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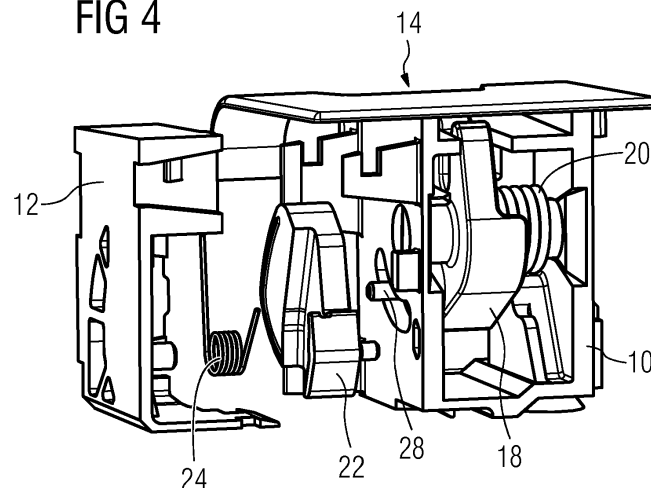
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(54) **A locking device and a domestic appliance**

(57) The present invention relates to a locking device for a domestic appliance. Said locking device is provided for opening and closing a door (34) or a drawer at a cabinet (32) of the domestic appliance and comprises at least one casing (10, 12), a wheel element (18) rotatable within the casing (10) around a rotational axis, a first spring element (20) effecting a rotation of the wheel element (18) into a predetermined sense of rotation, and at least one elongated pin element (28) attached at the wheel element (18), wherein the longitudinal axis of said pin element (28) extends parallel to the rotational axis of the wheel element (18). The locking device comprises further a path element (22) formed as a disk and arranged parallel to the wheel element (18), wherein a large-area side of the path element (22) includes a path (26) for receiving

and guiding an open end of the pin element (28), a second spring element (24; 36) effecting a rotation of the path element (22) in the predetermined sense of rotation and/or a displacement of the path element (22), and at least one hook element (16) inserted or insertable into a recess (14) of the casing (10, 12) and engaged or engageable with the wheel element (18). The hook element (16) is engageable with the wheel element (18) by pushing the casing (10, 12) towards the hook element (16). The hook element (16) is detachable from the wheel element (18) and the recess (14) by pushing the casing (10, 12) towards the hook element (16). Further, the present invention relates to a domestic appliance including a locking device.

FIG 4



Description

[0001] The present invention relates to a locking device for domestic appliance. Further, the present invention relates to a domestic appliance including a locking device.

[0002] Many domestic appliances comprise a cabinet with an opening and a door for covering and closing said opening. Usually, the door includes a handle or the like for opening and closing the door by a user. However, the handle sticks out from the door and increases the dimensions of said door. It would be advantageous, if the handle sticking out from the door could be avoided, so that the dimensions of the door are minimized.

[0003] WO 2011/132213 A1 discloses a push-pull locking device for the door of a washing and drying machine. The locking device includes a body of containment housing a locking wheel for a door latch. A sliding bolt is capable of preventing the rotation of the wheel. A time-delay mechanism is fitted with a locking pawl for said sliding bolt. The wheel is fitted with a cavity that presents a surface tilted with respect to the plane of rotation. The force exerting to the bolt is resolved, when the door is pulled, while the locking device is in a closed and locked position.

[0004] WO 2009/116094 A1 discloses an oven including a bottom-hinged door without handle. The door is provided with a locking and releasing mechanism, e.g. a push-pull, push-push or a touch latch, located on the door and on the body of the oven. A device for rotating the door open and slowly down is suited to make the door open, when it is released and to damp the movement of the door during its total opening move. The locking and releasing mechanism is activated by control means on the outer side of the door or on the control panel of the oven or by electric mechanisms operated by a remote control.

[0005] DE 198 25 324 A1 discloses a household appliance with a movable part like a drawer including a closure device. The closure device holds the drawer in a rear end position against the force of the spring. The closure device includes an element with a predetermined path. A manual push or pressure opens the drawer. Then the drawer is moved outwards by the spring force. If the drawer is completely inserted by a manual pushing, then said drawer is snapped in with the closure device, so that the drawer is closed and remains in its rear end position.

[0006] It is an object of the present invention to provide an improved locking device for opening and closing the door of a domestic appliance.

[0007] This is achieved by the locking device according to claim 1.

[0008] The present invention relates to locking device for a domestic appliance, said locking device is provided for opening and closing a door or a drawer at a cabinet of the domestic appliance and comprises:

- at least one casing,

- a wheel element rotatable within the casing around a rotational axis,
- a first spring element effecting a rotation of the wheel element into a predetermined sense of rotation,
- at least one elongated pin element attached at the wheel element, wherein the longitudinal axis of said pin element extends parallel to the rotational axis of the wheel element,
- a path element formed as a disk and arranged parallel to the wheel element, wherein a large-area side of the path element includes a path for receiving and guiding an open end of the pin element,
- a second spring element effecting a rotation of the path element in the predetermined sense of rotation and/or a displacement of the path element, and
- at least one hook element inserted or insertable into a recess of the casing and engaged or engageable with the wheel element, wherein
- the hook element is engageable with the wheel element by pushing the casing towards the hook element, and wherein
- the hook element is detachable from the wheel element and the recess by pushing the casing towards the hook element.

[0009] The main idea of the present invention is the arrangement and interaction of the wheel element, the path element and the spring elements. The locking device allows a push-push system for opening and closing the door or drawer. A handle is not required, so that the door or the front of the drawer may have a flat form.

[0010] In particular, the casing is subdivided into a main casing and a lateral casing.

[0011] For example, the main casing and the lateral casing are connected or connectable by at least one snap-in mechanism.

[0012] Preferably, the wheel element is arranged in the main casing, while the path element may be arranged in the lateral casing.

[0013] In similar way, the first spring element may be arranged in the main casing, while the second spring element may be arranged in the lateral casing.

[0014] In particular, the first spring element is a torsion spring element.

[0015] For example, the second spring element is also torsion spring element.

[0016] Alternatively, the second spring element may be an extension spring element.

[0017] Preferably, the casing, the main casing and/or the lateral casing are made of plastics.

[0018] Further, the rotation and/or displacement of the path element may be limited by a mechanical lock element.

[0019] Moreover, the rotation and/or displacement of the path element may be guided by a cam.

[0020] Further, the present invention relates to a domestic appliance including a cabinet, a door for closing an opening said cabinet and/or a drawer inserted in or

insertable into the cabinet, and a locking device for locking the door and/or the drawer, respectively, at the cabinet, wherein the domestic appliance includes the locking device mentioned above.

[0021] Preferably, the locking device is mounted inside a column of the door. In particular, the locking device is mounted inside a plastic column of the door.

[0022] Novel and inventive features of the present invention are set forth in the appended claims.

