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(54) System for screwless fixing of a body to a panel

System zur schraubenlosen Befestigung eines Körpers an einer Platte

Système pour fixation sans vis d'un corps à un panneau

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(56) References cited:
EP-A- 1 418 266 EP-A- 1 467 048
EP-A- 1 544 387 DE-A1- 2 615 512

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Description

[0001] The present invention relates to a system for screwless fixing of a body having a projecting formation, such as the body of a door-locking device for a washing machine, to a panel with an opening, for example a front panel of a washing machine, of the kind defined in the preamble of claim 1.

[0002] EP-A- 1 418 266 discloses such a system wherein pins resiliently carried by the body engage corresponding holes in the panel.

[0003] The object of the present invention is to provide a screwless fixing system of the improved type, implementation of which is particularly simple and operation of which is reliable and secure.

[0004] This object along with others is achieved according to the invention by a system according to claim 1.

[0005] In a first embodiment, the locking member is displaceable from the pre-engagement position into the engaged position essentially by means of a translation.

[0006] In a second embodiment the locking member is displaceable from the pre-engagement position into the engaged position by means of a rotation about an axis essentially parallel to the panel.

[0007] Further characteristic features and advantages of the invention will emerge from the detailed description which follows, provided purely by way of a non-limiting example with reference to the accompanying drawings in which:

Figure 1 is a partial perspective view of a door-locking device for a washing machine, provided with a screwless fixing system according to the invention, shown with the locking member in the pre-engagement position;

Figure 2 is a perspective view, similar to that shown in Figure 1, and also shows the locking member in the pre-engagement position;

Figure 3 shows an exploded perspective view of the assembly shown in Figures 1 and 2;

Figures 4a and 4b are two sides views, sectioned along parallel planes, which show the door-locking device of the preceding figures during introduction of a projecting part thereof through the opening in the panel of the washing machine;

Figures 5a and 5b are views similar to those shown in Figures 4a and 4b and show the body of the door-locking device and the associated fixing system during displacement relative to the panel;

Figures 6 and 6b are views similar to those shown in Figures 5a and 5b and show the door-locking device in the condition or position engaged with the opening of the panel;

Figure 7 is a partly sectioned perspective view of the door-locking device in the engaged position according to Figures 6a and 6b;

Figures 8a and 8b are views, sectioned in parallel planes, similar to those shown in Figures 6a and 6b

and showing the locking member in the engaged and locked position;

Figure 9 is a perspective view similar to that of Figure 7 and also shows the locking member in the engaged and locked position;

Figure 10 is a perspective view similar to that shown in Figure 1 and shows the locking member of the fixing system in the engaged and locked position;

Figure 11 is a partial perspective view of a door-locking device for a washing machine provided with a screwless fixing system according to a variation of embodiment of the present invention;

Figure 12 is another perspective view of the assembly shown in Figure 11;

Figure 13 is an exploded perspective view of the assembly shown in Figures 11 and 12;

Figure 14 is a partial perspective view of the assembly according to Figures 11 to 13 and shows in particular the locking member in the pre-engagement position;

Figures 15a and 15b are similar views, sectioned in parallel planes, and show the assembly according to Figures 11 and 14 during introduction of a projecting formation of the door-locking device through the panel opening;

Figures 16a and 16b are similar to the views shown in Figures 15a and 15b and show the door-locking device in a condition where its projecting formation has nearly completely passed through the panel opening;

Figures 17a and 17b are similar to Figures 16a and 16b and show the projecting formation of the door-locking device in the position engaged with the opening of the panel, with the locking member of the fixing system arranged in the engaged and locked position;

Figure 18 is a perspective view of the door-locking device and the associated fixing system in the condition according to Figure 17b; and

Figure 19 is a perspective view similar to that shown in Figure 11 and shows the locking member in the engaged and locked position.

[0008] With reference to the drawings, in Figures 1 to 10, 1 denotes overall a door-locking device for a washing machine, in particular a clothes washing machine, for example of the type described in the European Patent Application EP 1 544 387 A2 or in the application EP 1 467 048 A1, both in the name of the same Applicant.

[0009] In the drawings, only an essentially plate-shaped end part 2 of the door-locking device 1 is shown, said part having a projecting formation 3 defining inside it an opening 4 for receiving a hook-like member of a door or hatch of the washing machine.

[0010] In the embodiment shown the projecting formation 3 of the door-locking device has an essentially rectangular general shape, with a main axis or direction indicated by A-A in Figure 1.

[0011] The door-locking device 1 is intended to be fixed

to a front panel of the washing machine, for example the panel indicated by 5 in Figures 4 to 9. This panel has an opening 6, which also has an essentially rectangular shape.

[0012] The projecting formation 3 of the door-locking device has a head portion 3a which, in the direction of the axis A-A, has an extension greater than the corresponding larger dimension of the opening 6 of the panel 5.

[0013] The projecting formation 3 also has a neck portion, indicated by 3b (see, for example, Figures 3, 4a and 4b) which in the direction of the axis A-A has an extension which is smaller than or at the most essentially the same as the larger dimension of the opening 6 of the panel 5.

[0014] A locking member, denoted overall by 7, is associated with the plate-shaped body 2 of the door-locking device.

[0015] In the embodiment shown in Figures 1 to 10, the locking member 7 comprises an essentially plate-shaped body 8 which, on its periphery, has a plurality of resilient eyelet lugs 9 which are able to snap-engage with corresponding projections 10 of the body 2 of the door-locking device 1 (see in particular Figures 1 to 3).

[0016] The body 8 of the locking member 7 also has a plurality of resilient retaining formations 11, the distal end of which has a laterally projecting tooth-like formation 11a with an inclined end surface 11b.

[0017] Correspondingly, the plate-shaped body 2 of the door-locking device 1 has a corresponding plurality of openings 12 (Figures 1, 3, 4b, 5b, 10). These openings have an outer part, namely the retaining formation or formations 12a (Figures 4b, 5b, 6b, 7, 8b) with an inclined inner surface 12b.

[0018] The arrangement is such that the locking member 7 is able to assume, relative to the body 2 of the door-locking device 1, a pre-engagement position, shown in Figures 1, 2 and 4a to 7. In this condition, the resilient formations of the locking member 7 are engaged with the corresponding projections 10 of the door-locking device 1, as is shown in Figures 1 and 2, and the retaining formations 11 of the locking member have respective inclined end surfaces 11b which rest against the corresponding inclined surfaces 12b of the openings 12 of the door-locking device, as can be seen in particular in Figures 1, 4b, 5b, 6b, 7 and 8b. The retaining formations 11 are moreover disengaged from - or not engaged with - the retaining formation or formations 12a of the door-locking device.

[0019] The door-locking device 1 is conveniently engaged with the opening 6 of the panel 5 of the machine while the associated locking member is mounted thereon and is situated in the pre-engagement position described above.

[0020] Mounting of the door-locking device is performed in particular in the manner described below.

[0021] With reference to Figures 4a and 4b, the projecting formation 3 of the door-locking device is passed, in an inclined position, through the opening 6 of the panel 5. The door-locking device 1 is then rotated in the direc-

tion of the panel 5, as shown in Figures 5a and 5b, until the projecting formation 3 is positioned beyond this panel. The door-locking device 1, with the associated locking member 7 in the pre-engagement position, is then displaced, towards the right when viewing Figures 5a and 5b, until the engaged position shown in Figures 6a, 6b and 7 is reached. In this condition, both the ends of the head portion 3a of the projecting formation 3 extend outside the opening 6 of the panel 5 (Figure 6a).

[0022] Conveniently, on one side of the projecting formation 3, a step indicated by 13 is formed (see in particular Figures 1 and, for example, 6a) able to be arranged so as to bear against a corresponding side of the opening 6 of the panel 5 (Figure 6a).

[0023] After the projecting formation 3 of the door-locking device has been arranged in the engaged position shown in Figures 6a, 6b and 7, the locking member 7 may be manually displaced from the pre-engagement position, into an engaged and locked position, by means of displacement thereof in the direction of the said door-locking device and therefore in the direction of the panel 5. As a result of this displacement, the tooth-like ends 11a of the retaining formations 11 of the locking member 7 pass over the associated retaining formation or formations 12a of the body 2 of the door-locking device, snap-engaging with a stable retaining engagement beyond said walls and coming into contact with the surface of the panel 5 situated on the opposite side to the projecting formation 3 (Figures 8a, 8b and 9). In this condition, the door-locking device and the associated locking member are firmly fastened to the panel 5 and displacement thereof relative to this panel is prevented.

[0024] As a result, fixing of the door-locking device to the panel 5 is performed in a simple and rapid manner, without the need for screws or the like.

[0025] As can be seen in particular in Figures 1, 2, 3 and 10, conveniently, although not necessarily, the body 2 of the door-locking device has a plurality of openings 14 inside which corresponding, essentially cylindrical, relief formations 15 of the body 8 of the locking member 7 are able to extend in a guided manner.

[0026] The formations 15, as can be seen in Figure 10, may if necessary project beyond the body 2 of the door-locking device when the latter is fastened to the panel 5 following the arrangement of the locking member 7 in the engaged position described above.

[0027] The ends of the formations 15 may then press against the inner surface of the panel 5 or if necessary engage inside corresponding openings provided in this panel.

