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(54) **HINGE FOR FURNITURE**
SCHARNIER FÜR MÖBEL
ARTICULATION POUR MEUBLE

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Description

[0001] The present invention relates to a hinge for furniture.

[0002] In particular, the invention relates to a hinge for furniture including a first element to be fixed to the inside of a side wall of a piece of furniture, a second element to be fixed to a door and an intermediate element, hinged to the first element to enable the reciprocal articulation of the first and second element, so as to allow the opening and closing of the door.

[0003] Hinges of this type have been known for some time, as they simplify the assembling and dismantling operations of furniture doors and the necessary regulations for the correct assembly functioning.

[0004] A hinge of the above-mentioned type is described in Italian patent application Nr. BS91A0000089.

[0005] According to the disclosure of said patent application, a single pin hinge for furniture for fixing a door to a side wall of a piece of furniture, comprises an element fixed on the door, with a portion inserted therein, and an element fixed on the wall of the furniture, equipped with a hinge, the element fixed on said wall having an orientable portion, articulated on the pin of the hinge and connected to the element fixed on the door, when the hinge has been assembled. The orientable portion has an intermediate element, suitable for being inserted into a housing present in the element fixed to the door; a release device is included for blocking the intermediate element, which holds said element once it is inserted in the housing, by means of a rotation around its hinging point and pressure towards the bottom of the housing.

[0006] The hinge according to the above invention has the drawback of completely disinserting the part of the hinge fixed to the wall of the furniture from the element fixed to the door, during the dismantling of the door. This means that the operator must sustain the door in the correct position until all the hinges have been released, to prevent the door from falling and to prevent the whole weight of the door from resting on the last hinge to be released.

[0007] A second drawback of the hinges described above and so far known, is the necessity of resorting to tools for the disassembling of the hinge.

[0008] A hinge having all the features of the preamble of claim 1 is known from US-A- 4937917.

[0009] The general objective of the present invention is to solve the above drawbacks of the known art in a very simple, economical and particularly functional way.

[0010] A further objective of the invention, in addition to providing a system capable of safely supporting the door during the assembly and dismantling operations, is to facilitate said operations, above all when there is only one operator.

[0011] Also included in the objectives of the present invention is to provide a hinge which, thanks to the particular draft configuration of its insertion elements, allows easy assembly and guarantees an accurate coupling when said elements are in a closed position.

[0012] In view of the above objectives, a hinge for furniture has been conceived, according to the present invention, having the characteristics specified in the enclosed claims.

[0013] The structural and functional characteristics of the present invention together with its advantages with respect to the known art will appear clearer and more evident from an examination of the following description, referring to the enclosed drawings, which illustrate a hinge for furniture achieved according to the innovative principles of the invention itself. In the drawings:

- fig. 1 represents a perspective view of a hinge for furniture, according to a preferred embodiment of the invention, with the door dismantled;
- fig. 2 represents a plan view of the hinge of fig. 1;
- fig. 3 represents a section along the line III-III of fig. 2;
- fig. 4 represents a perspective view of the hinge of fig. 1, with the door assembled;
- fig. 5 is a plan view of the hinge of fig. 4;
- fig. 6 is a section along the line VI-VI of fig. 5;
- fig. 7 represents the section of a detail of the hinge of fig. 6;
- fig. 8 represents a perspective view of the hinge of fig. 4 with the door unblocked.
- fig. 9 shows a perspective view of a hinge for furniture according to a variant of the embodiment of the invention with the door dismantled;
- fig. 10 and 11 respectively show, in a longitudinal section, two operative positions of the variant of the embodiment of the hinge of fig. 9 with the door assembled.

[0014] With reference to the drawings, a hinge for furniture, object of the invention, conceived for fixing a door to the side wall of a piece of furniture, is indicated, as a whole, with 10 and, in the example illustrated according to the present invention, includes a first hinge element 20, fixed to a wall 11 of a piece of furniture and a second hinge element 40 fixed to a door 12 of the piece of furniture.

[0015] The first hinge element 20 is in the form of a shaped plate and has a first flat portion 21 for fixing it to the inside wall of the furniture by means of screws.

[0016] In this respect, a centering plate 22 fixed to said first portion 21 is inserted between the first flat portion 21 and the wall of the furniture.

[0017] A second portion 23 extends perpendicularly from the first portion 21, said second portion having the same profile as the side wall 11 beyond its edge adhering to the edge itself.

[0018] A fork 24 protruding from the edge of the furniture extends perpendicularly from the second portion 23, and is therefore parallel again to the surface of the wall 11 of the furniture.

[0019] At the end of the fork 24, an intermediate hinge element 60 is oscillatingly fixed with a hinge 25 to one of its two ends, forming an orientable articulated portion for the oscillating connection of the first hinge element 20 to the second hinge element 40 to allow the articulation of the door 12 with respect to the wall 11 of the piece of furniture.

[0020] The intermediate element 60 is substantially L-shaped and has a first portion 61 hinged to the fork 24 and a second portion 62 perpendicular to the first, on which an adapter 70 suitable for being connected with the second hinge element 40, is inserted.

[0021] To allow its insertion on the second portion 62 of the intermediate element 60, the adapter 70 has a base 71, two side walls 72 and a back wall 73 which surround the second portion 62.

[0022] A through hole 63 situated on the second portion 62 allows the position of the adapter 70 to be fixed and regulated by the insertion of a screw inside a threaded bushing (not illustrated) situated on the base 71 of the adapter 70.

[0023] The insertion of the second portion 62 of the intermediate element 60 containing the adapter 70 inside the second hinge element 40 is achieved with a linear sliding "drawer-like" movement, thanks to longitudinal matching elements 76 externally positioned along the side walls 72 of the adapter 70 and whose sliding is guided within grooved guides 43 situated along the walls 42 and for which there is a housing 41 incorporated in the second hinge element 40.

[0024] In order to facilitate the assembly of the second portion 62 of the intermediate element 60 inside the housing 41 and also guarantee a precise coupling once these elements are in a closed position, said second portion 62 and, correspondingly, said housing 41, are tapered, and broaden out starting, respectively, from the inserting end of said second portion 62 and from the bottom of said housing 41, so as to create a draft which facilitates said insertion.

