



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**17.01.2024 Bulletin 2024/03**

(21) Application number: **23184702.1**

(22) Date of filing: **11.07.2023**

(51) International Patent Classification (IPC):  
**E05D 3/02** (2006.01) **A47L 15/42** (2006.01)  
**E05D 11/00** (2006.01) **E05D 15/58** (2006.01)  
**E05F 1/12** (2006.01) **F25D 23/02** (2006.01)

(52) Cooperative Patent Classification (CPC):  
**E05D 3/02; A47L 15/4265; E05D 11/00;**  
**E05D 15/58; E05F 1/1276; F25D 23/028;**  
**E05D 3/18; E05Y 2201/624; E05Y 2800/10;**  
**E05Y 2800/296; E05Y 2900/302; E05Y 2900/304**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB**  
**GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL**  
**NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA**  
Designated Validation States:  
**KH MA MD TN**

(30) Priority: **12.07.2022 IT 202200014662**

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(54) **HINGE DEVICE FOR MOVING A DECORATIVE PANEL**

(57) A hinge device for moving a decorative panel (P) comprises a first member (3) assigned to be fixed to the frame or body of an appliance and hinged to by means of a hinge pin (7) to a second member (5) assigned to be fixed to a door of the same appliance.

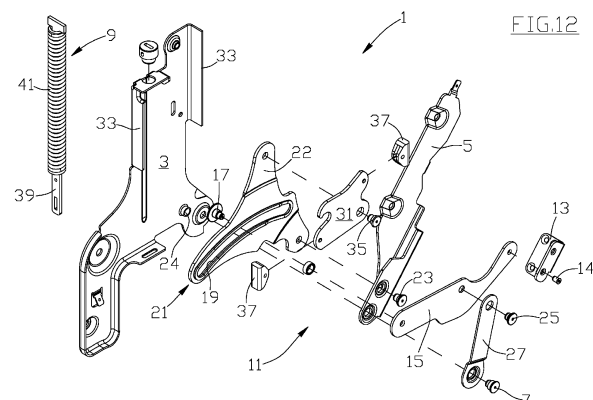
The elastic member (9) is connected to the first member (3) and interacts between the latter and the second member (5) by means of transmission elements (11) to impart a closing elastic force to the second member (5)

The decorative panel (P) is constrained to slide parallel to the door and perpendicularly to the hinge pin (7) by interconnection constraint members. The device (1) comprises a joint member (13) for the decorative panel (P) for moving it along the constraint members.

Such joint member (13) is hinged by means of a first pin (14) to a first end of a rocker element (15) whose opposite end bears a sliding pin (17) movable in a shaped slot (19) fixed to, or made in, a connection member (21) of the transmission elements (11) and pivoted, by means of a second pin (23), to the second member (5) in a separate point from the hinge pin (7).

The connection member (21) is connected to the elastic member (9) by means of a connection element (35) of the transmission elements (11). The median portion of the rocker element (15) is pivoted by means of a third pin (25) to a first end of an arm element (27) whose opposite second end is rotatably engaged to the hinge

pin (7).



**Description**TECHNICAL FIELD

**[0001]** The present invention relates to the technical field concerning hinges for built-in household appliances, such as dishwashers, ovens and the like, and for and furniture, in particular it relates to a hinge device for moving a decorative panel.

BACKGROUND ART

**[0002]** There are known hinges assigned to constrain a door of a household appliance or piece of furniture to a respective body, making it possible to move the door between a closed condition, in which the door blocks an opening in the body of the household appliance, and a fully open condition, in which the door is rotated almost perpendicular to the opening, leaving it free. Such known hinges are provided with a first member, connected to the body, and with a second member, hinged to the first member in correspondence with a hinge pin and connected to the door; an elastic element acts between the first and second member with an elastic closing force of the hinge. Such known hinges also comprise a system for attaching and translating a decorative panel which covers and masks the appliance door; the attachment and translation system acts in such a way that, in the passage from the closed condition to that of maximum opening and vice versa, the decorative panel fixed thereto is translated parallel to the surface of the door, respectively away from the hinge pin and vice versa.