[0028] Figures 11 to 19 show a variation of embodiment where the locking member 7 is able to pass from the pre-engagement position, shown in Figures 11, 12, 14b-16b as a result of a relative rotation thereof with respect to the body 2 of the door-locking device, about an axis essentially parallel to the panel 5.

[0029] In Figures 11 to 19, parts and components already described have been assigned again the same ref-

erence numbers used previously.

[0030] As can be seen in particular in Figure 3, in the variation of embodiment according to Figures 11 to 19, the body 2 of the door-locking device has two openings 16 which are aligned together in a direction B essentially perpendicular to the axis A-A of the projecting formation 3 and the corresponding opening 4. Respective cylindrical reliefs 17, aligned and facing each other in the direction B-B, extend inside the openings 16. Correspondingly, two resilient engaging lugs 18 extend from the body 8 of the locking member 7, essentially in the form of elongated eyelets able to extend inside the openings 16, engaging around the reliefs 17 (see, for example, Figures 13 and 15a).

[0031] The aligned reliefs or pins 17 define therefore an axis of relative rotation of the locking member 7 with respect to the body 2 of the door-locking device 1.

[0032] In the variant according to Figures 11 to 19, the body 2 of the door-locking device has a plurality of openings 19 (see, for example, Figures 11, 13, 14, 15b, 16b and 18) through which corresponding opposition reliefs 20 extend and project from the body 8 of the locking member 7.

[0033] Also in the variant according to Figures 11 to 19, the locking member 7 is able to assume, relative to the body 2 of the door-locking device 1, a pre-engagement position where the retaining formations 11 of the former rest against the inclined surfaces 12b of the corresponding retaining formations 12a of the latter (see, for example, Figures 15b).

[0034] The door-locking device may then be engaged with the opening 6 of the panel 5 in a manner similar to that described in relation to the first embodiment described previously. In particular, as can be seen in Figures 15a and 15b, initially the head portion 3a of the projecting formation 3 of the door-locking device is passed through the opening 6 of the panel 5 in an inclined position and is then rotated (Figures 16a, 16b) until said projecting formation 3 is positioned completely beyond the panel 5. In this condition, the opposition reliefs 20 of the locking member 7 are arranged against the surface or the side of the panel 5 opposite the projecting formation 3 (Figures 16b).

[0035] The assembly formed by the door-locking device and the associated locking member 7 is then displaced, parallel to the panel 5, until the projecting formation 3 reaches the engaged position where its step 13 is arranged inside the opening 6 of the panel 5, along one side of this opening.

[0036] Conveniently, the arrangement is such that, as a result of said displacement and reaching of the engaged position described above, following contact of the reliefs 20 against the panel 5, the locking member 7 automatically performs a rotation about the axis of the pins 17, passing into the condition shown in Figures 17a, 17b and 18, where the end teeth 11a of the retaining formations 11 have snap-engaged beyond the retaining formations 12a of the door-locking device and press against the pan-

el 5, ensuring in fact stable fixing of the door-locking device to the panel. In this condition, owing to the engagement of the members 11 and 20 with the panel 5, any play between the device 1 and the panel is eliminated.

[0037] Mounting of the door-locking device and fixing thereof to the panel 5 are therefore performed very easily.

[0038] Obviously, without modifying the principle of the invention, the embodiments and the constructional details may be widely varied with respect to that described and illustrated purely by way of a non-limiting example, without thereby departing from the scope of the invention as defined in the accompanying claims.

15 Claims

1. System for screwless fixing of a body (2) with a projecting formation (3) to a panel (5) with an opening (6), in which said projecting formation (3) has a head portion (3a) having in one direction (A-A) an extension greater than that of said opening (6) and a neck portion (3b) which, in said direction (A-A), has an extension smaller than or the same as that of said opening (6); the projecting formation (3) being able to pass through the opening (6) of the panel (5) in an inclined position and then be rotated towards the panel (5) and displaced in said direction (A-A) towards an engaged position in which both the ends of the head portion (3a) of said projecting formation (3) extend outside said opening (6); locking means being able to be operated while the projecting formation (3) of the body (2) is in the engaged position, so as to fix stably in this condition the body (2) to the panel (5);
- the locking means comprising a locking member (7) having at least one first retaining formation (11) able to snap-engage with a corresponding second retaining formation (12a); the locking member (7) being able to assume with respect to the body (2) a pre-engagement position wherein said first and second retaining formations (11, 12a) are situated close together but disengaged from each other, the locking member (7) being able thereafter to be displaced into a stable engaged and locked position wherein said retaining formations (11, 12a) are firmly engaged together and the at least one first retaining formation (11) of the locking member (7) co-operates with the panel (5), on the opposite side to said projecting formation (3), preventing displacement of the body (2) with respect thereto;
- characterized in that said second retaining formation (12a) is provided in said body (2), and in that the neck portion (3b) of the projecting formation (3) of the body (2) has at least one projection (13) oriented in said direction (A-A) and able to be arranged along a corresponding side of the opening (6) of the panel (5) so as to eliminate the play between said neck portion (3b) and said opening (6) when the pro-

jecting formation (3) is in the abovementioned engaged position.

2. Fixing system according to Claim 1, in which the locking member (7) is mounted on the body (2) so as to be displaceable from the pre-engagement position into the engaged position essentially by means of displacement. 5
3. Fixing system according to Claim 1, in which the locking member (7) is mounted on the body (2) so that said locking member (7) is displaceable from the pre-engagement position into the engaged position by means of a rotation. 10
4. Fixing system according to one of the preceding claims, in which the body (2) and the locking member (7) are connected together by means of resilient eyelet members (9; 18) of one component snap-engaging with retaining reliefs (10; 17) of the other component. 15
5. Fixing system according to any one of the preceding claims, in which, when the locking member (7) is in the pre-engagement position, the retaining formation or formations (11) of the locking member (7) rests/rest against the retaining formation or formations (12a) of the body (2). 20
6. Fixing system according to Claims 3 and 4, in which the retaining reliefs (17) extend perpendicularly with respect to said direction (A-A) and define an axis of relative rotation of the locking member (7) with respect to the body (2). 25
7. Fixing system according to Claim 6, in which the locking member (7) has opposition reliefs (20) which, when the projecting formation (3, 3a) of the body (2) is displaced towards the abovementioned engaged position, are arranged against the panel (5); the arrangement being such that the displacement of the body (2) towards said engaged position is able to cause automatically rotation of the locking member (7) from the pre-engagement position into the engaged position. 30

Patentansprüche

1. System zum schraubenlosen Befestigen eines Körpers (2) mit einer vorstehenden Ausbildung (3) an einer Tafel (5) mit einer Öffnung (6), bei dem die vorstehende Ausbildung (3) einen Kopfabschnitt (3a), der in einer Richtung (A-A) eine Erstreckung aufweist, die größer ist als diejenige der Öffnung (6), und einen Halsabschnitt (3b) aufweist, der in der Richtung (A-A) eine Erstreckung aufweist, die kleiner oder gleich derjenigen der Öffnung (6) ist; wobei 50

die vorstehende Ausbildung (3) in einer geneigten Position durch die Öffnung (6) der Tafel (5) hindurch gehen und dann in Richtung der Tafel (5) gedreht und in der Richtung (A-A) in Richtung einer Ineingriffnahmeposition verschoben werden kann, in der beide Enden des Kopfabschnitts (3a) der vorstehenden Ausbildung (3) sich außerhalb der Öffnung (6) erstrecken; wobei eine Verriegelungseinrichtung betrieben werden kann, während die vorstehende Ausbildung (3) des Körpers (2) in der Ineingriffnahmeposition ist, um in diesem Zustand den Körper (2) stabil an der Tafel (5) zu befestigen; wobei die Verriegelungseinrichtung ein Verriegelungsbauteil (7) aufweist, das zumindest eine erste Halteausbildung (11) aufweist, die eine erstsprechende zweite Halteausbildung (12a) einschnappend in Eingriff nehmen kann; wobei das Verriegelungsbauteil (7) in Bezug auf den Körper (2) eine Vor-Ineingriffnahmeposition einnehmen kann, in der die erste und die zweite Halteausbildung (11, 12a) nahe beieinander angeordnet sind, jedoch außer Eingriff voneinander stehen, wobei das Verriegelungsbauteil (7) danach in eine stabil Ineingriffnahme- und Verriegelungsposition verschoben werden kann, in der die Halteausbildungen (11, 12a) fest in Eingriff miteinander gebracht sind und die zumindest eine erste Halteausbildung (11) des Verriegelungsbauteils (7) mit der Tafel (5) auf der gegenüberliegenden Seite zu der vorstehenden Ausbildung (3) zusammenwirkt, was eine Verschiebung des Körpers (2) in Bezug auf dieselbe verhindert; **dadurch gekennzeichnet, dass** die zweite Halteausbildung (12a) in dem Körper (2) vorgesehen ist, und dadurch, dass der Halsabschnitt (3b) der vorstehenden Ausbildung (3) des Körpers (2) zumindest einen Vorsprung (13) aufweist, der in der Richtung (A-A) ausgerichtet ist und entlang einer entsprechenden Seite der Öffnung (6) der Tafel (5) angeordnet sein kann, um so das Spiel zwischen dem Halsabschnitt (3b) und der Öffnung (6) zu beseitigen, wenn die vorstehende Ausbildung (3) in der oben erwähnten Ineingriffnahmeposition ist.