[0025] For the same reasons, the longitudinal matching elements 76 are tapered and broaden out vertically starting from the ends 76' to be inserted inside the grooved guides 43 which correspondingly have enlarged mouths 43', are tapered and become narrow towards the end of housing 41.

[0026] Said ends 76' also have rounded edges to facilitate insertion inside the grooved guides 43.

[0027] The second hinge element 40 also comprises an anchoring plate 50 of the element to the door 12, having a substantially quadrangular shape, connected along one side to said housing 41 and equipped with holes 51 for the screwing of the door 12.

[0028] A blocking element is also assembled on the anchoring plate 50, on the opposite side with respect to that connected to the housing 41, consisting of a lid 52 attached by the hinge 48, so that it can be reversed from a closed position in contact with the anchoring plate 50, to an open position obtained by a rotation around the hinge, varying from a few degrees to 90 degrees.

[0029] The lid 52 is equipped with a groove 53 for housing a tooth 77 protruding from the upper surface of the back wall 73 of the adapter 70.

[0030] The lid 52 also has a matching element 54, situated along the side of the groove 53, for the insertion of the tooth 77, when the lid 52 is closed, in order to block the adapter 70 with a release movement, and consequently connect the two hinge elements 20 and 40.

[0031] The matching element 54 also enables the adapter to be inserted inside the housing 41, even when the lid 52 is closed.

[0032] For this purpose, the tooth 77 has a sloping surface 77' which allows it to slide, during the drawer-like movement for the insertion of the adapter 70 inside the housing 41, along a corresponding sloping surface 54' positioned on the matching element 54, so as to lift the lid 52, by rotation around the hinge 48, to an angle suitable for allowing the insertion of the tooth 77 inside the groove 53 and for allowing the lid 52 to close with a click, once the tooth 77 has passed over the matching element 54.

[0033] A leaf spring 55, arranged in contact with the edge of the lid 52, below the hinge 48, is provided to guarantee the return to the closed position of the lid 52.

[0034] The leaf spring, in combination with the particular section of the part of the lid 52 in contact therewith (Fig. 7), has two functions:

1. to bring the lid back to a closed position.

In this way, the assembly operation is greatly facilitated and is limited to the insertion and pushing of the door, without any direct manoeuvring on the hinge. A firm fastening is also guaranteed.

2. During the assembly phase, when the lid is rotated beyond a certain angle, the thrust of the spring produces a contrary effect, ensuring the opening of the lid and the release of the hinge.

[0035] A pair of teeth 56 protruding below said lid 52, at the sides of the tooth 77, suitable for being inserted inside the corresponding opening 58, situated in the anchoring plate 50, are provided to make the closing of the lid 52 structurally more solid.

[0036] It is evident how the assembly and dismantling of the door can be effected without any particular difficulty, safely, and without operating under precarious conditions, as once the intermediate element had been unblocked by lifting the lid 52, it is still supported inside the housing 41.

[0037] For particular safety requirements, such as those requested by the regulations of certain countries, the hinge must be provided with additional means against accidental release, as may occur with the intervention of children.

[0038] The intermediate element 60, as shown in figures 9 to 11, is equipped with a stop 80, which slides and is inserted into the back wall 73 of the adapter 70 and is elastically held in position.

[0039] Said stop 80 is "T"-shaped, being equipped with an upper element 80', substantially enlarged and horizontal, and with a lower vertical shank 80".

[0040] On the upper element 80', it is possible both to move the stop 80 to the blocking position and also to release it in the unblocked position.

[0041] In the former case, the stop 80 will have the shank 80" inserted in an opening 83 situated in a surfacing 82 situated on the bottom of the housing 41, whereas, in the latter case, said shank 80" will be positioned outside the opening 83.

[0042] For safety reasons, a certain pressure must be applied on the upper element 80' of the stop to obtain said unblocking, using a tool such as a screwdriver, in order to prevent unblocking on the part of children.

[0043] A blunting 84 is present on the back wall 73 corresponding to the surfacing 82 on the bottom of the housing 41, and having the same shape.

[0044] From the above description with reference to the figures, it can be seen how a furniture hinge, according to the invention, is particularly useful and advantageous. The objective mentioned in the introduction of the description is thus achieved.

[0045] The hinge according to the invention can obviously have different shapes from those shown in the drawings which are purely illustrative and non-limiting examples.

[0046] The scope of the invention is consequently delimited by the enclosed claims.

Claims

1. A hinge for fastening a door (12) to a side wall (11) of a piece of furniture, comprising a first hinge element (20) fixed to the side wall (11), a second hinge element (40) fixed to the door (12) of the piece of furniture, and an intermediate element (60) hinged to said first element of the hinge (20), for allowing the oscillating connection of the first hinge element (20) to the second hinge element (40) to enable the articulation of the door (12) with respect to the side wall (11) of the piece of furniture, the intermediate element (60) being equipped with an adapter (70) suitable for being inserted in a housing (41), incorporated in the second hinge element (40), by means of a linear sliding "drawer-like" movement, said adapter being blocked by the insertion of a tooth (77) situated on said adapter (70) into a groove (53) and a matching element (54), situated on a lid (52) attached by means of a hinge (48) along the edge of an anchoring plate (50) incorporated inside the second hinge element (40), allowing it to be reversed from a closed position in contact with the anchoring plate (50), to an open position obtained by a rotation around the hinge (48), **characterized in that** said open position is provided variable from a few degrees to 90 degrees, and **in that** said lid (52) has a pair of teeth (56) protruding at the sides of the matching element (54) and suitable for being inserted within corresponding openings (58) situated in the anchoring plate (50), in order to make the closing of the lid structurally more solid.
2. The hinge according to claim 1, wherein said tooth (77) protrudes from a back wall (73) with which the adapter (70) is equipped, and said tooth (77) has a sloping surface (77') suitable for contact with a corresponding sloping surface (54') positioned on the matching element (54), in order to reverse the lid (52), during the assembly phase of the door, to an angle suitable for allowing the insertion of said tooth (77) inside the groove (53) and to obtain blockage, by means of the click-insertion of the tooth (77) within said matching element (54).
3. The hinge according to claim 2, wherein a leaf spring (55) is situated near the hinge (48) of said lid (52), suitable for coming into contact with an edge of the lid (52) to guarantee the return of the lid (52) from an open to a closed position, said open position being effected by means of rotation to a variable angle, so that when the lid (52) is rotated beyond a certain angle, the thrust of the spring (55) produces a contrary effect, ensuring the opening of the lid and the release of the hinge.