[0023] The present invention will be described in further detail with reference to the drawings, in which

FIG 1 illustrates a perspective front view of a locking device according to a first embodiment of the present invention,

FIG 2 illustrates a perspective rear view of the locking device according to the first embodiment of the present invention,

FIG 3 illustrates a further perspective rear view of the locking device according to the first embodiment of the present invention,

FIG 4 illustrates an exploded perspective rear view of the locking device according to the first embodiment of the present invention,

FIG 5 illustrates a perspective view of a domestic appliance including the locking device according to the present invention,

FIG 6 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention,

FIG 7 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a first step of closing said locking device,

FIG 8 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a second step of closing said locking device,

FIG 9 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a third step of closing said locking device,

FIG 10 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a fourth step of closing said locking device,

FIG 11 illustrates an exploded perspective side view of the locking device according to the first em-

bodiment of the present invention during a fifth step of closing said locking device,

FIG 12 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a sixth step of closing said locking device,

FIG 13 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a first step of opening said locking device,

FIG 14 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a second step of opening said locking device,

FIG 15 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a third step of opening said locking device,

FIG 16 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a fourth step of opening said locking device,

FIG 17 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a fifth step of opening said locking device,

FIG 18 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a sixth step of opening said locking device, and

FIG 19 illustrates a perspective rear view of the locking device according to a second embodiment of the present invention.

[0024] FIG 1 illustrates a perspective front view of a locking device according to a first embodiment of the present invention.

[0025] The locking device includes a main casing 10 and a lateral casing 12. The main casing 10 and the lateral casing 12 are connected by a snap-in mechanism. The main casing 10 comprises a recess 14 for receiving a hook element 16.

[0026] FIG 2 illustrates a perspective rear view of the locking device according to the first embodiment of the present invention.

[0027] A wheel element 18 and a first torsion spring element 20 are arranged inside the main casing 10. The wheel element 18 is rotatable within the main casing 10 around a rotational axis. In FIG 2 the rotational axis extends horizontally. The first torsion spring element 20 in-

teracts between the wheel element 18 and the main casing 10. The first torsion spring element 20 effects a clockwise rotation of the wheel element 18.

[0028] A pin element 28 is attached at the wheel element 18. The pin element 28 is arranged in an outer portion of the wheel element 18. In this example, the pin element 28 has a cylindrical shape. The elongated axis of the pin element 28 extends in parallel to the rotational axis of the wheel element 18.

[0029] FIG 3 illustrates a further perspective rear view of the locking device according to the first embodiment of the present invention.

[0030] A path element 22 and a second torsion spring element 24 are arranged inside the lateral casing 12. The path element 22 is pivotable within the lateral casing 12 around a horizontal axis. The second torsion spring element 24 interacts between the path element 22 and the lateral casing 12. The second torsion spring element 24 effects a counter-clockwise rotation of the path element 22.

[0031] FIG 4 illustrates an exploded perspective rear view of the locking device according to the first embodiment of the present invention.

[0032] The path element 22 is formed as a disk. One of the two large-area sides of the path element 22 is arranged face to face with the main casing 10 and includes a path 26. The path 26 is formed as a closed groove in said large-area side of the path element 22. In this example, the path 26 is formed as an approximately heart-shaped groove. The pin element 28 attached at the wheel element 18 moves along the path 26 of the path element 22.

[0033] FIG 5 illustrates a perspective view of a domestic appliance 30 including the locking device according to the present invention.

[0034] The domestic appliance 30 comprises a cabinet 32 and a door 34. The cabinet 32 includes an open front side closable by the door 34. The door 34 is connected to the cabinet 32 via a hinge. In this example, the door 34 is pivoting at the cabinet 32 around a vertical axis. The domestic appliance 30 may be a cooking oven, a refrigerator or the like. The locking device is mounted in an inner column of the door 34. For example, the inner column is made of plastics.

[0035] FIG 6 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention.

[0036] The state of the locking device in FIG 6 corresponds with an open door 34 of the domestic appliance 30. The hook element 16 is outside of the locking device. The pin element 28 attached at the wheel element 18 is inserted in the path 26 of the path element 22.

[0037] FIG 7 to FIG 12 shows the states of the locking device during the closing of the door 34.

[0038] FIG 7 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a first step of closing said locking device.

[0039] At the start of closing of the door 34 the hook element 16 is engaged with the wheel element 18. The wheel element 18 rotates counter-clockwise. The pin element 28 follows the path 26 of the path element 22.

[0040] FIG 8 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a second step of closing said locking device.

[0041] The hook element 16 has been moved a little bit into the recess 14, while the wheel element 18 has rotated counter-clockwise. The pin element 28 has followed a little bit the path 26 of the path element 22.

[0042] FIG 9 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a third step of closing said locking device.

[0043] In this step the force of the second torsion spring element 24 effects the counter-clockwise rotation of the path element 22. The force of the second torsion spring element 24 and the shape of the path 22 bring the locking device into the closed state.

[0044] FIGS 10 to FIG 12 show the further process of closing the locking device. FIG 10 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a fourth step of closing said locking device. FIG 11 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a fifth step of closing said locking device. FIG 12 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a sixth step of closing said locking device. In this position the locking device is blocked.

[0045] FIG 13 to FIG 20 shows the states of the locking device during the opening of the door 34. For opening the door 34 the user has to push on the door 34.

[0046] FIG 13 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a first step of opening said locking device.

[0047] When the user pushes on the door 34, then the wheel element 18 performs a small clockwise rotation, while the pin element 28 moves a little bit within the path 22.

[0048] FIG 14 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a second step of opening said locking device.

[0049] When the user stops pushing and releases the door 34, then the pin element 28 takes a start position. This movement is guaranteed by the first torsion spring element 20. In this step, the hook element 16 is at most inserted in the recess 14.

[0050] FIG 15 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a third step of opening said locking device.

[0051] The force of the first torsion spring element 20 rotates the wheel element 18 clockwise. The pin element 28 moves within the path 22 of the path element 22. The path element 22 rotates until it is blocked by a mechanical lock element 38. Then, the path element 22 translates vertically controlled by a cam 40.

[0052] FIG 16 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a fourth step of opening said locking device.

[0053] FIG 16 shows that the movements of the cam 40 and the pin element 28 are controlled by long slots formed in the main casing 10.

[0054] FIG 17 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a fifth step of opening said locking device.

[0055] In the fifth step the door 34 is open. The pin element 28 returns to a position within the path 26 by the force of the second torsion spring element 24.

[0056] FIG 18 illustrates an exploded perspective side view of the locking device according to the first embodiment of the present invention during a sixth step of opening said locking device.

[0057] In the sixth step the pin element 28 is in a start position again.

[0058] FIG 19 illustrates a perspective rear view of the locking device according to a second embodiment of the present invention.

[0059] The second embodiment of the locking device has substantially the same structure as the first embodiment. The second embodiment of the locking device includes an extension spring element 36 instead of the second torsion spring element 24. The extension spring element 36 allows very constant properties during its life cycle.