**[0003]** A drawback of these known hinge devices consists in the fact that the attachment and translation system of the decorative panel consists of a large number of interconnected components, and is therefore extremely susceptible to malfunctions, wear and tear, furthermore the operations for its assembly require particular care and often unacceptably long times.

**[0004]** Another drawback of the known devices consists in the fact that they comprise a large number of straight or curved guides, for example slots with pins or carriages sliding therein, which can cause annoying and intense noises during the opening and closing of the hinge.

DISCLOSURE OF THE INVENTION

**[0005]** An object of the present invention is to propose a hinge device for moving a decorative panel that is simple and easy to assemble and install.

**[0006]** Another object of the present invention is to propose a device which has a minimum number of sliding guides and whose opening and closing actuation is therefore extremely silent.

BRIEF DESCRIPTION OF DRAWINGS

**[0007]** The characteristics of the invention are highlighted below with particular reference to the accompanying drawings in which:

- figure 1 shows a front view of the hinge device for moving a decorative panel object of the present invention, in its closed condition;
- figure 2 shows a left side view of the device of figure 1;
- figure 3 shows a rear view of the device of figure 1;
- figure 4 shows a right side view of the device of figure 1;
- figure 5 shows an axonometric view of the device of figure 1, in its partially open condition;
- figures 6-8 show respective left side, schematic and partial views of an opening sequence of the device of figure 1;
- figures 9-11 show respective right side, schematic and partial views of the opening sequence of the device of figure 1 shown in figures 6-8;
- figure 12 shows an exploded axonometric view of the device of figure 1;
- figures 13a and 13b respectively show a left side view of the device of figure 1 applied to a household appliance with decorative panel and in its closed condition, and a related partial enlarged view;
- figures 13a, 14a, 15a, 16a show respective left side views of an opening sequence of the device of figure 1 applied to a household appliance with decorative panel;
- figures 13b, 14b, 15b, 16b show respective partial and enlarged views of the opening sequence of the device of figure 1 shown in figures 13a, 14a, 15a, 16a;
- figure 17 shows an enlarged partial view of the device of figure 16a;
- figure 18 shows an enlarged partial view of the device of figure 17a.

BEST MODE TO CARRY OUT THE INVENTION

**[0008]** With reference to figures 1-18, numeral 1 indicates the hinge device for moving a decorative panel P object of the present invention.

**[0009]** Device 1 comprises at least:

- a first member 3 and a second member 5;
- an elastic member 9;
- a joint member 13 assigned to be fixed to the decorative panel P with screws, glue, interlock and/or similar means;
- transmission elements 11, comprising at least one connection member 21 and a connection element 35;
- an elongated, almost straight or shaped, rocker element 15;

- a connection member 21;
- an arm element 27.

**[0010]** The first member 3 and the second member 5 are pivoted to each other by means of a hinge pin 7 co-axial with the fulcrum or with the hinge axis of the device 1 itself.

**[0011]** The first member 3 is assigned to be fixed to the frame, or structure, or body of a household appliance, for example an oven or a dishwasher, while the second member 5 is assigned to be fixed to a door of the same household appliance to hinge the door to the frame; for example, the first member 3 and the second member 5 are fixed on an external side of the frame and of the door, respectively.

**[0012]** The device 1 can also be applied and used as a hinge for furniture, household appliance and the like, provided they are equipped with a frame and at least one door.

**[0013]** The first member 3 and the second member 5 can therefore rotate with respect to each other around the hinge axis between a closed condition C of the device 1, in which the door of the household appliance blocks an opening of an internal volume of the appliance itself lying almost parallel to the plane defined by the edge of the opening, and a maximum opening condition A of the device 1, in which the door forms a maximum opening angle with such plane, for example an angle of approximately 90°. The joint member 13, during the rotation of the device 1 between said closed C and maximum opening A conditions, is assigned to move the decorative panel P which is constrained to translate parallel to the door of the appliance as better specified below.

**[0014]** The elastic member 9 interacts, by means of the transmission elements 11, between the first member 3 and the second member 5 to impart to the latter, and therefore to the door of the appliance, an elastic closing force.