4. The hinge according to claim 2, wherein said intermediate element (60) is substantially "L"-shaped and has a first portion (61) hinged to a fork (24) at one end of said first hinge element (20) and a second portion (62), perpendicular to said first portion (61), on which said adapter (70) is inserted.
- 5 5. The hinge according to claim 4, wherein said adapter (70) has a base (71), two side walls (72) and a back wall (73) which surround said second portion (62).
6. The hinge according to claim 5, wherein on said second portion (62) there is a through-hole (63) to allow the position of the adapter (70) to be fixed and regulated by means of a screw.
- 10 7. The hinge according to claim 6, wherein the adapter (70) has longitudinal matching elements (76) externally protruding along the side walls (72) suitable for sliding with a linear "drawer-like" movement, and being guided within grooved guides (43) situated along the walls (42) of the housing (41).
- 15 8. The hinge according to claim 7, wherein said second portion (62) and, correspondingly, said housing (41) are tapered, so that they broaden out starting, respectively, from the end to be introduced of said second portion (62) and from the bottom of said housing (41), so as to create a draft which facilitates said introduction.
- 20 9. The hinge according to claim 8, wherein said longitudinal matching elements (76) are tapered and broaden out vertically starting from the ends (76') to be inserted within the grooved guides (43) which, correspondingly, have enlarged mouths (43') and are tapered so as to become narrow towards the bottom of the housing (41).
- 25 10. The hinge according to claim 2, wherein said adapter (70) is equipped with a stop (80) which slides into the back wall (73) and is suitable for being inserted inside an opening (83) situated in the housing (41).
- 30 11. The hinge according to claim 10, wherein said stop (80) is "T"-shaped, being equipped with an upper element (80') substantially enlarged and horizontal, and with a lower vertical shank (80'') suitable for being inserted inside said opening (83).

Patentansprüche

1. Scharnier zum Befestigen einer Tür (12) an einer Seitenwand (11) eines Möbelstücks, umfassend ein an der Seitenwand (11) befestigtes erstes Scharnierelement (20), ein an der Tür (12) des Möbelstücks befestigtes zweites Scharnierelement (40) und ein am ersten Element des Scharniers (20) klappbar befestigtes Zwischenelement (60) zum Ermöglichen einer Schwenkbewegung des ersten Scharnierelements (20) gegenüber dem zweiten Scharnierelement (40), so dass die Tür (12) bezüglich der Seitenwand (11) des Möbelstücks artikulierbar ist, wobei das Zwischenelement (60) mit einem Adapter (70) ausgestattet ist, welcher in ein im zweiten Scharnierelement (40) integriertes Gehäuse (41) mittels einer linearen "schubladenartigen" Gleitbewegung einsetzbar ist, wobei der Adapter durch Einsetzen eines sich auf dem Adapter (70) befindlichen Zahns (77) in eine Nut (53) und ein Passelement (54), welche sich auf einem mittels eines Scharniers (48) längs des Rands einer im zweiten Scharnierelement (40) integrierten Verankerungsplatte (50) befestigten Deckel (52) befinden, blockiert wird, wodurch es möglich ist, diesen von einer geschlossenen im Kontakt mit der Verankerungsplatte (50) befindlichen Position durch eine Rotation um das Scharnier (48) in eine offene Position zu bringen, **dadurch gekennzeichnet, dass** die offene Position von einigen Grad bis 90° variierbar ist, und dass der Deckel (52) zwei Zähne (56) hat, welche an den Seiten des Passelements (54) vorspringen, und welche in entsprechende in der Verankerungsplatte (50) befindliche Öffnungen (58) einsetzbar sind, um den Deckel konstruktiv bedingt noch fester zu schließen.
2. Scharnier nach Anspruch 1, wobei der Zahn (77) von einer Rückwand (73) des Adapters (70) vorspringt, wobei der Zahn (77) eine schräge Fläche (77') zum Berühren einer auf dem Passelement (54) angeordneten entsprechenden schrägen Fläche (54') hat, um den Deckel (52) beim Zusammenbau der Tür um einen Winkel zu drehen, welcher das Einsetzen des Zahns (77) in die Nut (53) und eine Blockieren durch Einrasten des Zahns (77) in das Passelement (54) ermöglicht.
3. Scharnier nach Anspruch 2, wobei sich in der Nähe des Scharniers (48) des Deckels (52) eine Blattfeder (55) zum Berühren eines Rands des Deckels (52) befindet, um das Zurückkehren des Deckels (52) von einer offenen in eine geschlossene Position sicherzustellen, wobei die offene Stellung durch eine Rotation um einen variablen Winkel erreicht wird, so dass, wenn der Deckel (52) um mehr als einen bestimmten Winkel gedreht wird, die Druckkraft der

Feder (55) eine entgegengesetzte Wirkung erzeugt, welche das Öffnen des Deckels (52) und die Freigabe des Scharniers sicherstellt.