[0060] The locking device according to the present invention allows a push-push system for opening and closing the door 34. A handle is not required, so that the door 34 may have a flat form. Although illustrative embodiments of the present invention have been described herein with reference to the accompanying drawings, it is to be understood that the present invention is not limited to those precise embodiments, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of reference numerals

[0061]

10 main casing
12 lateral casing
14 recess
16 hook element

18 wheel element
20 first torsion spring element
22 path element
24 second torsion spring element
26 path
28 pin element
30 domestic appliance
32 cabinet
34 door
36 extension spring element
38 mechanical lock element
40 cam

15 Claims

1. A locking device for a domestic appliance, said locking device is provided for opening and closing a door (34) or a drawer at a cabinet (32) of the domestic appliance and comprises:

- at least one casing (10, 12),
- a wheel element (18) rotatable within the casing (10) around a rotational axis,
- a first spring element (20) effecting a rotation of the wheel element (18) into a predetermined sense of rotation,
- at least one elongated pin element (28) attached at the wheel element (18), wherein the longitudinal axis of said pin element (28) extends parallel to the rotational axis of the wheel element (18),
- a path element (22) formed as a disk and arranged parallel to the wheel element (18), wherein a large-area side of the path element (22) includes a path (26) for receiving and guiding an open end of the pin element (28),
- a second spring element (24; 36) effecting a rotation of the path element (22) in the predetermined sense of rotation and/or a displacement of the path element (22), and
- at least one hook element (16) inserted or insertable into a recess (14) of the casing (10, 12) and engaged or engageable with the wheel element (18), wherein
- the hook element (16) is engageable with the wheel element (18) by pushing the casing (10, 12) towards the hook element (16), and wherein
- the hook element (16) is detachable from the wheel element (18) and the recess (14) by pushing the casing (10, 12) towards the hook element (16).

2. The locking device according to claim 1, characterized in that the casing (10, 12) is subdivided into a main casing (10) and a lateral casing (12).

3. The locking device according to claim 2,
characterized in that
the main casing (10) and the lateral casing (12) are
connected or connectable by at least one snap-in
mechanism. 5
4. The locking device according to claim 2 or 3,
characterized in that
the wheel element (18) is arranged in the main casing
(10). 10
5. The locking device according to any one of the claims
2 to 4,
characterized in that
the path element (22) is arranged in the lateral casing
(12). 15
6. The locking device according to any one of the claims
2 to 5,
characterized in that 20
the first spring element (20) is arranged in the main
casing (10).
7. The locking device according to any one of the claims
2 to 6, 25
characterized in that
the second spring element (20; 36) is arranged in
the lateral casing (12).
8. The locking device according to any one of the pre-
ceding claims, 30
characterized in that
the first spring element is a torsion spring element
(20). 35
9. The locking device according to any one of the pre-
ceding claims,
characterized in that
the second spring element is a torsion spring ele-
ment (24). 40
10. The locking device according to any one of the claims
1 to 8,
characterized in that
the second spring element is an extension spring
element (36). 45
11. The locking device according to any one of the pre-
ceding claims,
characterized in that 50
the casing (10, 12), the main casing (10) and/or the
lateral casing (12) are made of plastics.
12. The locking device according to any one of the pre-
ceding claims, 55
characterized in that
the rotation and/or displacement of the path element
(22) is limited by a mechanical lock element (38).
13. The locking device according to any one of the pre-
ceding claims,
characterized in that
the rotation and/or displacement of the path element
(22) is guided by a cam (40).
14. A domestic appliance including a cabinet (32), a door
(34) for closing an opening of said cabinet (32) and/or
a drawer inserted in or insertable into the cabinet
(32), and a locking device for locking the door (34)
and/or the drawer, respectively, at the cabinet (32),
characterized in that
the domestic appliance includes the locking device
according to any one of the claims 1 to 13.
15. The domestic appliance according to claim 14,
characterized in that
the locking device is mounted inside a column of the
door (34).

