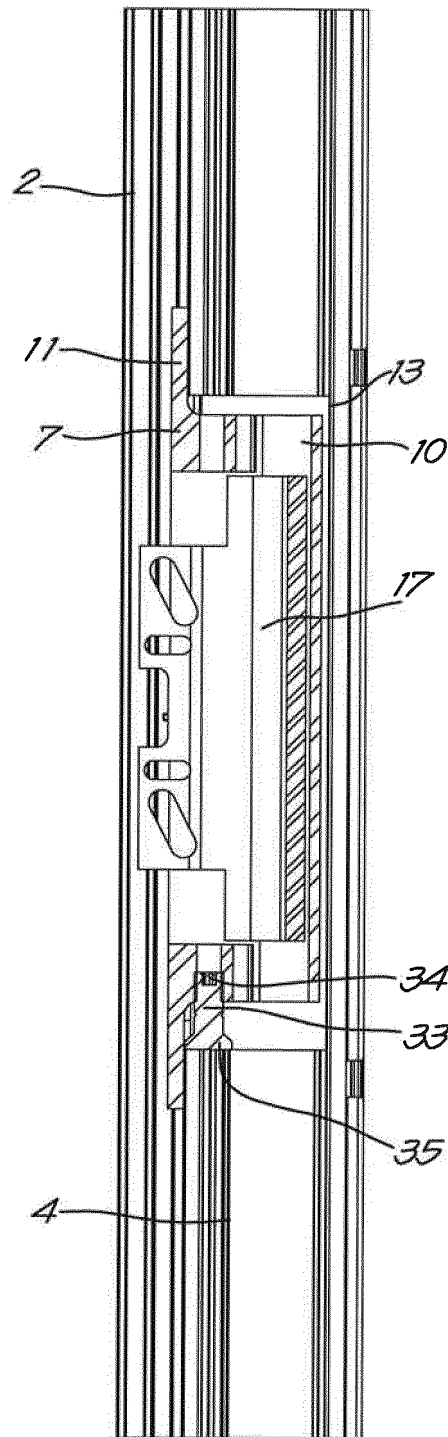
*Fig. 9*



*Fig. 10*



*Fig. 11*



*Fig. 12*

**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- DE 20021406 U1 [0014]