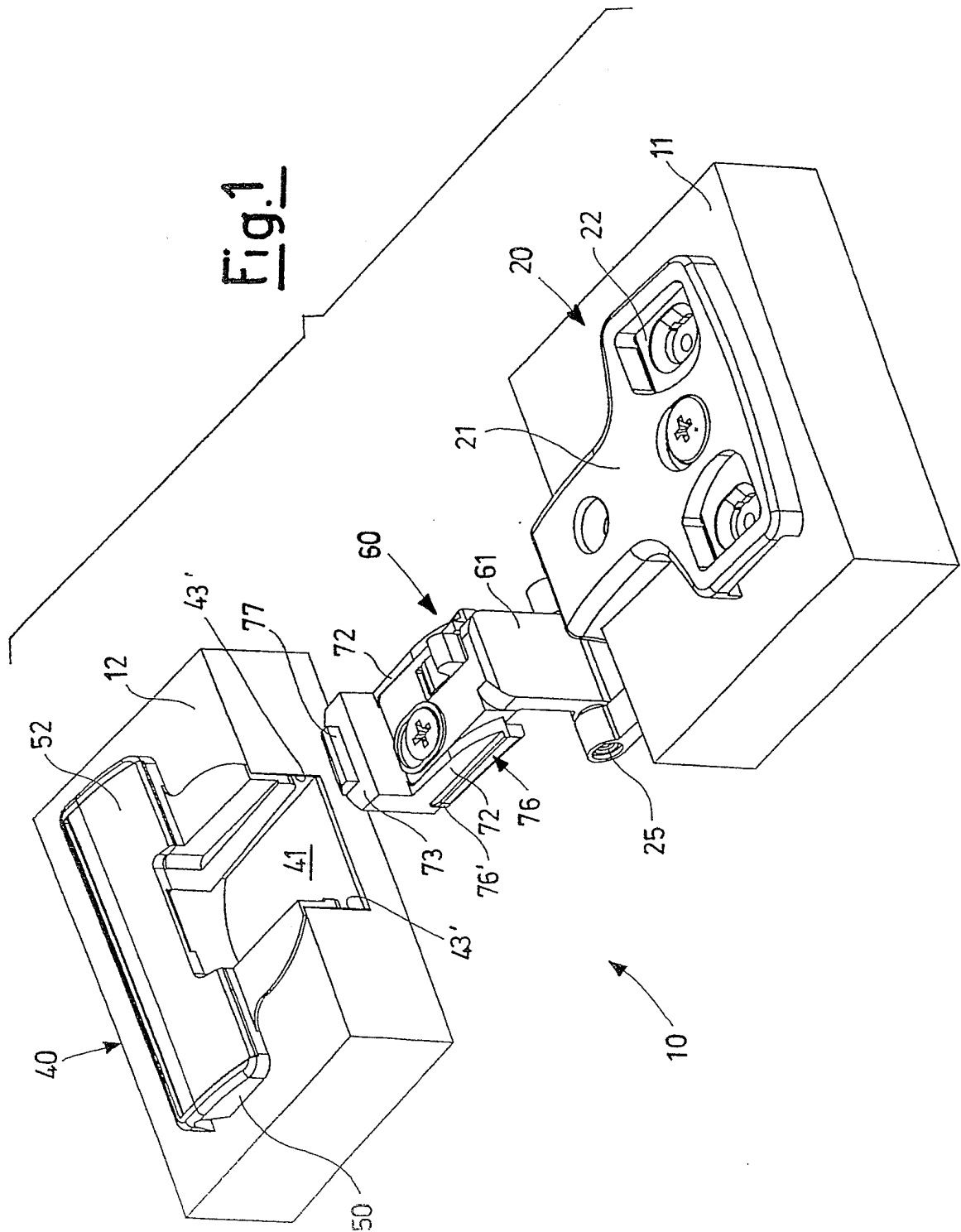
4. Scharnier nach Anspruch 2, wobei das Zwischenelement (60) im Wesentlichen "L"-förmig ist und einen ersten Abschnitt (61), welcher an einer Gabel (24) an einem Ende des ersten Scharnierelements (20) klappbar angebracht ist, und einen zum ersten Abschnitt (61) senkrechten zweiten Abschnitt (62) hat, auf welchem der Adapter (70) aufgenommen ist.
5. Scharnier nach Anspruch 4, wobei der Adapter (70) eine Grundplatte (71), zwei Seitenwände (72) und eine Rückwand (73) hat, welche den zweiten Abschnitt (62) umgeben.
6. Scharnier nach Anspruch 5, wobei auf dem zweiten Abschnitt (62) ein Durchgangsloch (63) vorgesehen ist, um ein Feststellen und Einstellen der Position des Adapters (70) mittels einer Schraube zu ermöglichen.
7. Scharnier nach Anspruch 6, wobei der Adapter (70) Längspasselemente (76) hat, welche längs der mit einer linearen "schubladenartigen"-Bewegung verschiebbaren Seitenwände (72) nach außen vorspringen, und welche in mit einer Nut versehenen, sich längs der Wände (42) des Gehäuses (41) befindenden Führungen (43) geführt werden.
8. Scharnier nach Anspruch 7, wobei der zweite Abschnitt (62) und korrespondierend dazu das Gehäuse (41) sich verjüngen, so dass sich diese, beginnend jeweils von dem einzusetzenden Ende des zweiten Abschnitts (62) und vom Boden des Gehäuses (41) verbreitern, so dass eine das Einsetzen erleichternde Verjüngung erzeugt wird.
9. Scharnier nach Anspruch 8, wobei sich die Längspasselemente (76) verjüngen und beginnend von den Enden (76'), welche in die mit einer Nut versehenen Führungen (43) einzusetzen sind, vertikal verbreitern, wobei die mit einer Nut versehenen Führungen (43) entsprechend vergrößerte Öffnungen (43') haben und sich verjüngen, so dass diese in Richtung des Bodens des Gehäuses (41) schmal werden.
10. Scharnier nach Anspruch 2, wobei der Adapter (70) mit einem Anschlag (80) ausgestattet ist, welcher in die Rückwand (73) gleitet und in eine sich im Gehäuse (41) befindliche Öffnung (83) einsetzbar ist.
11. Scharnier nach Anspruch 10, wobei der Anschlag (80) "T"-förmig ist, und mit einem wesentlich verbreiterten und horizontalen oberen Element (80') und mit einem unteren vertikalen Schenkel (80'') zum Einsetzen in die Öffnung (83) ausgestattet ist.