FIG 1

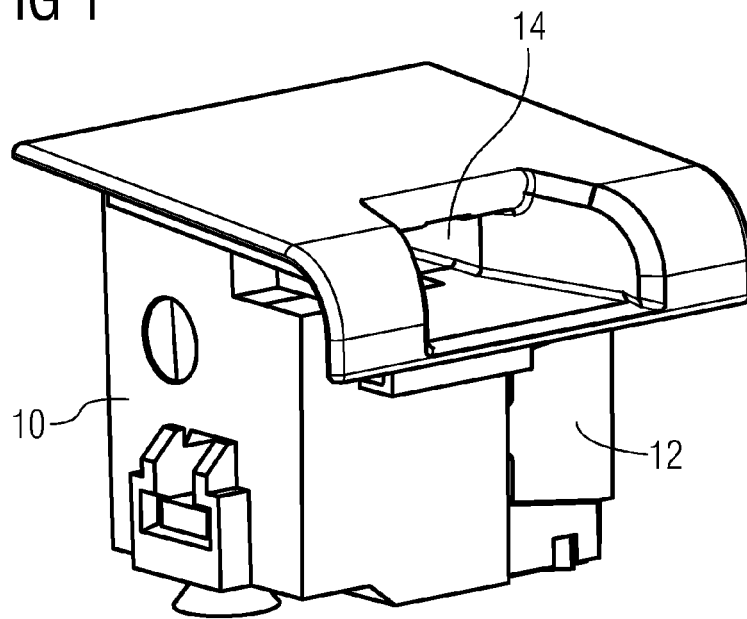


FIG 2

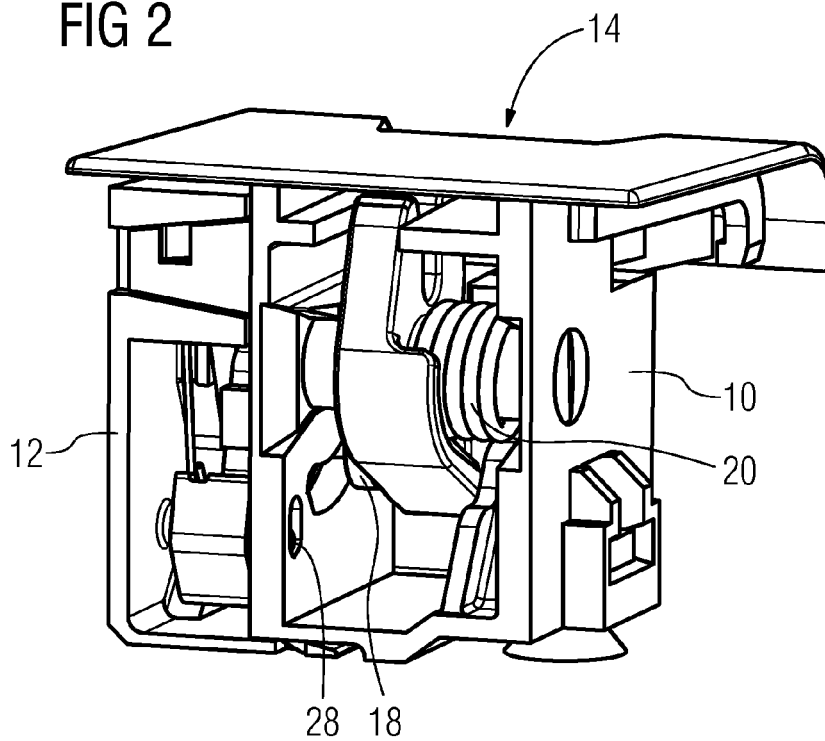


FIG 3

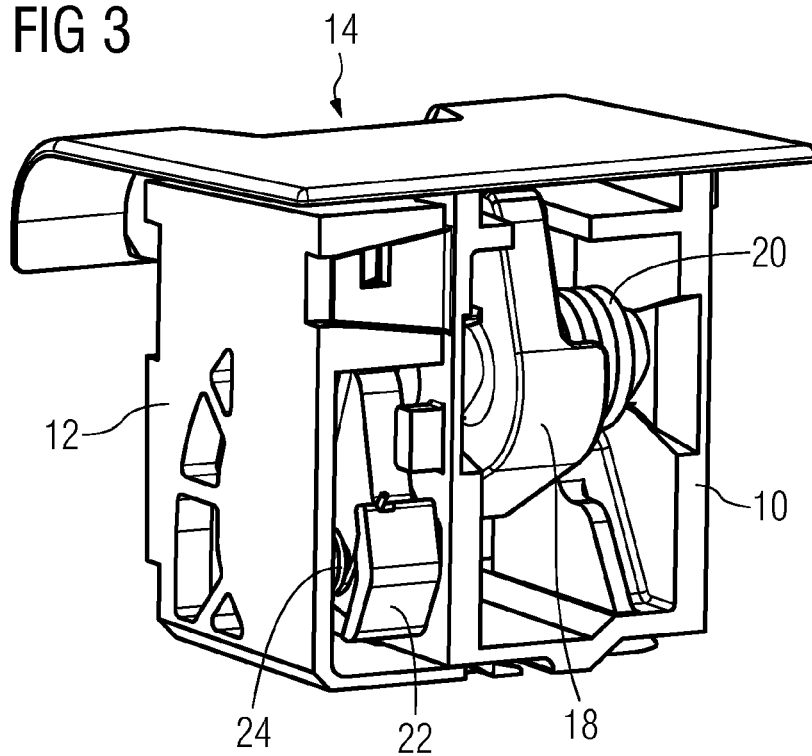


FIG 4

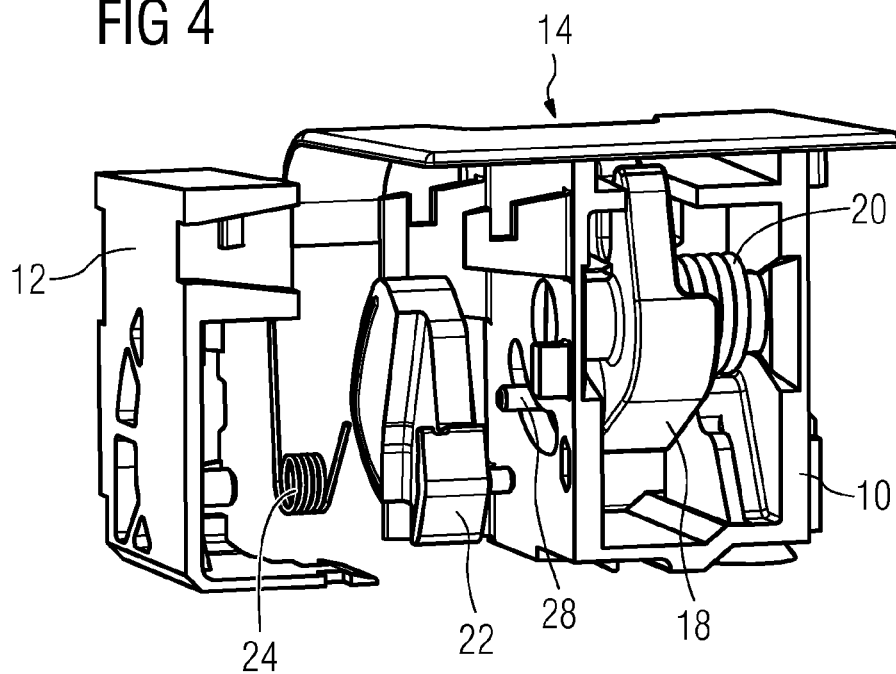


FIG 5

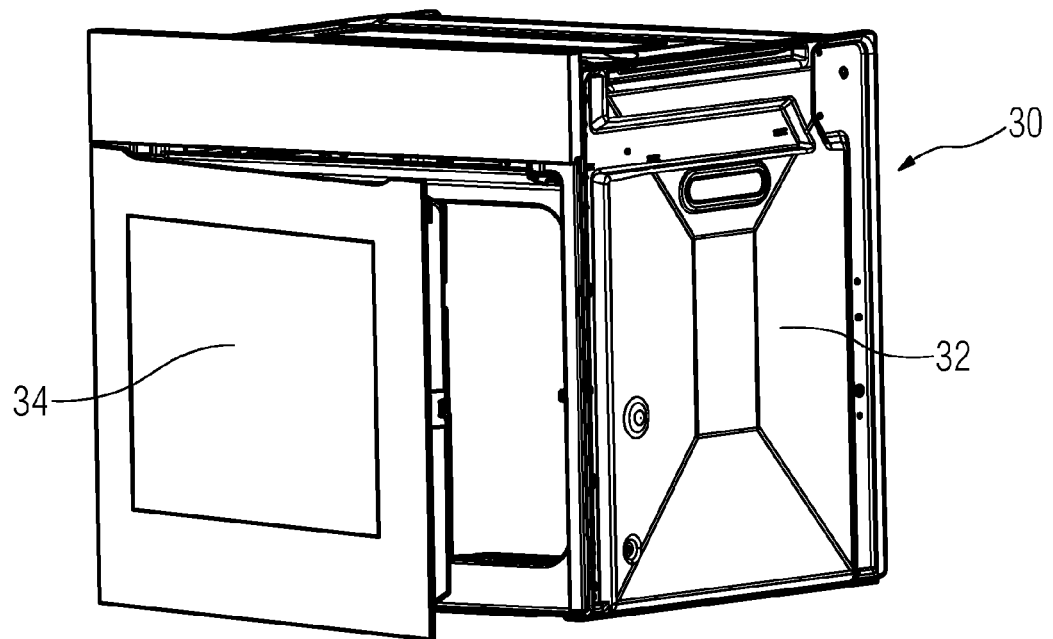


FIG 6