**[0015]** In each assembled condition of the device, or at least in an operating condition in which the device, the household appliance and the decorative panel are mutually connected, a first end of the rocker element 15 is pivoted, by means of a first pin 14, to the joint member 13; the second and opposite end of the rocker element 15 bears a sliding pin 17. The median portion of the rocker element 15, located between the two ends thereof, is pivoted by means of a third pin 25 to a first end of an arm element 27 rotatable along a geometric arc of circumference centered in the hinge pin 7, being the opposite second end of the arm element 27 itself rotatably engaged or pivoted to the hinge pin 7.

**[0016]** The sliding pin 17 is mobile and slidably constrained in a shaped slot 19 which is obtained in the connection member 21 through the thickness of the latter, or which is fixed on the surface of the latter.

**[0017]** The sliding pin 17 is preferably provided with a rolling means, for example a bushing or a bearing, and the edges of the shaped slot 19 are provided with an

edge protruding perpendicularly to the main face of the connection member 21 to facilitate the movement of the rolling means in the shaped slot itself.

**[0018]** The sliding pin 17 can optionally be provided with a roller or a coating which facilitates its sliding along the respective shaped slot 19, or on the contrary which hinders and slows down its sliding, thus acting as a damper for the device 1.

**[0019]** The connection member 21 has a connection element 35 by means of which it is directly or indirectly connected to the elastic member 9, and is also pivoted to the second member 5 by means of a second pin 23 at a point separate from the hinge pin 7, that is the second pin 23 and the hinge pin 7 have parallel but not coincident axes.

**[0020]** In particular, the distance between the hinge pin 7 and the second pin 23 which connects the second member 5 and the connection member 21 is preferably less than the distance between such hinge pin 7 and the third pin 25 which connects the rocker element 15 and the arm element 27. Both the second pin 23 and the third pin 25 are constrained to travel along respective circular trajectories centered in the hinge pin 7 and perpendicular to the hinge axis.

**[0021]** The connection member 21 is an almost flat slab or plate shaped in such a way that its shape preferably has angles approximately defined by one end of the shaped slot 19, by the second pin 23 and by the connection element 35.

**[0022]** Preferably the device 1 also comprises a guide element 31 sliding along walls 33 of the first member 3 parallel to the straight action line R of the elastic member 9. The guide element 31 is transversally constrained between the walls 33 and slides longitudinally between them between a minimum position, in which it is located near one end of the first member 3 and at the maximum distance from the hinge pin 7, and a maximum position, in which it is at the minimum distance from the hinge pin 7. Such guide element 31 has opposite portions which are respectively fixed to the elastic member 9 and, by means of the connection element 35, to the connection member 21 at a connection portion 22 of the latter.

**[0023]** The connection member 21 is therefore connected to the elastic member 9 by means of the guide element 31. The connection portion 22 constitutes a vertex of the connection member 21 opposite the vertex of the second pin 23 with respect to a straight line which joins the ends of the shaped slot 19.

**[0024]** The guide element 31 has two further opposite portions for the sliding abutment of the walls 33 by means of respective skids 37 fixed to such portions. The walls 33 protrude almost perpendicularly from the main development surface of the first member 3 and constitute a track for the sliding of the guide element 31.

**[0025]** The elastic member 9 is preferably a spring 41 of the helical type having one end blocked to the first member 3. Such spring 41 operates in compression and is provided with an internal spring guide 39, which has

one end constrained to the spring 41, and is hooked at the other end to the respective portion of the guide element 31. Alternatively, the elastic member 9 can consist for example of a gas spring, comprising a cylinder blocked to the first member 3 and within which a piston slides externally hooked to the guide element 31.

**[0026]** The coupling between the spring guide 39 and the guide element 31 is achieved for example by coupling a tooth, hook or shaped hook of the guide element 31 with a slotted abutment obtained in the corresponding end of the spring guide 39.