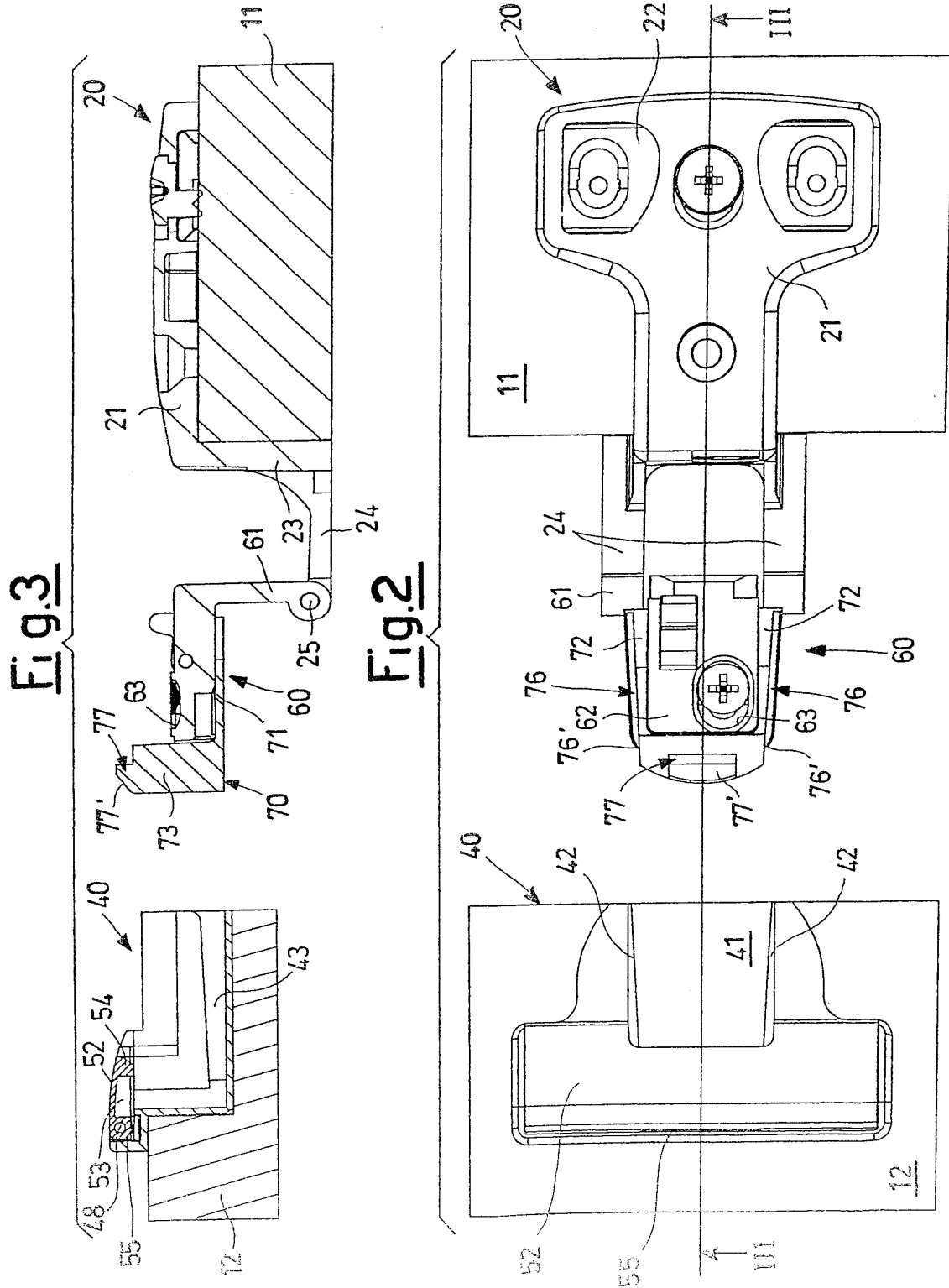
Revendications

1. Charnière pour fixer une porte (12) à une paroi latérale (11) d'un meuble, comprenant un premier élément de charnière (20) fixé à la paroi latérale (11), un deuxième élément de charnière (40) fixé à la porte (12) du meuble, et un élément intermédiaire (60) relié par une charnière au dit premier élément de la charnière (20), pour permettre une connexion oscillante entre le premier élément de charnière (20) et le deuxième élément de charnière (40) afin de permettre l'articulation de la porte (12) par rapport à la paroi latérale (11) du meuble, l'élément intermédiaire (60) étant équipé d'un adaptateur (70) approprié pour être inséré dans un logement (41) intégré dans le deuxième élément de charnière (40), au moyen d'un mouvement de glissement linéaire à la manière d'un tiroir, ledit adaptateur étant bloqué par l'insertion d'une dent (77) située sur ledit adaptateur (70) dans une rainure (53) et dans un élément d'accouplement (54), situés sur un capot (52) fixé au moyen d'une charnière (48) le long du bord d'un plateau d'ancrage (50) intégré dans le deuxième élément de charnière (40), lui permettant d'être renversé d'une position fermée en contact avec le plateau d'ancrage (50) à une position ouverte obtenue par une rotation autour de la charnière (48), **caractérisée en ce que** ladite position ouverte est prévue pour varier de quelques degrés jusqu'à 90 degrés, **et en ce que** ledit capot (52) a une paire de dents (56) dépassant sur les côtés de l'élément d'accouplement (54) et appropriées pour être insérées dans des ouvertures correspondantes (58) situées dans le plateau d'ancrage (50), pour rendre la fermeture du capot plus solide au niveau de la structure.
2. Charnière selon la revendication 1, dans laquelle ladite dent (77) dépasse d'une paroi arrière (73) dont est équipé l'adaptateur (70), et ladite dent (77) a une surface inclinée (77') appropriée pour venir en contact avec une surface inclinée correspondante (54') située sur l'élément d'accouplement (54), pour renverser le capot (52), pendant la phase d'assemblage de la porte, selon un angle approprié pour permettre l'insertion de ladite dent (77) à l'intérieur de la rainure (53) et pour obtenir le blocage au moyen de l'encliquetage de la dent (77) dans ledit élément d'accou-

plement (54).