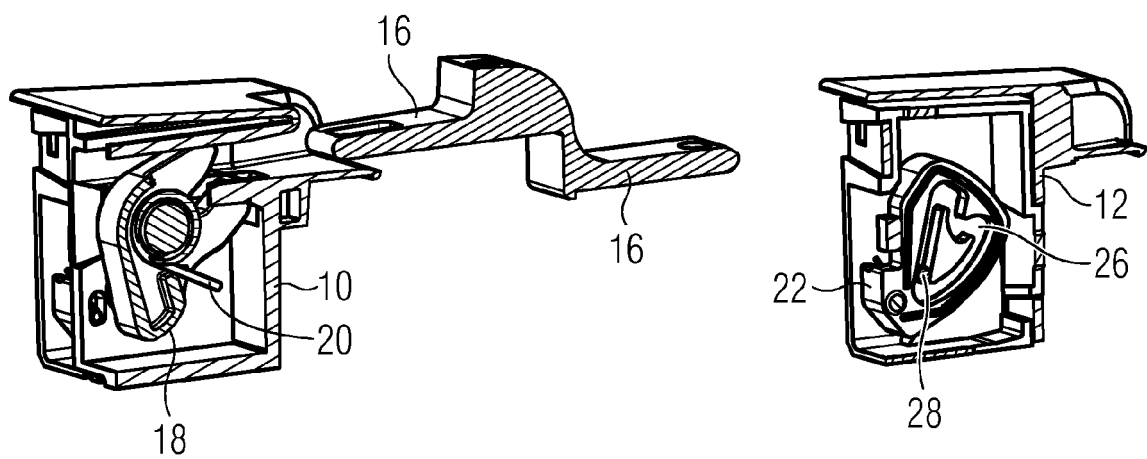


FIG 7

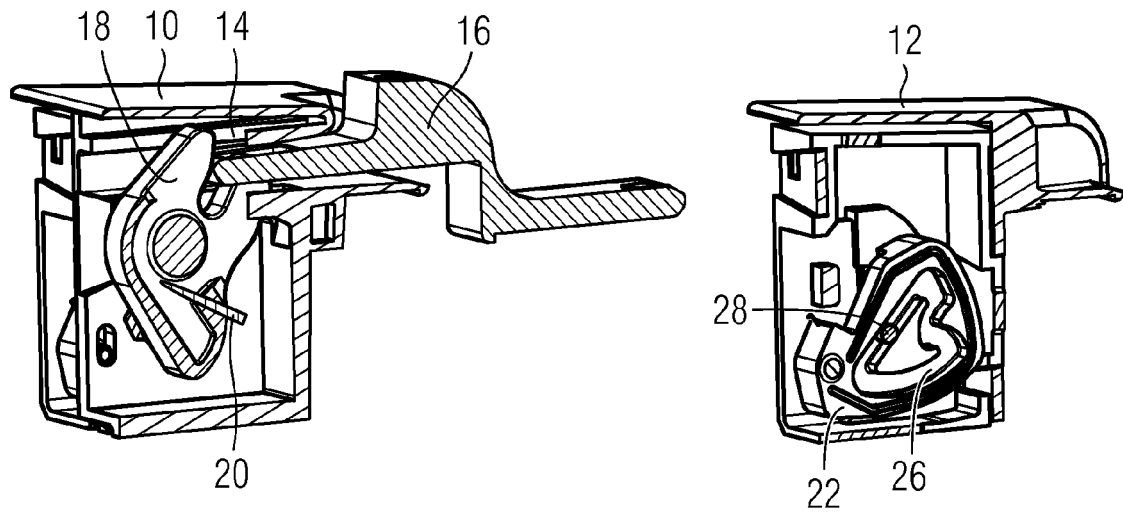


FIG 8

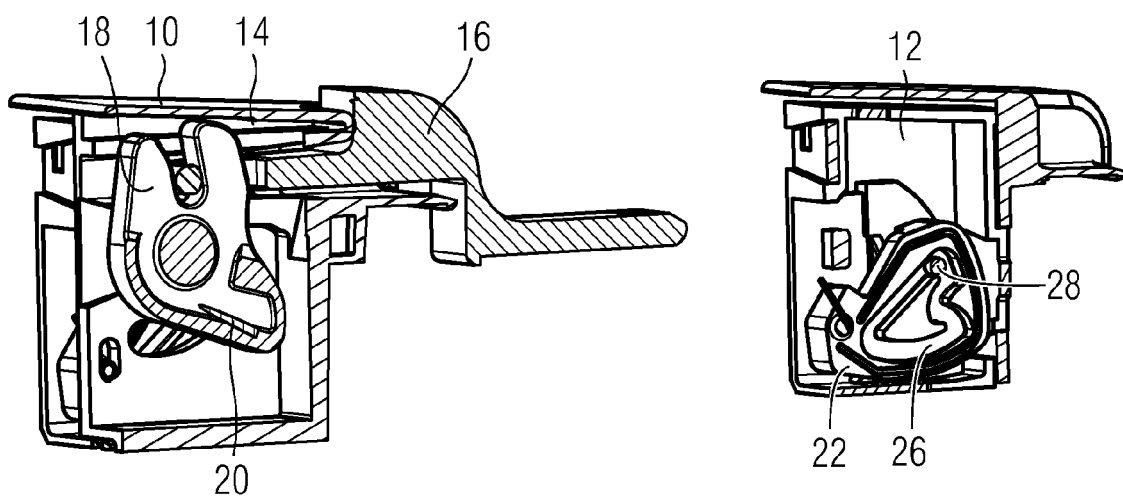


FIG 9

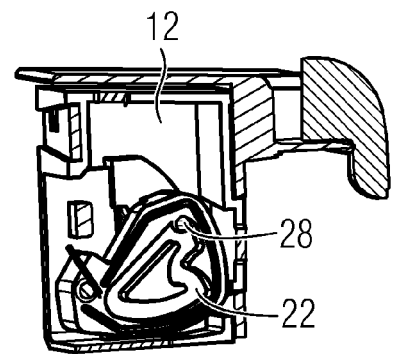
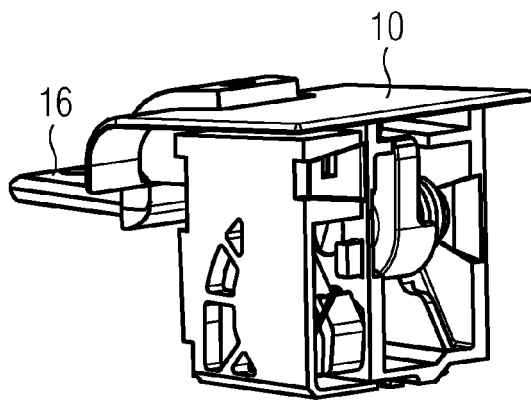
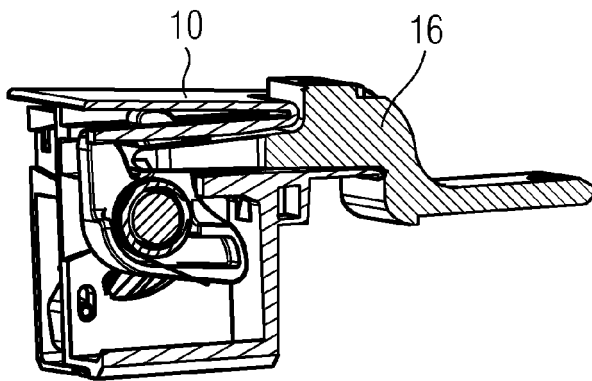