**[0027]** Between the closed C and maximum opening A conditions, this last end of the spring guide 39 is movable along the action line R between the walls 33, this movement being guided by the guide element 31. The first member 3 preferably has a stop pin 24 of the connection member 21, fixed in the proximity of the hinge pin 7 and which, in the maximum opening condition A, is assigned to abut against the edge of the connection member 21 opposite the connection portion 22 of this, possibly in correspondence with a recess formed in such edge, to stop the movement of the connection member 21 itself and, consequently, to limit the movement of the guide element 31 along the action line R.

**[0028]** Alternatively, the guide element 31 is hooked directly to one end of a spring 41 operating in traction and fixed at the opposite end to a suitable grip extension of the first member 3. The connection element 35 is for example a connection pin fixed between the connection member 21 and the portion of the guide element 31 opposite the portion thereof connected to the spring 41 or to the spring guide 39. Alternatively, and especially in the event that the guide element 31 is omitted, the connection element 35 consists for example of a tooth, hook or other abutment made or fixed along an edge of the connection member 21 for direct hooking to the respective end of the spring 41 or the spring guide 39.

**[0029]** The straight line joining the ends of the shaped slot 19 forms, with the straight line joining the second pin 23 and the connection element 35, an angle between 40°-120°, preferably between 65°-80°.

**[0030]** Preferably, such shaped slot 19 is approximately shaped as an arch of circumference with concavity facing the hinge pin 7 and with the corresponding convexity facing in the opposite direction towards the connection element 35, that is towards the connection portion 22.

**[0031]** The decorative panel P is connected to the respective door of the appliance by means of sliding connection members of known type, for example guide and slide, or rail and carriage, or slot and pin. Each side portion of the decorative panel P and not far from its P bottom edge 44 in the closed condition, is connected to the joint member 13 of the corresponding hinge device 1 of the door. Each constraint member is parallel to the external surface of the door and perpendicular to the hinge axis of the device 1, and therefore constrains the decorative panel P to slide parallel to the door and perpendicular to

the hinge pin 7 and the devices, or at least one of them, operates the decorative panel along such sliding direction.

**[0032]** The mutual position, the dimensional ratios, the relationships and the connection of the second member 5, of the rocker element 15, of the connection member 21 and of the arm element 27, in agreement with the shape and with the orientation and course of the shaped slot 19, transmit to the joint member 13 the translational force of the decorative panel along the trajectory parallel to the door and perpendicular to the hinge axis of the device 1 determined by the sliding constraint members which interconnect the panel to the door of the household appliance.

**[0033]** When the device 1 is actuated towards its maximum opening condition A, that is during the opening of the appliance door, the joint member 13 moves away from the hinge pin 7, while when the device 1 is actuated in the opposite direction towards its closed condition C, that is during the closing of the door, the joint member 13 approaches the hinge pin 7.

**[0034]** The first pin 14 can be of the fixed type and blocked to the rocker element 15 and to the joint member 13 during production or, preferably, it can be of the plug-gable type and applicable manually (with the fingers or with a manual tool) to the respective seats formed in the rocker element 15 and in the joint member 13. The first pin 14 of the manually applicable type facilitates the installation operations of the panel: it is in fact possible to fix or screw to the hidden face of the latter P, for example, with the aid of a template, the joint members 13 of the hinge devices of the door, constrain the latter to the panel by means of the constraint members and only at this point connect the joint members 13 to the respective rocker elements 15 by manually inserting the first pins 14. Obviously, in this case, the first pins are provided with means which prevent them from slipping out from their respective seats.

**[0035]** It is also provided that in some particular embodiments of the device 1 for specific applications, the first pin 14 or the end of the rocker element 15 which bears the first pin are constrained by a slot, a guide or the like, to slide along the second member 5 parallel to the constraint members where present.

**[0036]** The operation of the device 1 applied to a household appliance equipped with a decorative panel P provides that, starting from the closed condition C, a user of the household appliance applies an opening force to the opening edge 45 of the decorative panel P itself and/or to the door of the appliance. In the closed condition C:

- the joint member 13 is at the minimum distance from the hinge axis;
- the arm element 27 is oriented at its own minimum angle with respect to the action line R and points towards the body of the appliance;
- the line passing by the ends of the shaped slot 19 is

oriented at a minimum angle of inclination of the shaped slot 19, for example of about 90°, with respect to the action line R;

- the hinge angle, having vertex in the hinge pin 7 and having as sides the door and the plane defined by the edge of the opening of the appliance, is null;
- the guide element 31 is in its minimum position, close to the spring 41;
- the elastic force of the spring 41 is minimal.