3. Charnière selon la revendication 2, dans laquelle un ressort à lame (55) est situé à proximité de la charnière (48) dudit capot (52), approprié pour venir en contact avec un bord du capot (52) pour garantir le retour du capot (52) dans une position fermée depuis une position ouverte, ladite position ouverte étant obtenue au moyen d'une rotation à un angle variable, de sorte que lorsque le capot (52) pivote au-delà d'un certain angle, la poussée du ressort (55) produit un effet contraire, garantissant l'ouverture du capot et la libération de la charnière.
4. Charnière selon la revendication 2, dans laquelle ledit élément intermédiaire (60) est essentiellement en forme de L et a une première partie (61) reliée par une charnière à une fourche (24) à une extrémité dudit premier élément de charnière (20), et une deuxième partie (62), perpendiculaire à ladite première partie (61), dans laquelle est inséré ledit adaptateur (70).
5. Charnière selon la revendication 4, dans laquelle ledit adaptateur (70) a une base (71), deux parois latérales (72) et une paroi arrière (73) qui entoure ladite deuxième partie (62).
6. Charnière selon la revendication 5, dans laquelle un trou débouchant (63) se trouve dans ladite deuxième partie (62) pour permettre le positionnement de l'adaptateur (70) à fixer et l'ajustement au moyen d'une vis.
7. Charnière selon la revendication 6, dans laquelle l'adaptateur (70) a des éléments d'accouplement longitudinaux (76) dépassant vers l'extérieur le long des parois latérales (72) destinés à glisser selon un mouvement linéaire à la manière d'un tiroir et étant guidés dans des rainures de guidage (43) situées le long des parois (42) du logement (41).
8. Charnière selon la revendication 7, dans laquelle ladite deuxième partie (62) et, de manière correspondante, ledit logement (41), sont coniques, de sorte qu'ils s'élargissent respectivement à partir de l'extrémité à introduire de ladite deuxième partie (62) et du fond dudit logement (41), pour créer une dépouille qui facilite ladite introduction.
9. Charnière selon la revendication 8, dans laquelle lesdits éléments d'accouplement longitudinaux (76) sont coniques et s'élargissent verticalement à partir des extrémités (76') à insérer dans les rainures de guidage (43) qui, de manière correspondante, ont des échancrures élargies (43') et sont coniques pour se rétrécir vers le fond du logement (41).
10. Charnière selon la revendication 2, dans laquelle ledit adaptateur (70) est équipé d'une butée (80) qui glisse dans la paroi arrière (73) et qui est appropriée pour être insérée dans une ouverture (83) située dans le logement (41).
11. Charnière selon la revendication 10, dans laquelle ladite butée (80) est en forme de T, étant équipée d'un élément supérieur (80') essentiellement élargi et horizontal, et avec une barre verticale inférieure (80'') appropriée pour être insérée à l'intérieur de ladite ouverture (83).