2. Befestigungssystem gemäß Anspruch 1, bei dem das Verriegelungsbauteil (7) so an dem Körper (2) angebracht ist, dass es aus der Vor-Ineingriffnahmeposition im Wesentlichen mittels Verschiebung in die Ineingriffnahmeposition verschiebbar ist. 45

3. Befestigungssystem gemäß Anspruch 1, bei dem das Verriegelungsbauteil (7) so an dem Körper (2) angebracht ist, dass das Verriegelungsbauteil (7) aus der Vor-Ineingriffnahmeposition mittels Drehung in die Ineingriffnahmeposition verschiebbar ist. 50

4. Befestigungssystem gemäß einem der vorherigen Ansprüche, bei dem der Körper (2) und das Verriegelungsbauteil (7) mittels elastischer Ösenbauteile 55

(9; 18) einer Komponente miteinander verbunden sind, die Halteaussparungen (10; 17) der anderen Komponente einschnappend in Eingriff nehmen.

5. Befestigungssystem gemäß einem der vorherigen Ansprüche, bei dem, wenn das Verriegelungsbauteil (7) in der Vor-Ineingriffnahmeposition ist, die Halteausbildung oder Ausbildungen (11) des Verriegelungsbauteils (7) an der Halteausbildung oder den Ausbildungen (12a) des Körpers (2) anliegt/anliegen. 5 10
6. Befestigungssystem gemäß Anspruch 3 und 4, bei dem sich die Halteaussparungen (17) senkrecht in Bezug auf die Richtung (A-A) erstrecken und eine relative Rotationsachse des Verriegelungsbauteils (7) in Bezug auf den Körper (2) definieren. 15
7. Befestigungssystem gemäß Anspruch 6, bei dem das Verriegelungsbauteil (7) gegenüberliegende Aussparungen (20) aufweist, die, wenn die vorstehende Ausbildung (3, 3a) des Körpers (2) in Richtung der oben erwähnten Ineingriffnahmeposition verschoben ist, an der Tafel (5) angeordnet sind; wobei die Anordnung derart ist, dass die Verschiebung des Körpers (2) in Richtung der Ineingriffnahmeposition eine automatische Drehung des Verriegelungsbauteils (7) aus der Vor-Ineingriffnahmeposition in die Ineingriffnahmeposition bewirken kann. 20 25

Revendications

1. Système de fixation sans vis d'un élément (2) comportant une partie saillante (3) sur un panneau (5) avec une ouverture (6), dans lequel ladite partie saillante (3) possède une partie supérieure (3a) ayant dans une direction (A-A) une saillie supérieure à celle de ladite ouverture (6) et une partie inférieure (3b) qui, dans ladite direction (A-A), a une saillie inférieure ou égale à ladite ouverture (6), la partie saillante (3) pouvant passer par l'ouverture (6) du panneau (5) en position inclinée puis être pivotée vers le panneau (5) et déplacée dans ladite direction (A-A) jusqu'à une position d'enclenchement dans laquelle les deux extrémités de la partie supérieure (3a) de ladite partie saillante (3) dépassent à l'extérieur de ladite ouverture (6), mécanisme de verrouillage pouvant être manoeuvré pendant que la partie saillante (3) de l'élément (2) est en position d'enclenchement, de manière à fixer de manière stable dans cette situation l'élément (2) sur le panneau (5), le mécanisme de verrouillage comprenant un organe de blocage (7) possédant au moins une première structure de maintien (11) pouvant s'encliqueter avec une deuxième structure de maintien (12a) correspondante, l'organe de blocage (7) étant capable 35 40 45 50 55

de prendre, par rapport à l'élément (2), une position de pré-enclenchement dans laquelle lesdites première et deuxième structures de maintien (11, 12a) sont proches l'une de l'autre mais libres l'une par rapport à l'autre, l'organe de blocage (7) pouvant être ensuite déplacé dans une position enclenchée et verrouillée stable dans laquelle lesdites structures de maintien (11, 12a) sont fermement solidaires et au moins la première structure de maintien (11) de l'organe de blocage (7) co-agit avec le panneau (5), du côté opposé à ladite partie saillante (3), empêchant le déplacement de l'élément (2) par rapport au panneau,

caractérisé en ce que ladite deuxième structure de maintien (12a) est réalisée dans ledit élément (2) et **en ce que** la partie inférieure (3b) de la partie saillante (3) de l'élément (2) possède au moins une saillie (13) orientée dans ladite direction (A-A) et pouvant être placée le long d'un côté correspondant de l'ouverture (6) du panneau (5) de manière à éliminer le jeu entre ladite partie inférieure (3b) et ladite ouverture (6) quand la partie saillante (3) est dans la position enclenchée mentionnée ci-dessus.

2. Système de fixation selon la revendication 1, dans lequel l'organe de blocage (7) est monté sur l'élément (2) de manière à pouvoir être déplacé de la position de pré-enclenchement à la position enclenchée essentiellement par déplacement. 25 30
3. Système de fixation selon la revendication 1, dans lequel l'organe de blocage (7) est monté sur l'élément (2) de telle manière que l'organe de blocage (7) peut être déplacé de la position de pré-enclenchement à la position enclenchée par rotation. 35
4. Système de fixation selon une des revendications précédentes, dans lequel l'élément (2) et l'organe de blocage (7) sont solidarisés par des oeilletons souples (9; 18) d'un composant qui s'encliquètent dans les bossages de retenue (10; 17) de l'autre composant. 40
5. Système de fixation selon une des revendications précédentes, dans lequel, quand l'organe de blocage (7) est dans la position de pré-enclenchement, la(les) structure(s) de maintien (11) de l'organe de blocage (7) appuie(ent) contre la(les) structure(s) de maintien (12a) de l'élément (2). 45 50
6. Système de fixation selon les revendications 3 et 4, dans lequel les bossages de retenue (17) se prolongent perpendiculairement à ladite direction (A-A) et définissent un axe de rotation relative de l'organe de blocage (7) par rapport à l'élément (2). 55
7. Système de fixation selon la revendication 6, dans lequel l'organe de blocage (7) possède des bossa-

ges en opposition (20) qui, quand la partie saillante (3, 3a) de l'élément (2) est déplacée vers la position enclenchée mentionnée ci-dessus, sont contre le panneau (5), la disposition étant telle que le déplacement de l'élément (2) vers ladite position enclenchée peut entraîner la rotation automatique de l'organe de blocage (7) qui passe de la position de pré-enclenchement à la position enclenchée.