**[0037]** As the opening movement of the door proceeds, the hinge angle increases, the second pin 23 rotates around the hinge pin 7 pulling the respective vertex of the connection member 21, which in turn pulls the guide element 31 by means of the connection element 35 along the walls 33, with the elastic member 9 increasing the elastic force provided. The combination of the motions of the second pin 23 and of the connection element 35 produces a roto-translation of the connection member 21 and an increase in the inclination angle of the shaped slot 19. The roto-translation of the shaped slot 19 itself sets the sliding pin 17 in motion together with the respective end of the rocker element 15 connected to it 17. The third pin 25 acts as a fulcrum, movable along a circumference arc determined by the arm element 27, for the rocker element 15. The end, carrying the joint member 13, of the rocker element 15 of each device cooperates with the constraint members in imposing predetermined motion and trajectory on the joint member 13 itself. The constraint members establish the trajectory that is the direction of translation of the decorative panel P along the respective door and the device determines the motion of the panel along such trajectory. At the opening of the door, said trajectory of the joint member 13 has an angular component which follows the course of the hinge angle and a radial component which is a function of the angular component, being predetermined and imposed by the shape and mutual constraints of the transmission elements 11.

**[0038]** Such chain of movements continues as long as the user applies the opening force to the door of the appliance, until the device 1 reaches the maximum opening condition A in which:

- the joint member 13 is at the maximum distance from the hinge axis;
- the arm element 27 is oriented at its own maximum angle and points externally to the body of the household appliance;
- the shaped slot 19 is oriented at a maximum angle of inclination with respect to the action line R;
- the hinge angle is maximum, corresponding to the maximum opening angle of approximately 90°;
- the guide element 31 is in its maximum position, at the maximum distance from the spring 41;
- the elastic force of the spring 41 is maximum.

**[0039]** In the maximum opening condition A, the appli-

ance door remains blocked on the second member 5, while its decorative panel P, in addition to having changed its own angular orientation together with the door according to the hinge angle, has undergone a variation also in the radial component with respect to the door itself and with respect to the hinge pin 7, from which it moved away.

**[0040]** The closure operation of the device 1, requires the user to apply a closing force to the opening edge 45 of the decorative panel P itself and/or to the door of the appliance, in the opposite direction to the opening force. The interconnected components of the device 1 follow backwards the complex motions already described above for the opening movement of the door of the household appliance.

## Claims

1. Hinge device for moving a decorative panel (P) and comprising a first member (3) hinged to a second member (5) by means of a hinge pin (7) and an elastic member (9); the first member (3) being assigned to be fixed to the frame or body of an appliance and the second member (5) being assigned to be fixed to a door of the same appliance; the elastic member (9) being connected to the first member (3) and interacting between the latter and the second member (5) by means of transmission elements (11) to impart a closing elastic force to the second member (5) where the decorative panel (P) is constrained to slide parallel to the door and perpendicularly to the hinge pin (7) by interconnection constraint members of said door and panel (P); said device (1) being **characterized in that** it comprises a joint member (13) for the decorative panel (P) and assigned to move the latter (P) along the constraint members; at least in one operating condition of the device (1), said joint member (13) is hinged by means of a first pin (14) to a first end of a rocker element (15) whose opposite end bears a sliding pin (17) movable in a shaped slot (19) fixed to, or made in, a connection member (21) of the transmission elements (11); said connection member (21) is pivoted, by means of a second pin (23), to the second member (5) in a separate point from the hinge pin (7); such connection member (21) being connected to the elastic member (9) by means of a connection element (35) of the transmission elements (11); the median portion of the rocker element (15) is pivoted by means of a third pin (25) to a first end of an arm element (27) whose opposite second end is rotatably engaged to the hinge pin (7), where in an installed condition of the device (1) and of the panel (P), the position, the dimensional ratios and the connection of the second member (5), the rocker element (15), the connection member (21) and the arm element (27) and the shape and orientation of the shaped slot (19) in cooperation with the constraint members impose to the joint member (13)

a motion parallel to the door, away from the hinge pin (7) in correspondence with the actuation of the device (1) towards a maximum opening condition (A) thereof, and approaching the hinge pin (7) in correspondence with the actuation of the device (1) towards its closed condition (C).