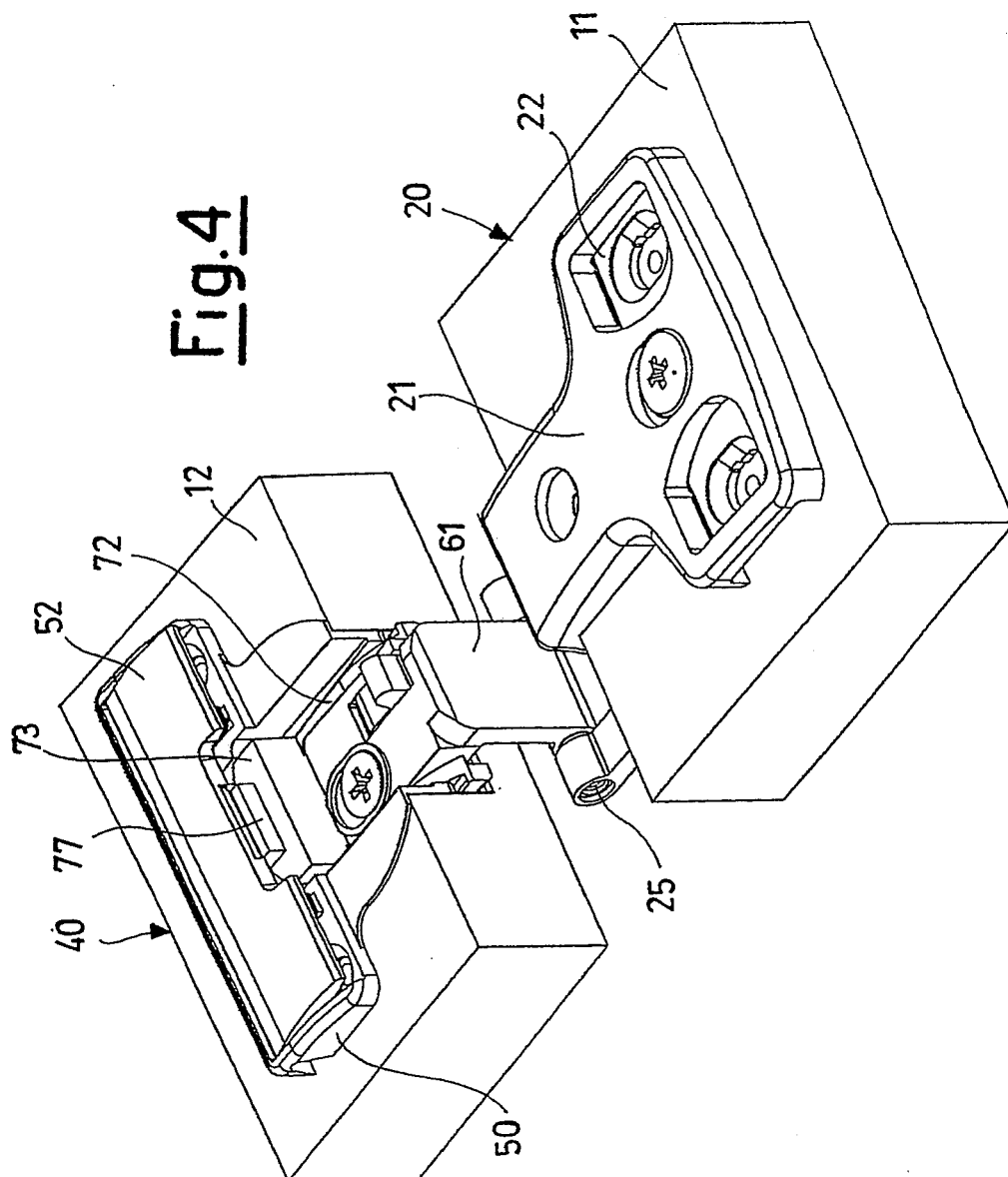
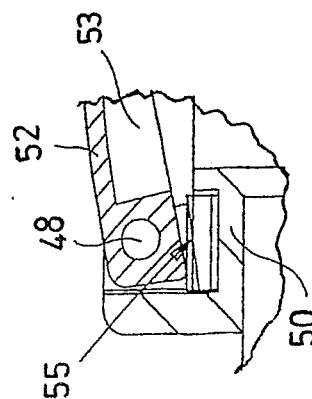
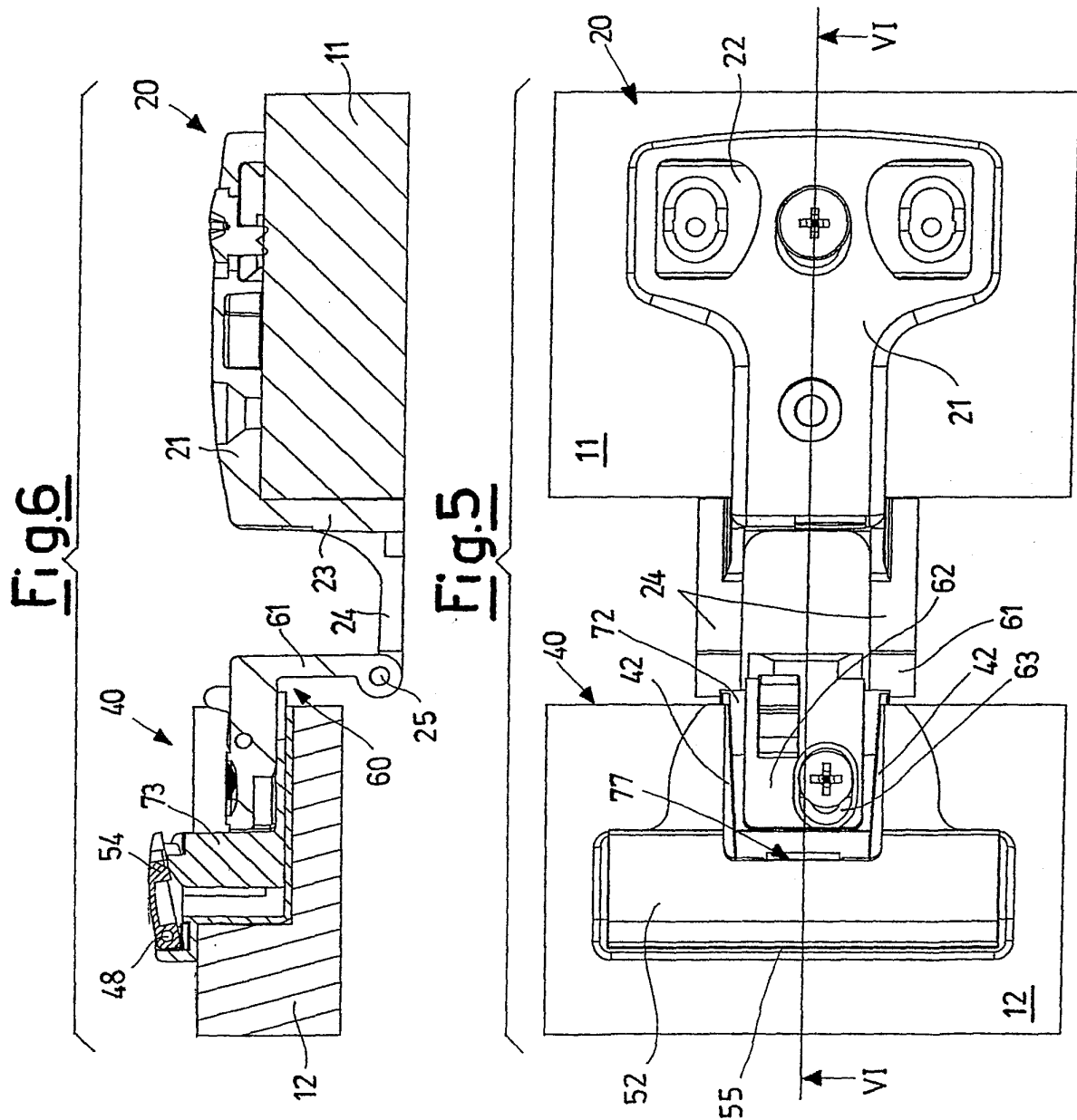
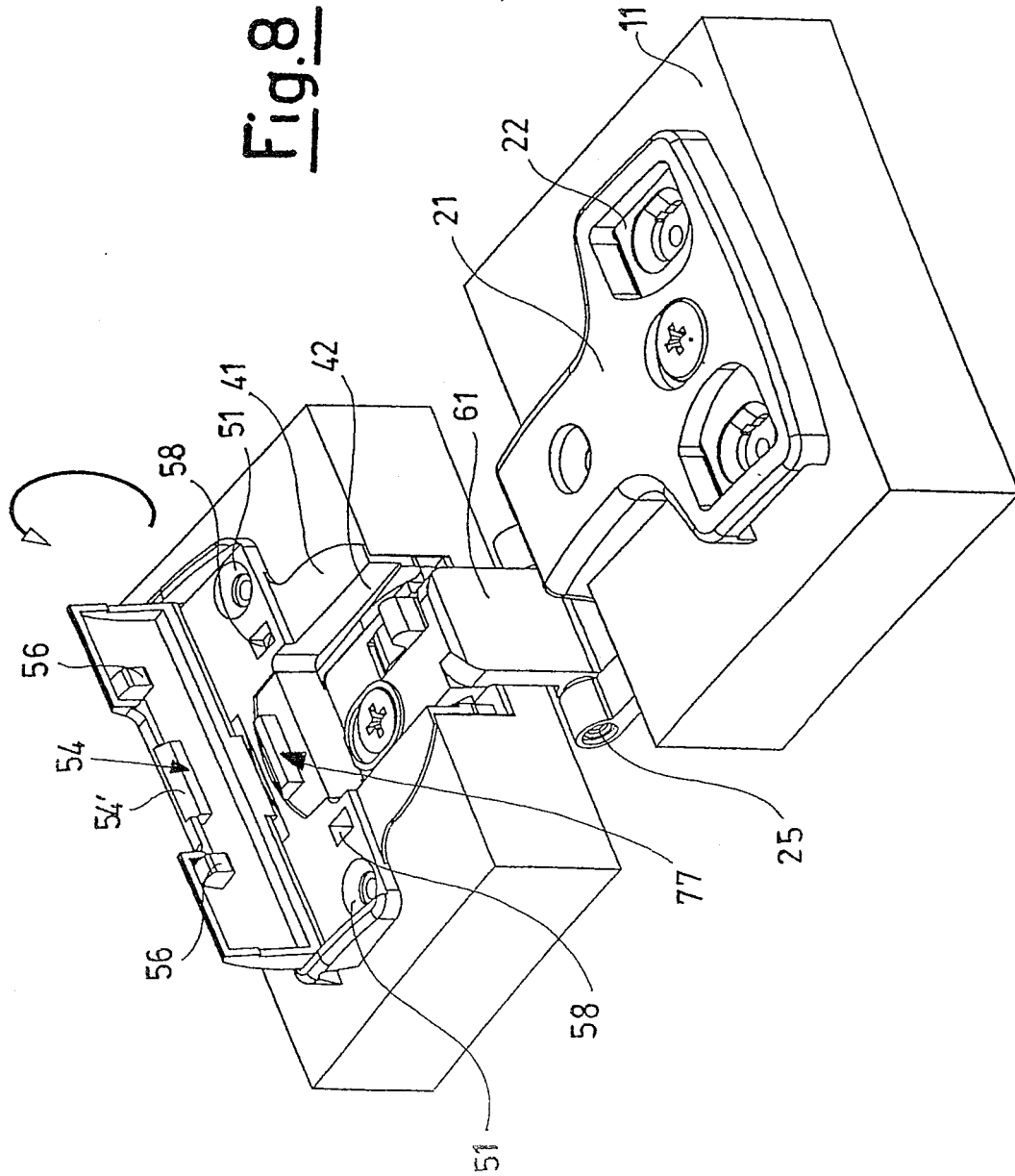