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FIG.1

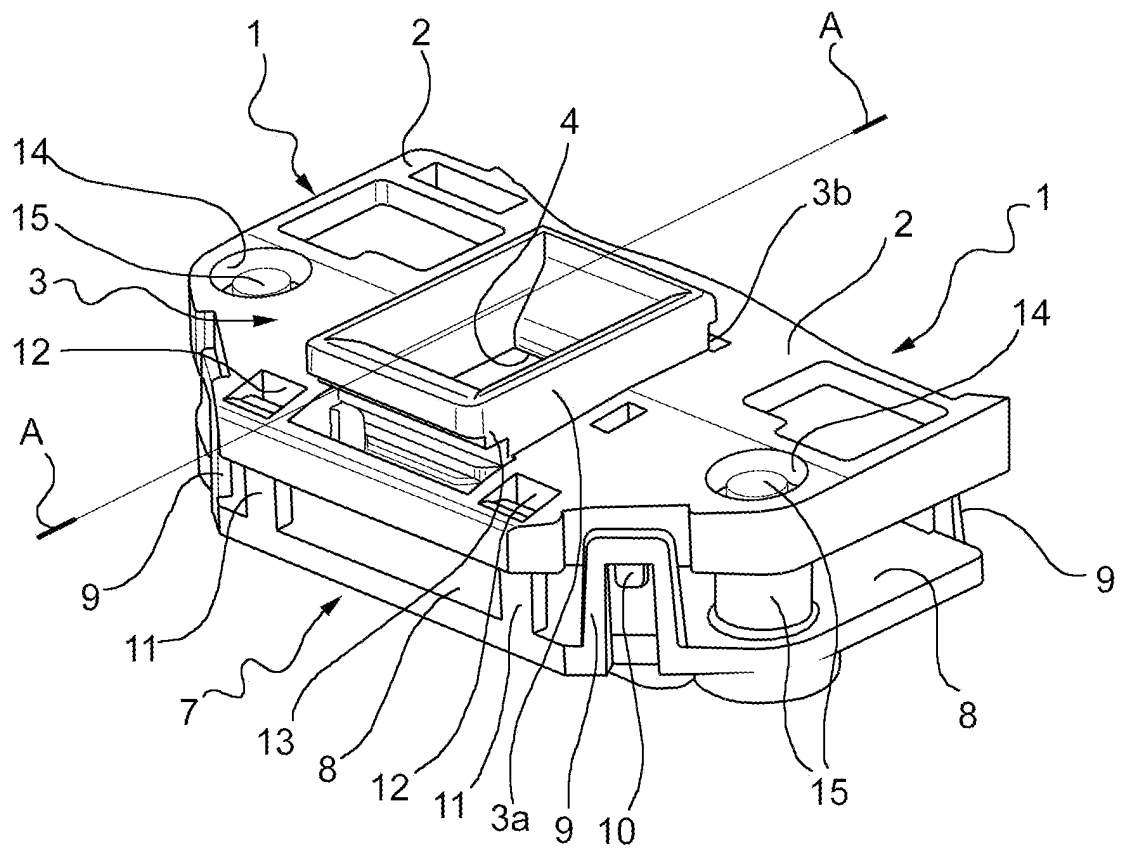


FIG.2

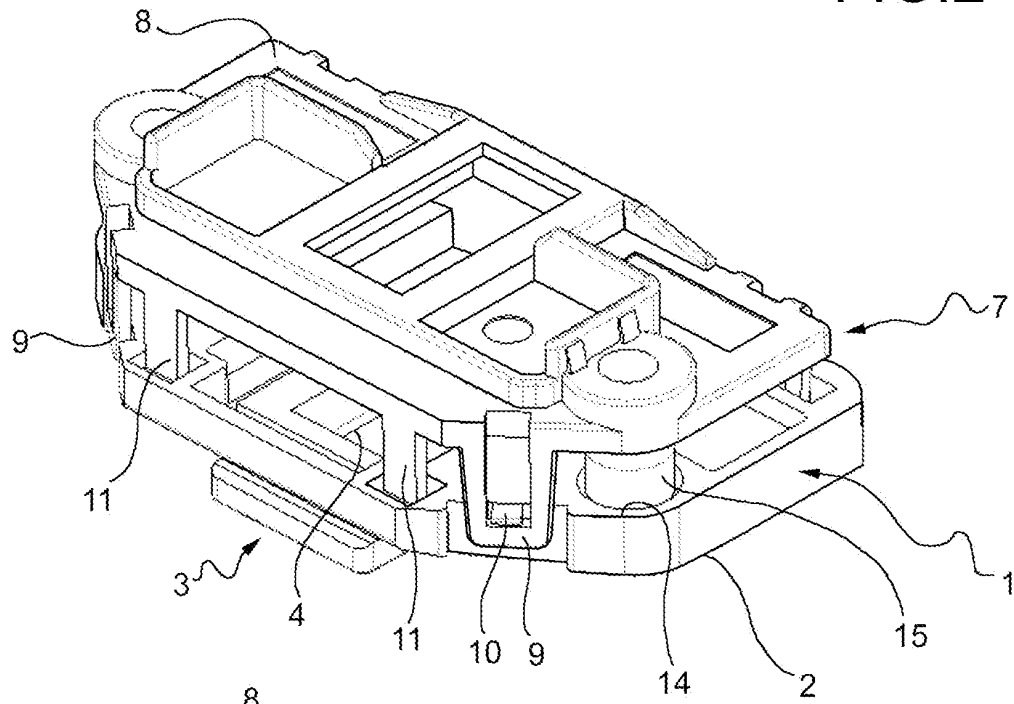
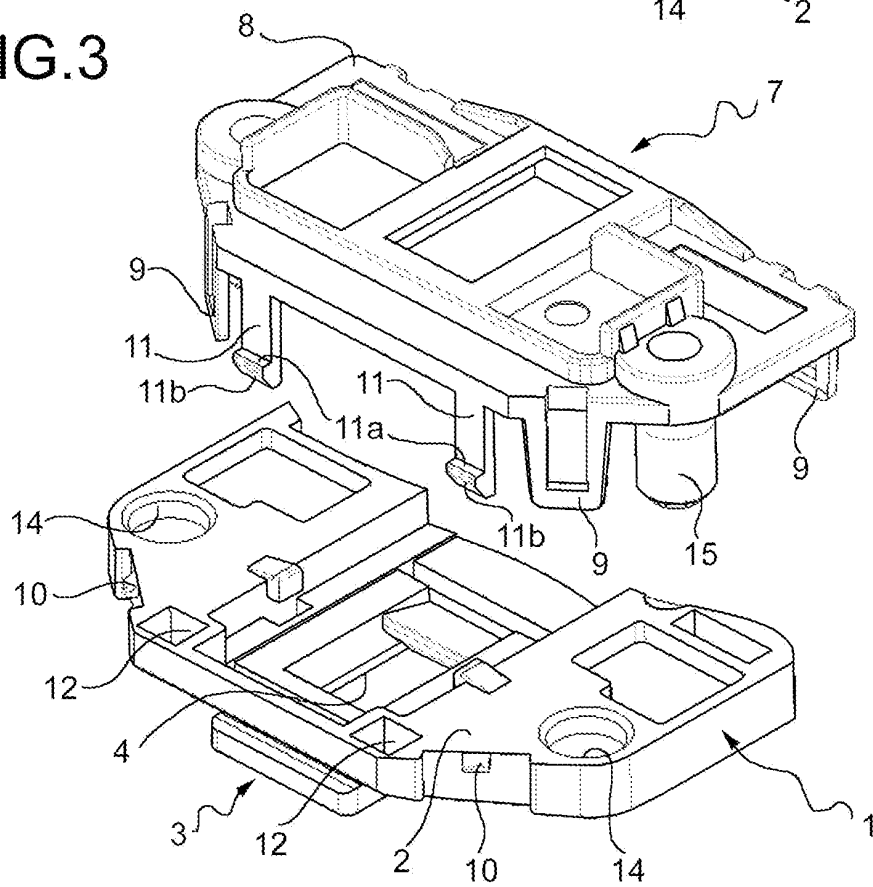