2. Device according to claim 1 **characterized in that** it comprises a guide element (31) sliding along walls (33) of the first member (3) parallel to the action line (R) of the elastic member (9) and having opposite portions respectively fixed to the elastic member (9) and, by means of the connection element (35), to a connection portion (22) of the connection member (21) opposite to the second pin (23) with respect to a line joining the ends of the shaped slot (19). 10 15
3. Device according to claim 2 **characterized in that** the guide element (31) slidably abuts the walls (33) by means of respective skids (37). 20
4. Device according to claim 2 or 3 **characterized in that** the guide element (31) is hooked to an end of a spring guide (39) of a compressed spring (41) of the elastic element (9) and having an end blocked to the first member (3), or the guide element (31) is hooked to an end of a spring (41) operating in traction the opposite end of which is fixed to an extension of the first member (3). 25 30
5. Device according to any of the preceding claims **characterized in that** the shaped slot (19) has an approximately circular arc shape with concavity facing the hinge pin (7). 35
6. Device according to any of the preceding claims **characterized in that** the line joining the ends of the shaped slot (19) forms, with the line joining the second pin (23) and the connection element (35), an angle comprised between 40° and 120°. 40
7. Device according to any of the preceding claims **characterized in that** the distance between the hinge pin (7) and the second pin (23) is lower than the distance between said hinge pin (7) and the third pin (25). 45
8. Device according to any of the preceding claims **characterized in that** the shape of the connection member (21) is approximately triangular with vertices approximately defined by one end of the shaped slot (19), by the second pin (23) and by the connection element (35). 50
9. Device according to any of the preceding claims **characterized in that** the first pin (14) is of the fixed type or can be inserted manually. 55

10. Device according to any of the preceding claims **characterized in that** the sliding pin (17) is provided with a rolling means and the edges of the shaped slot (19) are provided with a rim to facilitate the motion of the rolling means.