FIG 10

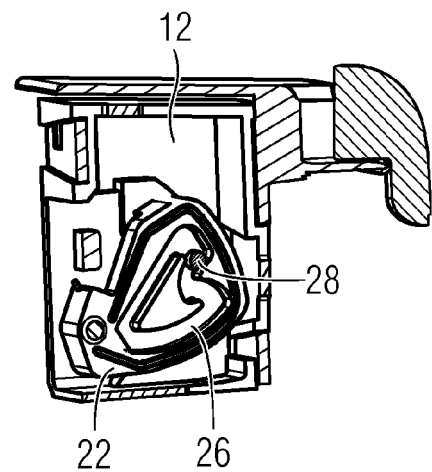
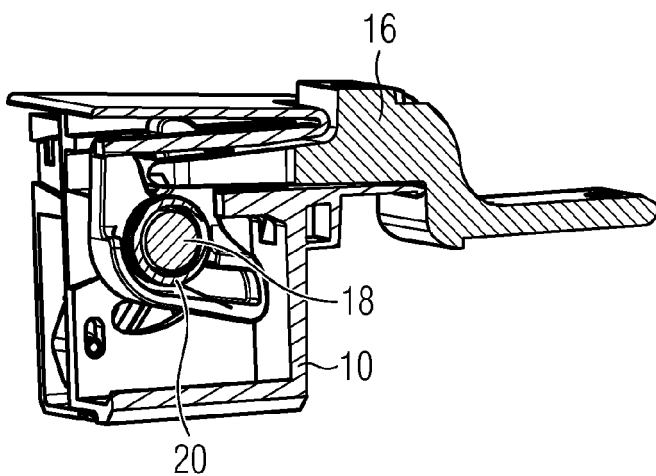