FIG.3



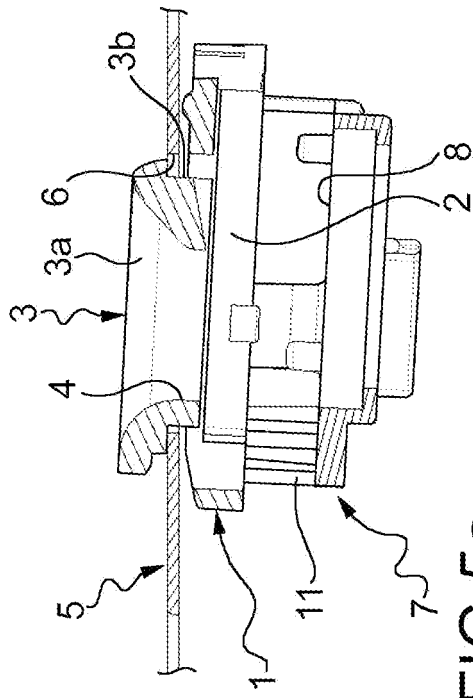


FIG. 5a

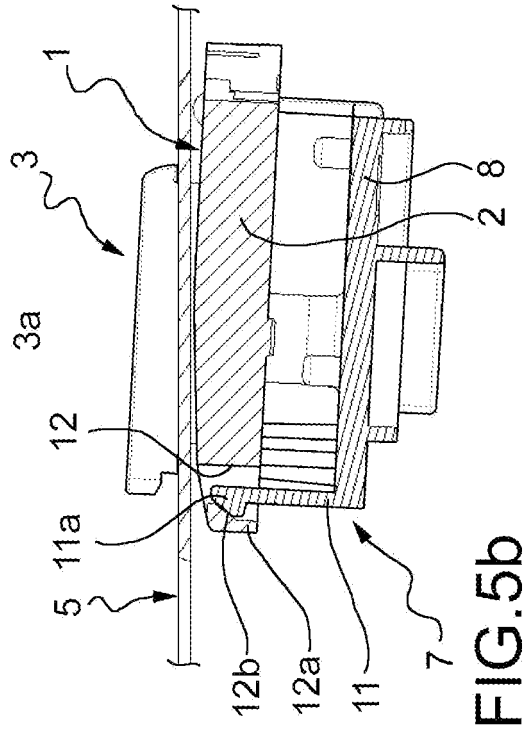


FIG. 5b

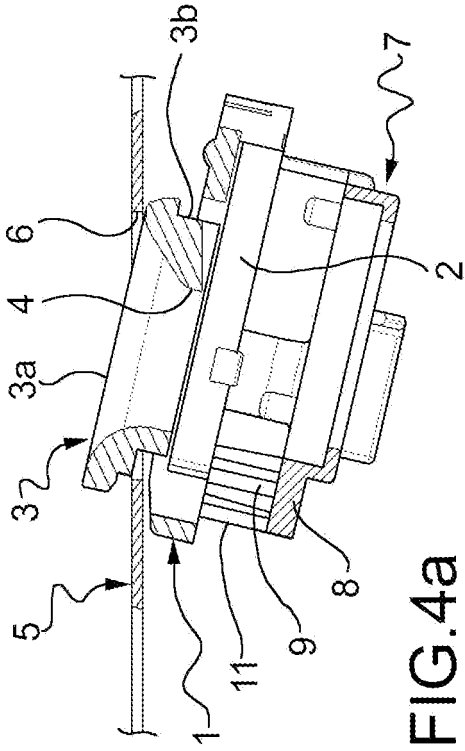


FIG. 4a

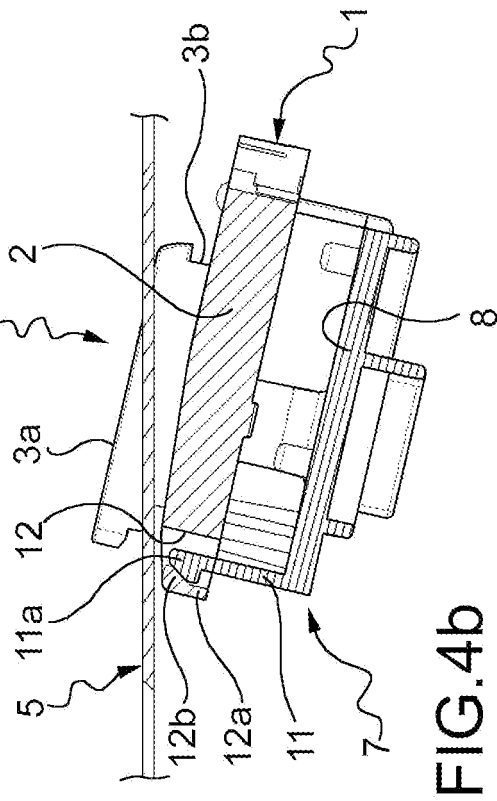


FIG. 4b

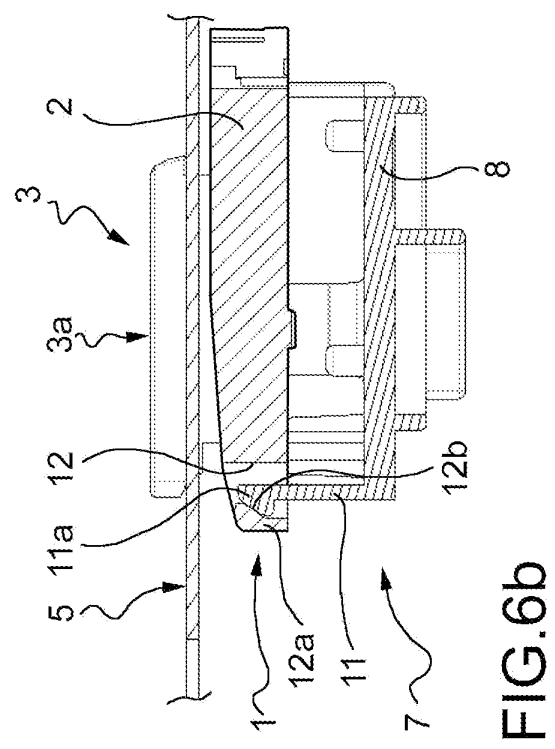