Fig.7







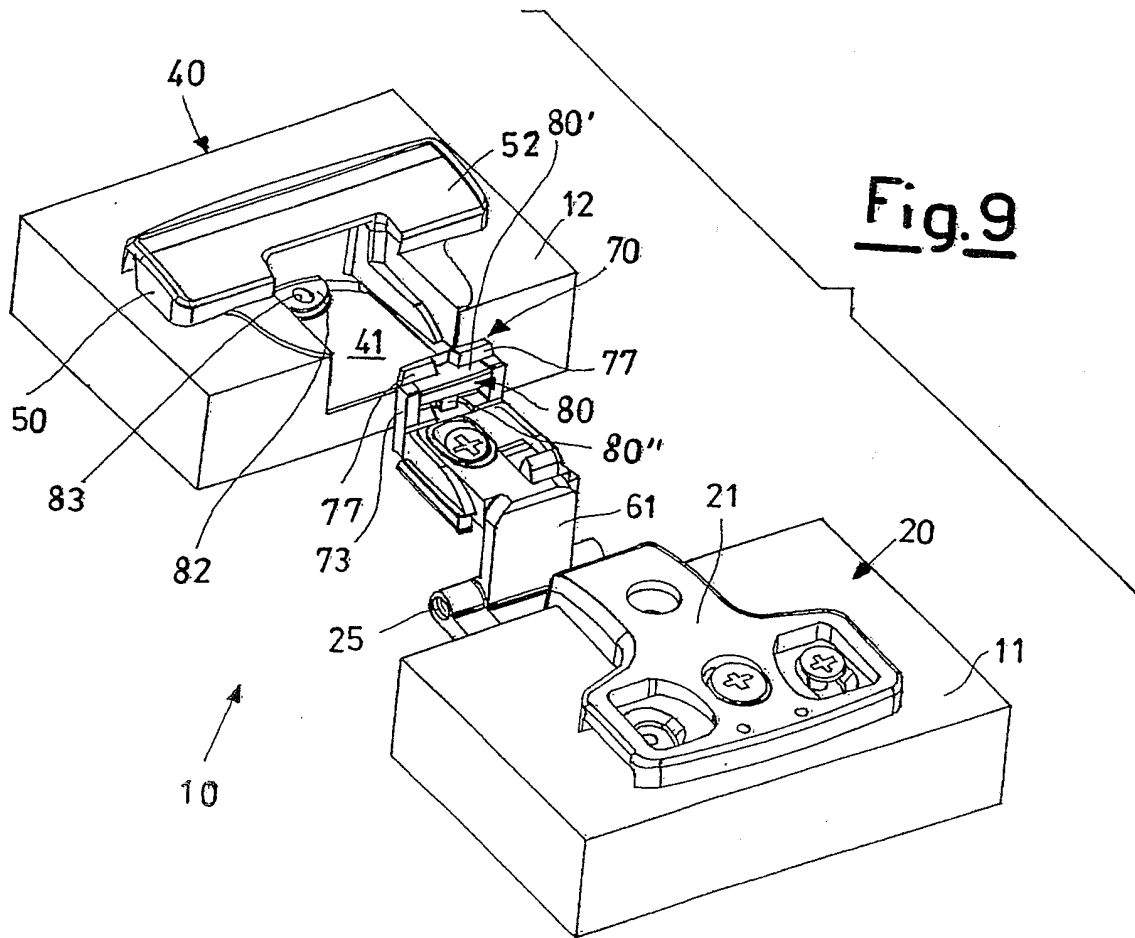


Fig.10

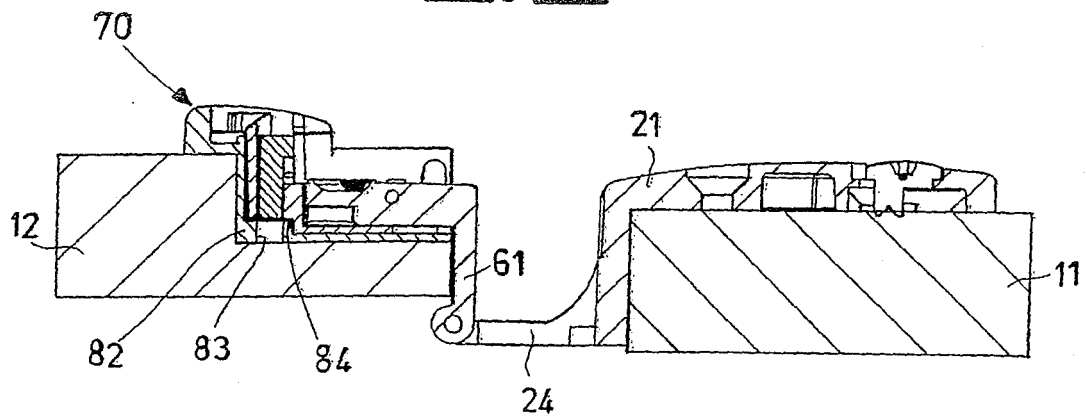


Fig.11