FIG 11

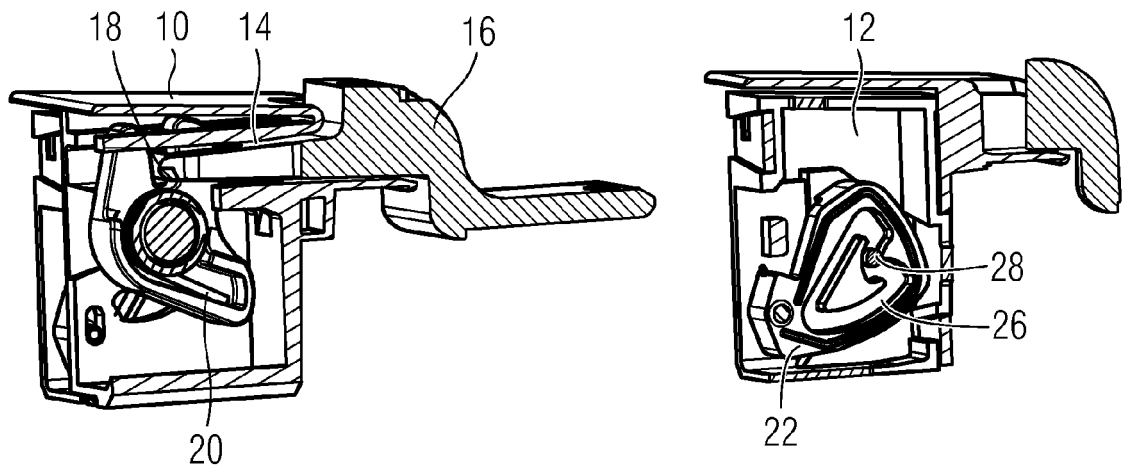


FIG 12

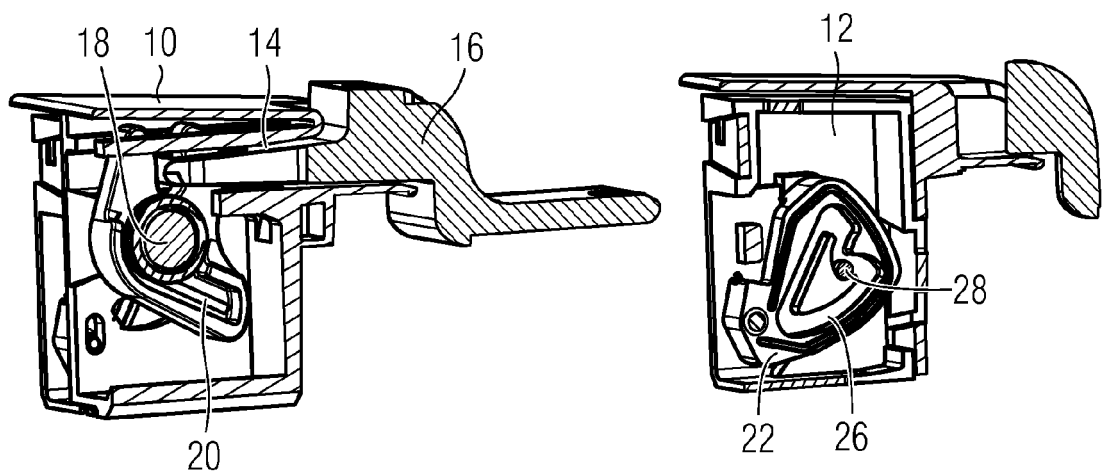


FIG 13

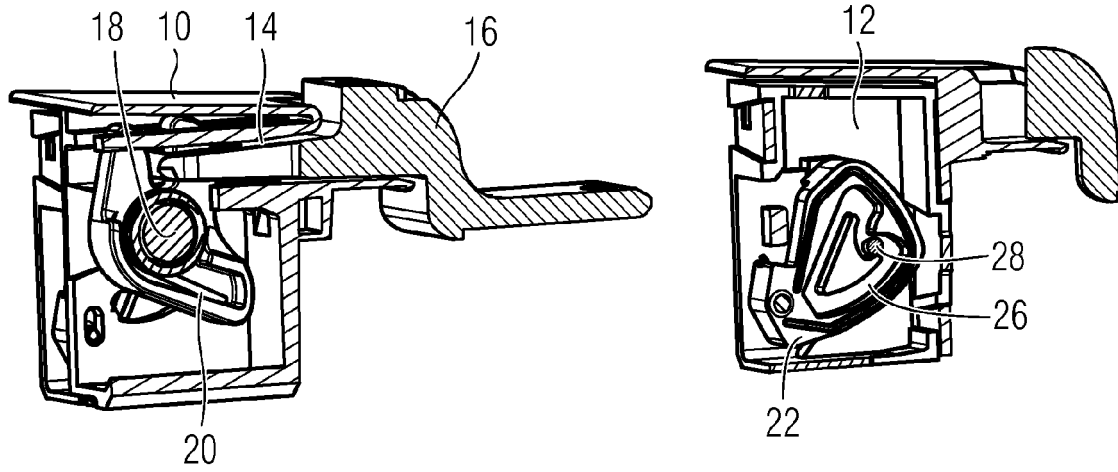


FIG 14

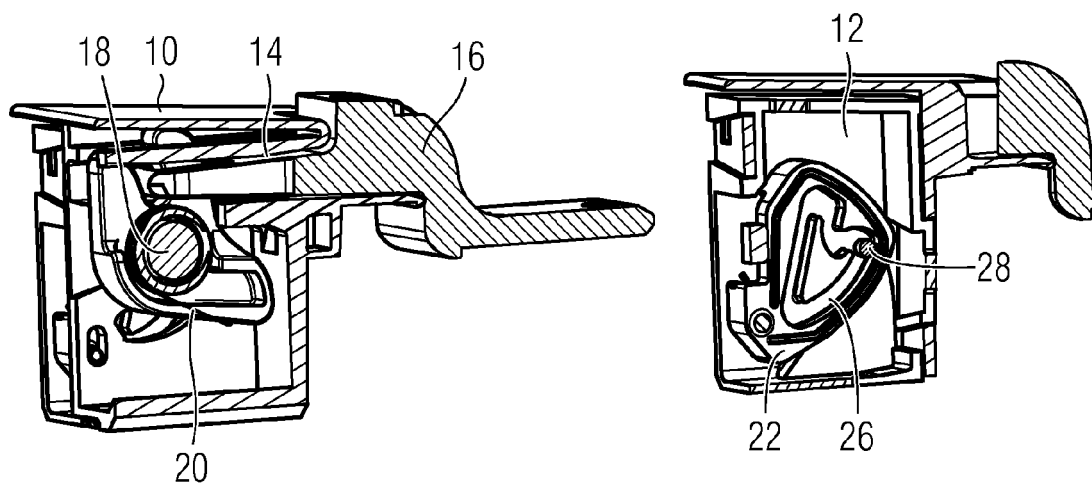


FIG 15

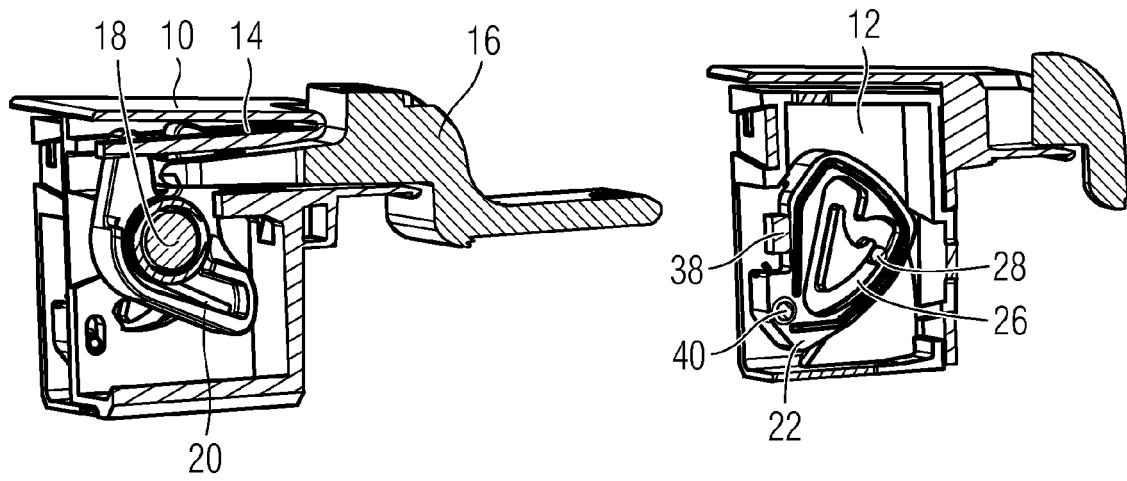


FIG 16

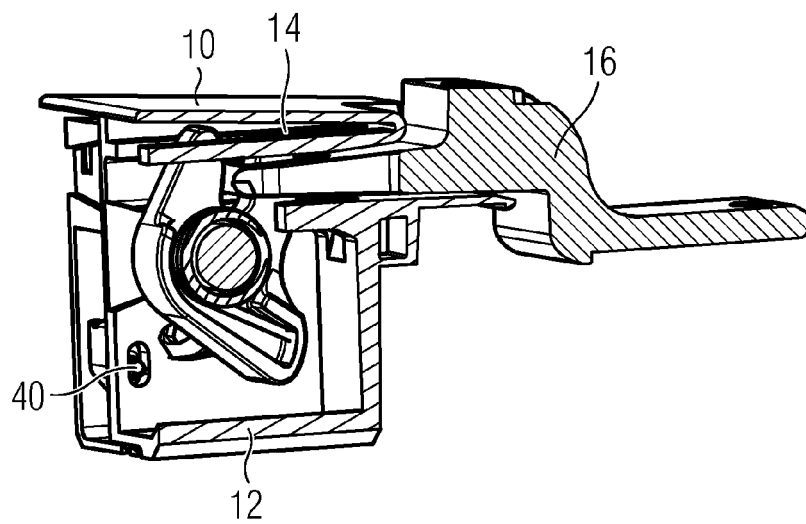


FIG 17

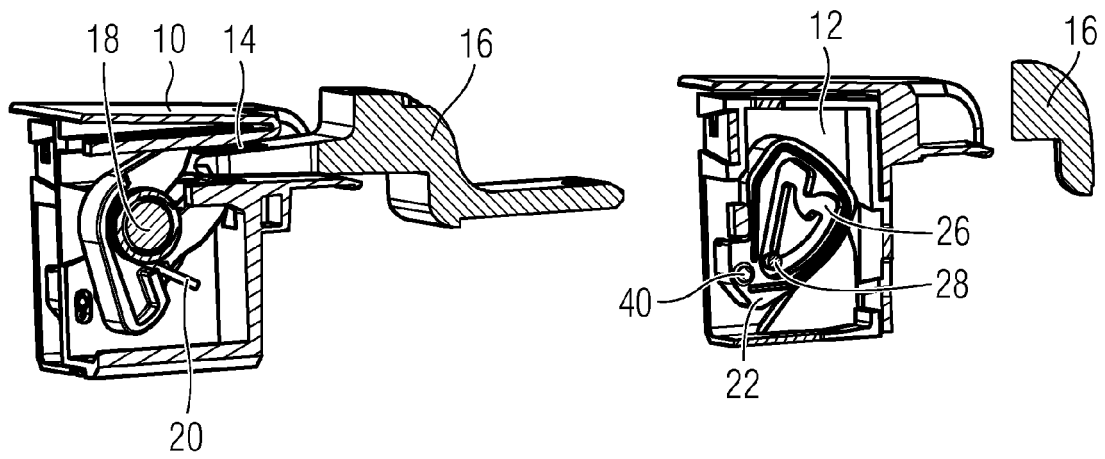


FIG 18

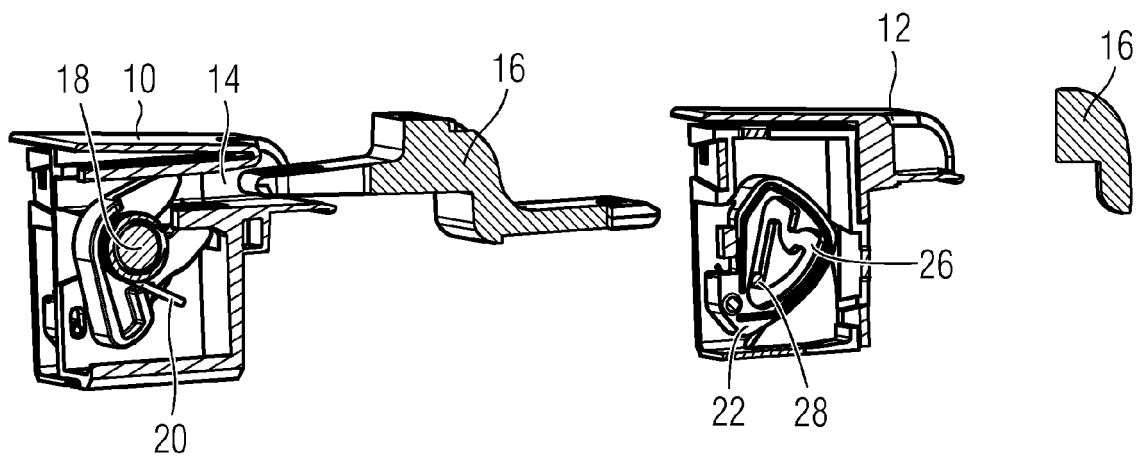
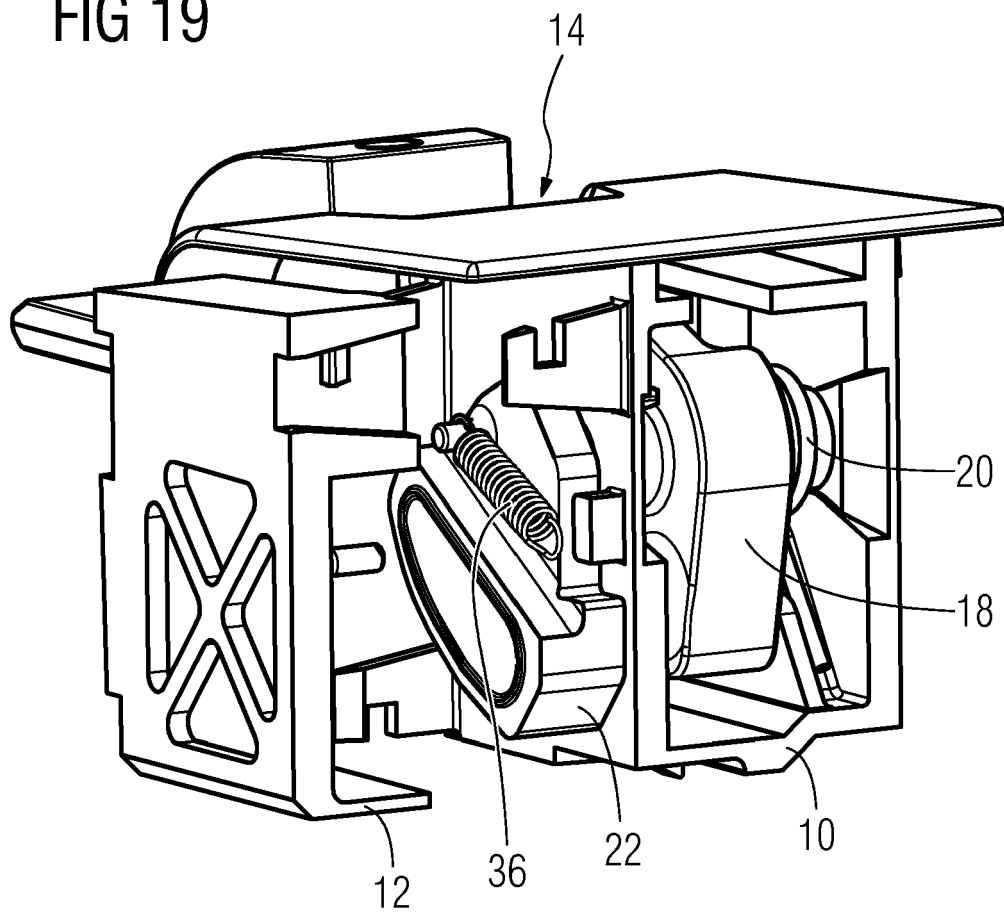


FIG 19





EUROPEAN SEARCH REPORT

Application Number
EP 13 18 0805

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2010/056062 A2 (P K TECH SYSTEM CO LTD [KR]; CHU YONG-HO [KR]; LEE KYU-TAE [KR]; CHU Y) 20 May 2010 (2010-05-20) * abstract; figures 1-8 *	1-15	INV. E05C19/16 E05C19/02
A,D	WO 2009/116094 A1 (FILIPPI S R L [IT]; FILIPPI FILIPPO [IT]) 24 September 2009 (2009-09-24) * page 6, line 18 - page 7, line 2; figures 1a-2b *	1,2,10, 11,14	
A	EP 1 785 063 A1 (GRASS GMBH [AT]) 16 May 2007 (2007-05-16) * paragraph [0063] - paragraph [0065]; figures 1-11 *	1,2,4,6, 8,11,14	
A	DE 20 2011 104824 U1 (GRASS GMBH [AT]) 26 November 2012 (2012-11-26) * paragraphs [0032], [0037], [0039] *	1,14	