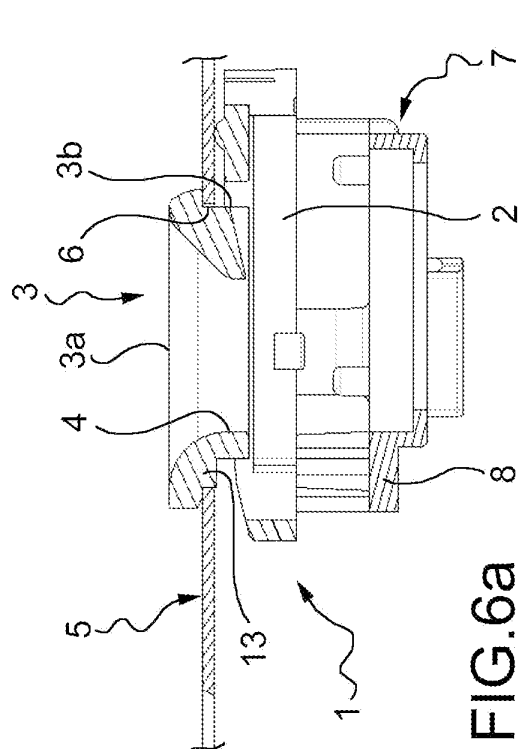
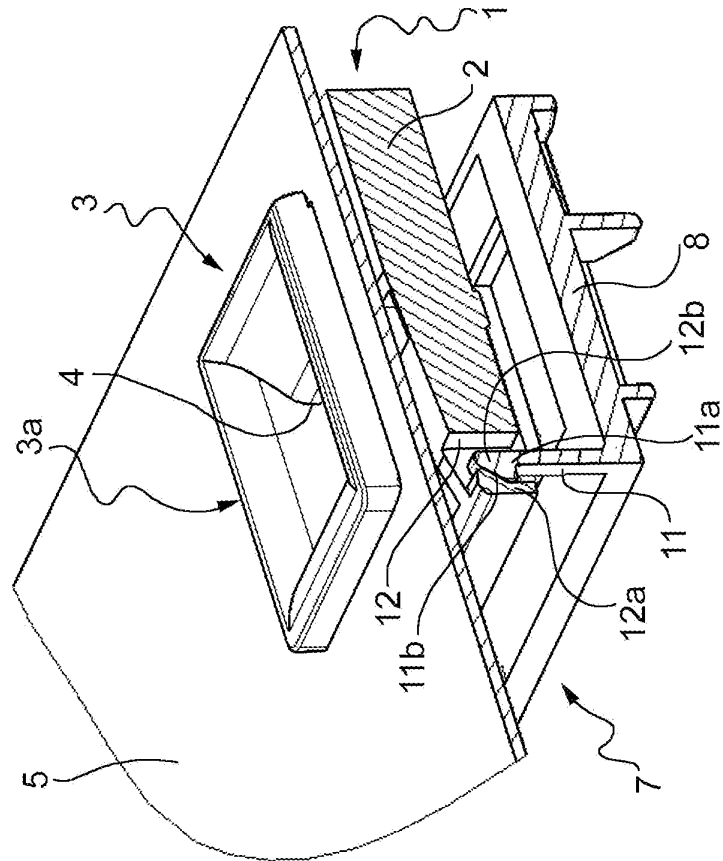


FIG. 7



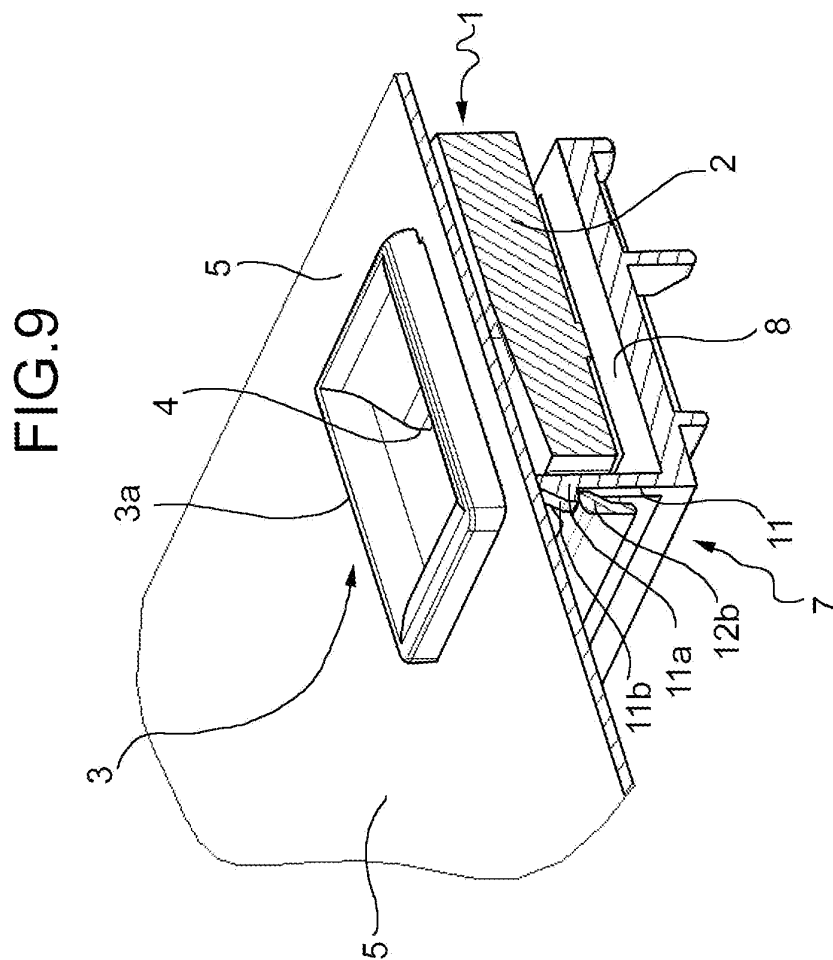
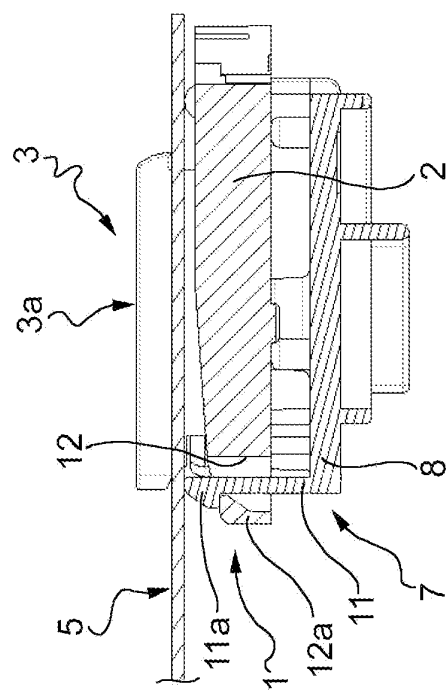
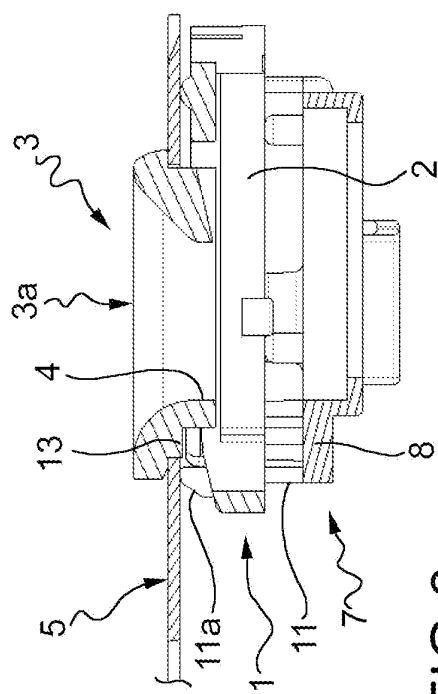
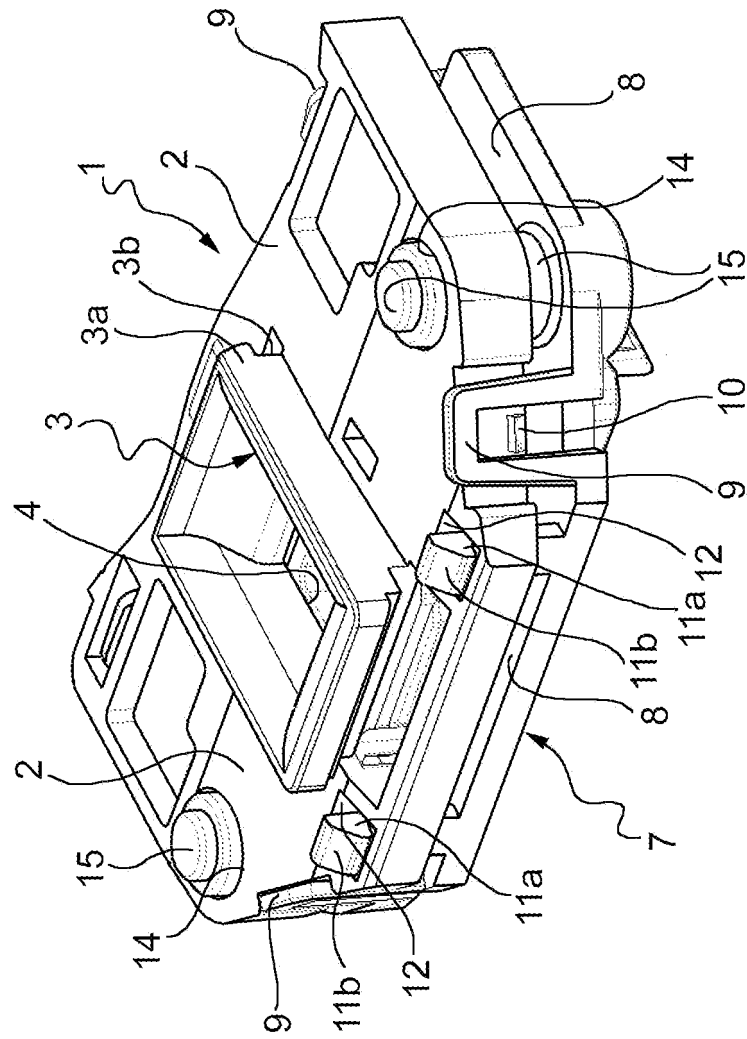


FIG.10



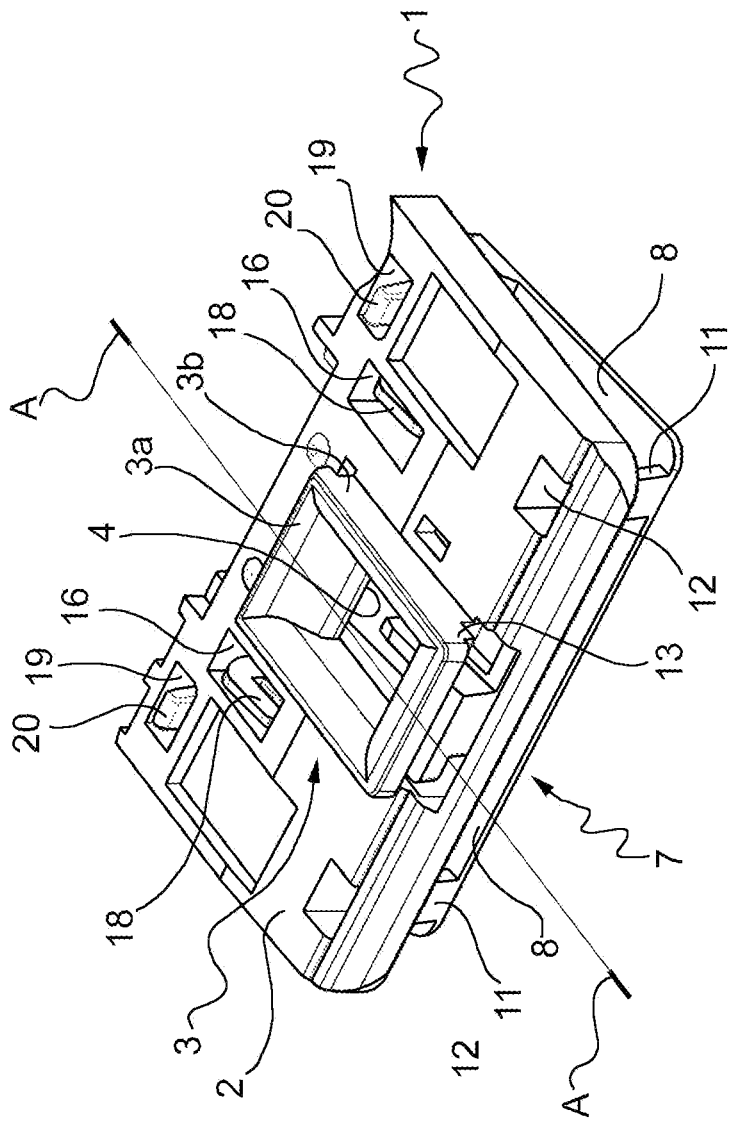


FIG.11

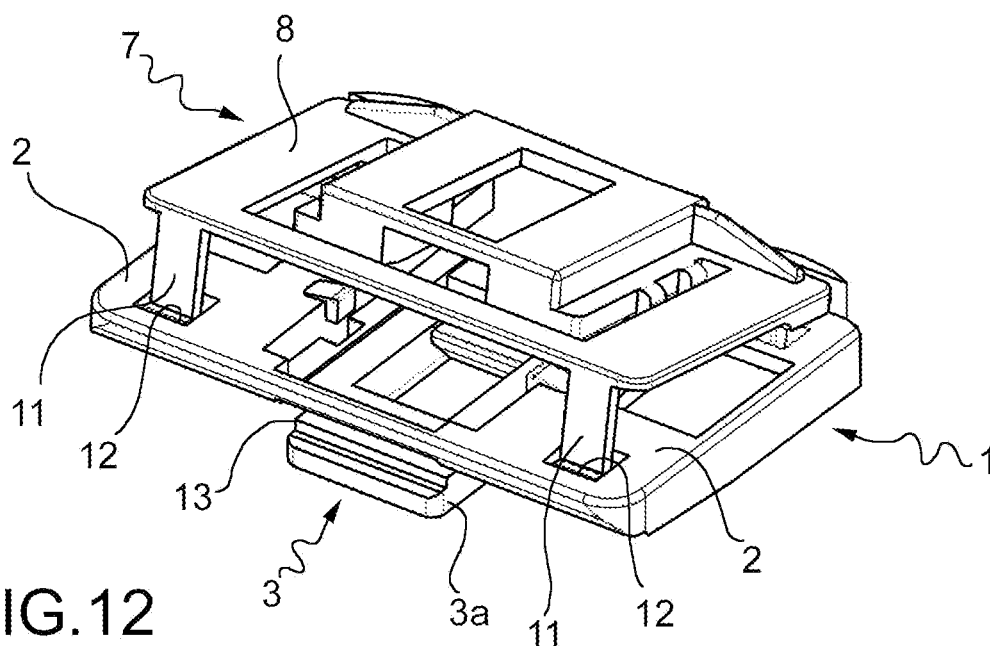


FIG.12

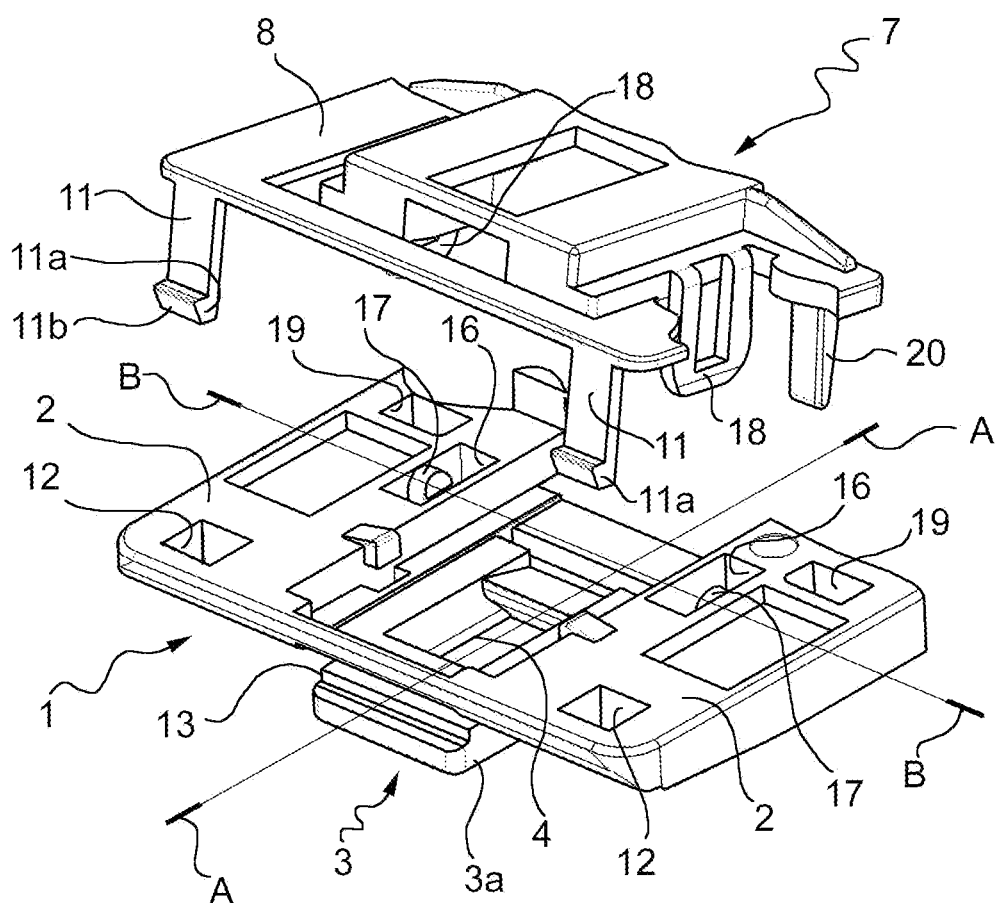
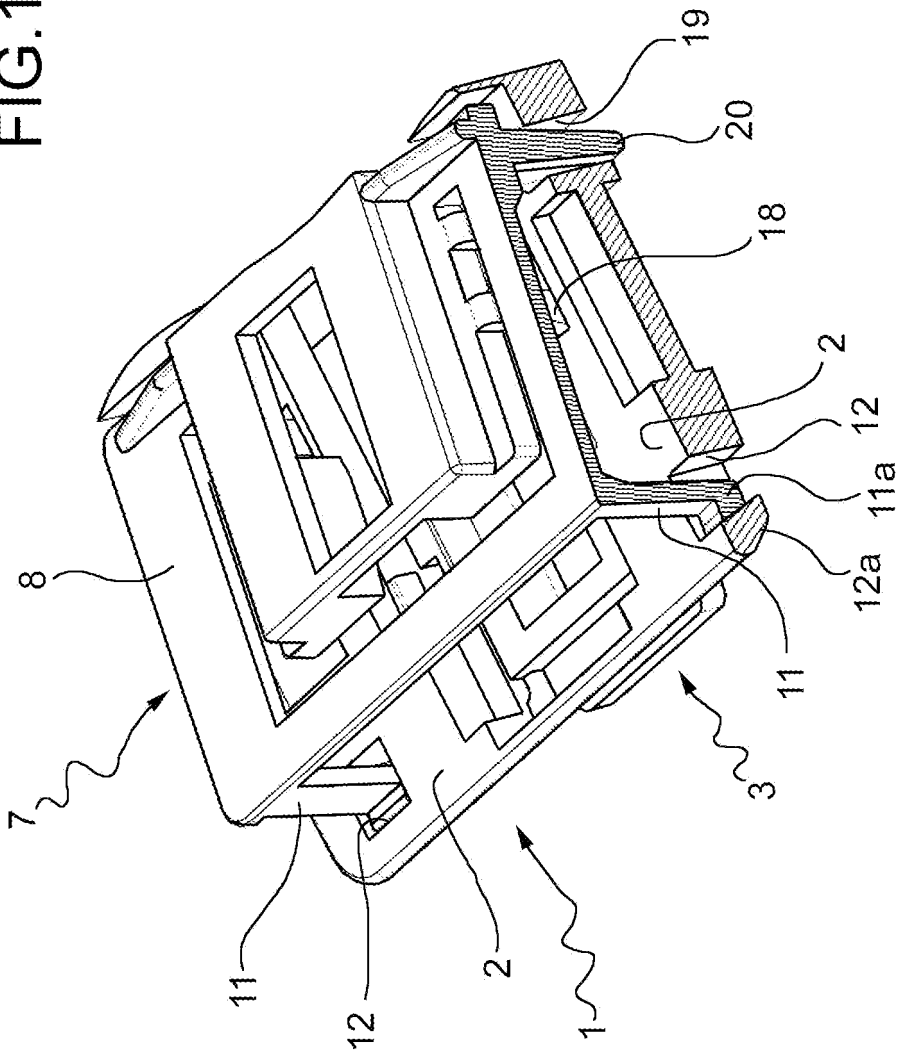