A	US 4 792 165 A (NISHIMURA TAMOTSU [JP]) 20 December 1988 (1988-12-20) * abstract; figures 1-12(D) *	1,2,10, 14,15	TECHNICAL FIELDS SEARCHED (IPC) E05C A47B
A	DE 20 2011 105059 U1 (KIEKERT AG [DE]) 3 December 2012 (2012-12-03) * paragraph [0031] - paragraph [0036]; figures 1-3F *	1,2,11, 12,14	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 4 March 2014	Examiner Pérez Méndez, José F
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 18 0805

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-03-2014

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010056062 A2	20-05-2010	KR 20100055032 A WO 2010056062 A2	26-05-2010 20-05-2010
-----	-----	-----	-----
WO 2009116094 A1	24-09-2009	NONE	
-----	-----	-----	-----
EP 1785063 A1	16-05-2007	AT 548940 T DE 202006020236 U1 EP 1785063 A1 US 2007103041 A1	15-03-2012 07-02-2008 16-05-2007 10-05-2007
-----	-----	-----	-----
DE 202011104824 U1	26-11-2012	DE 102012016280 A1 DE 202011104824 U1	28-02-2013 26-11-2012
-----	-----	-----	-----
US 4792165 A	20-12-1988	NONE	
-----	-----	-----	-----
DE 202011105059 U1	03-12-2012	NONE	
-----	-----	-----	-----

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2011132213 A1 [0003]
- WO 2009116094 A1 [0004]
- DE 19825324 A1 [0005]