FIG.13

FIG.14



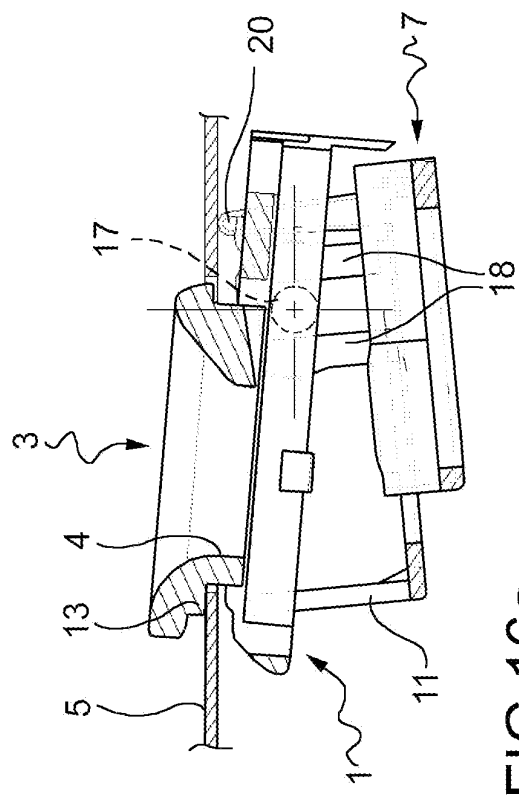


FIG. 15a

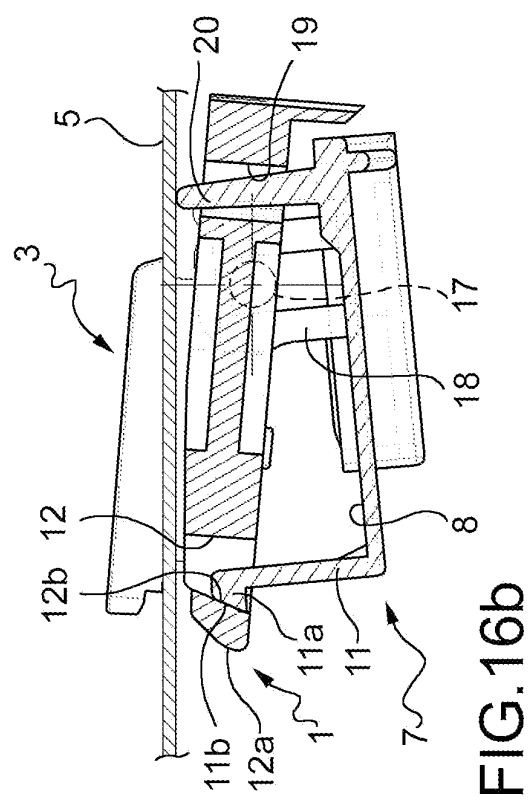


FIG. 16a

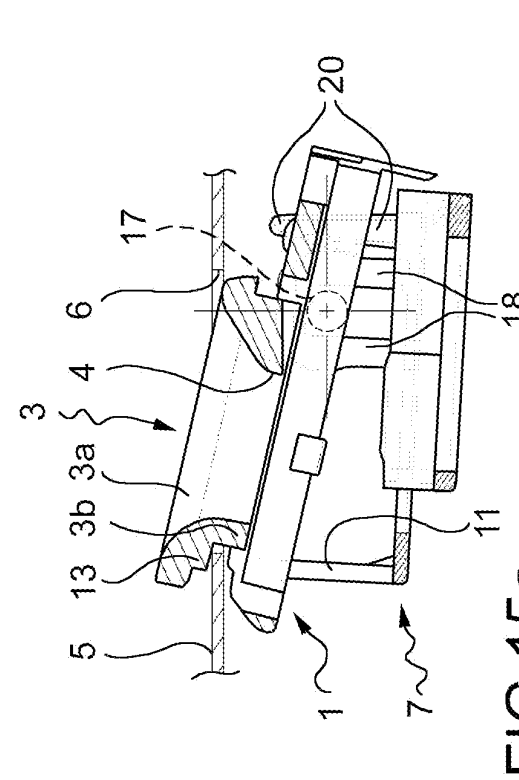


FIG. 15b

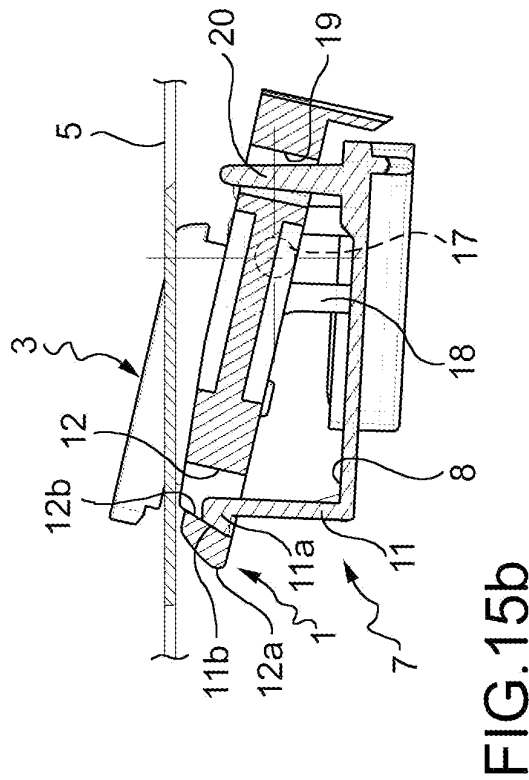


FIG. 16b

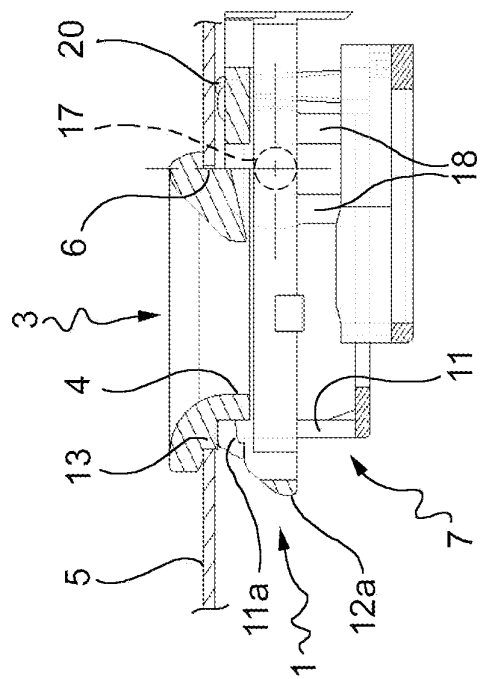


FIG. 17a

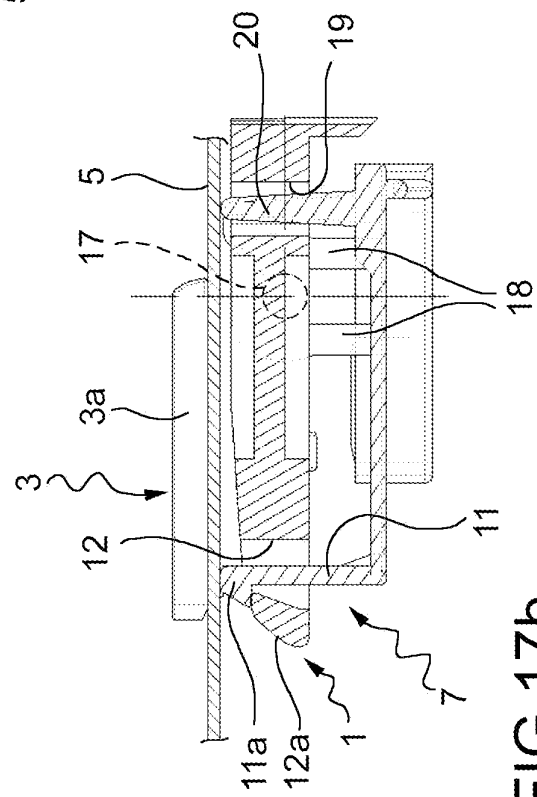


FIG. 17b

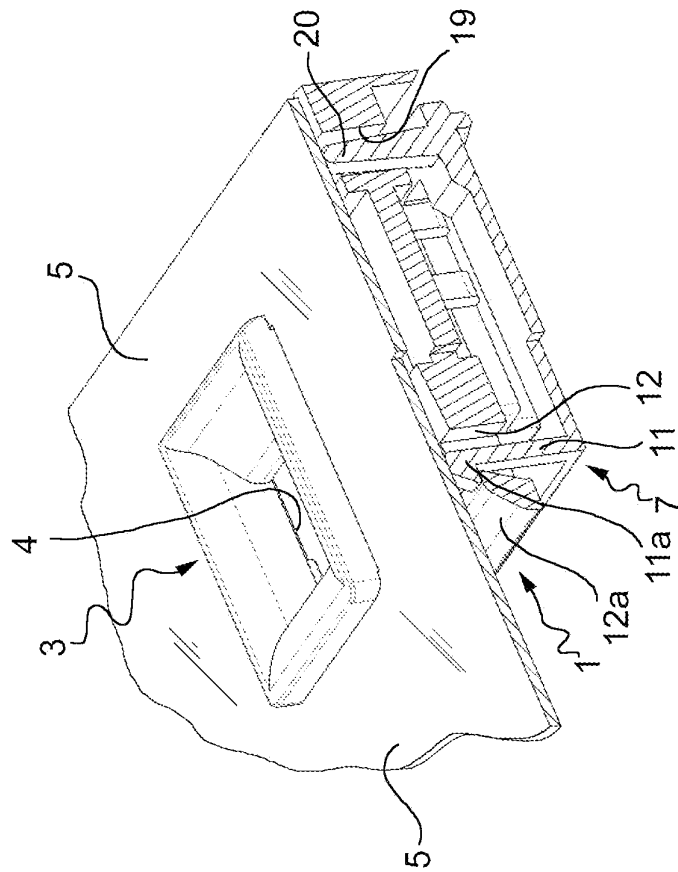


FIG. 18

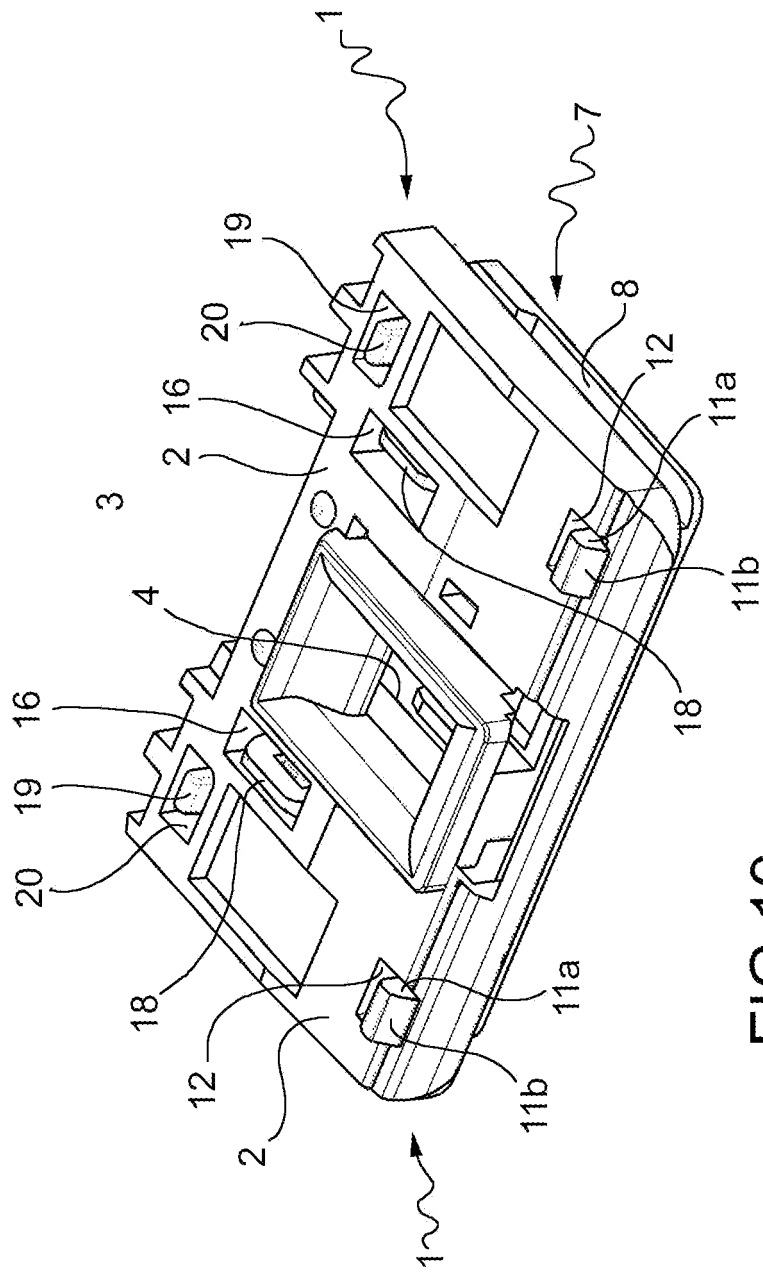


FIG.19

REFERENCES CITED IN THE DESCRIPTION

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