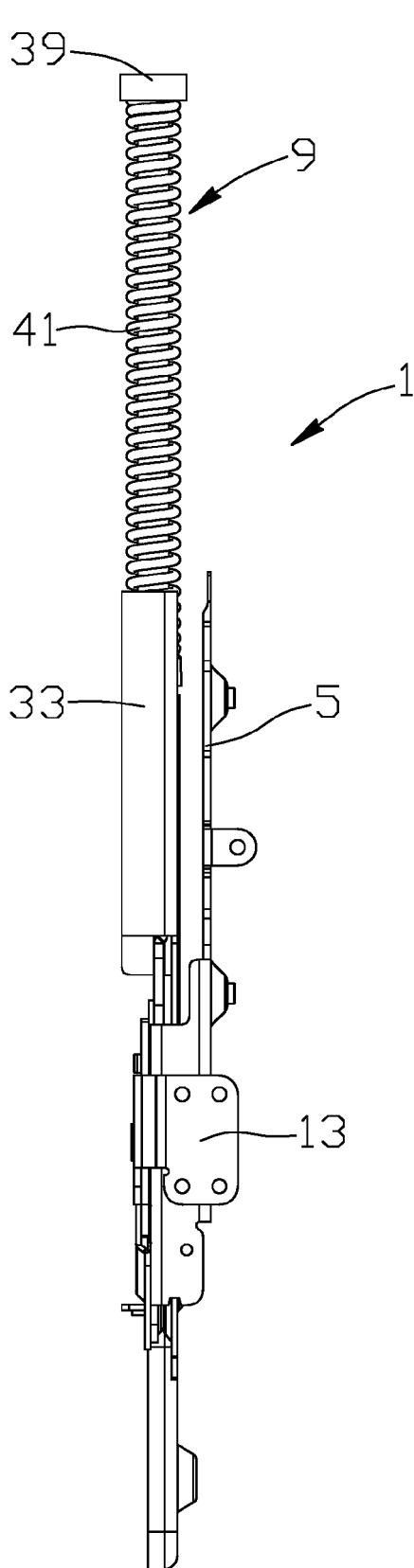


FIG.1

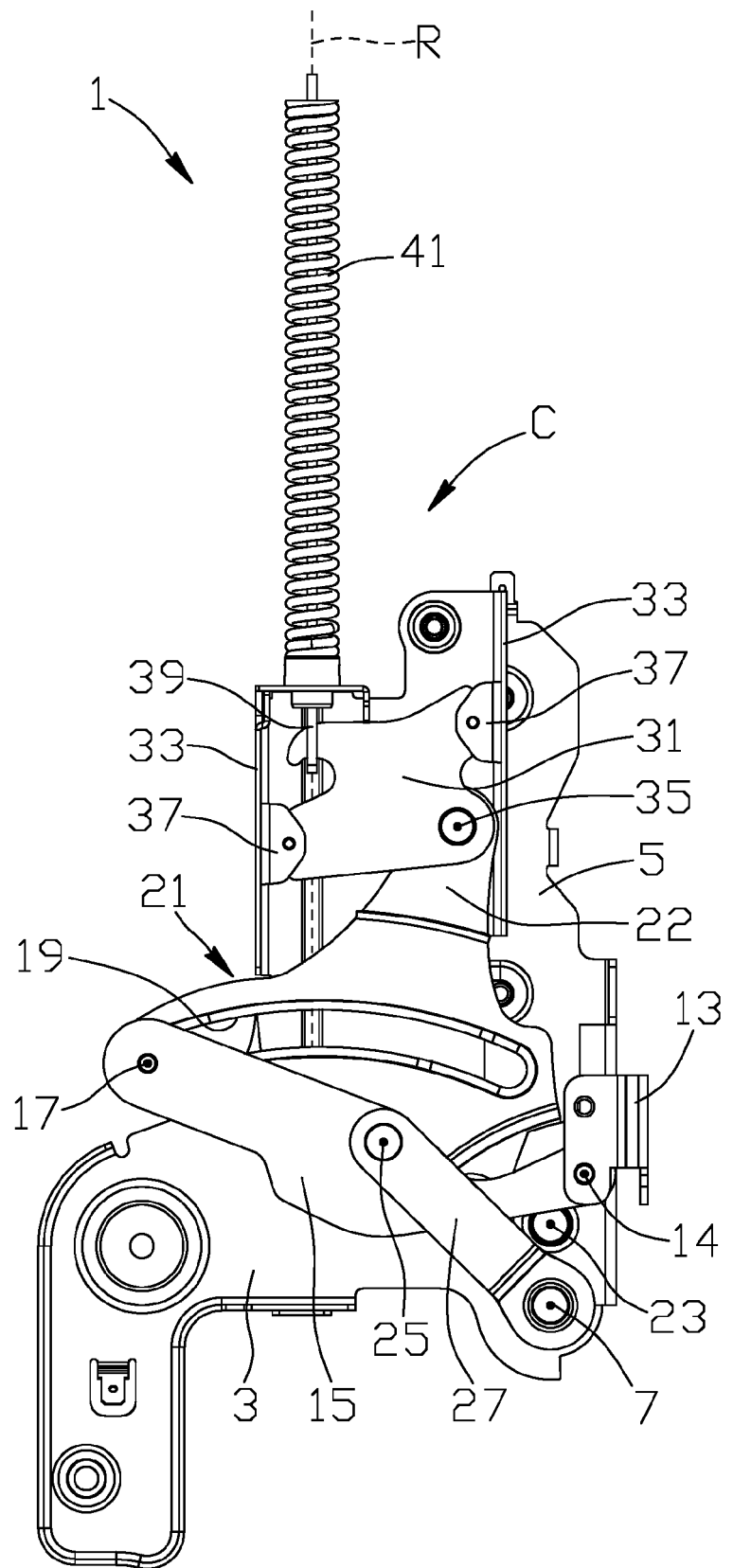


FIG.2

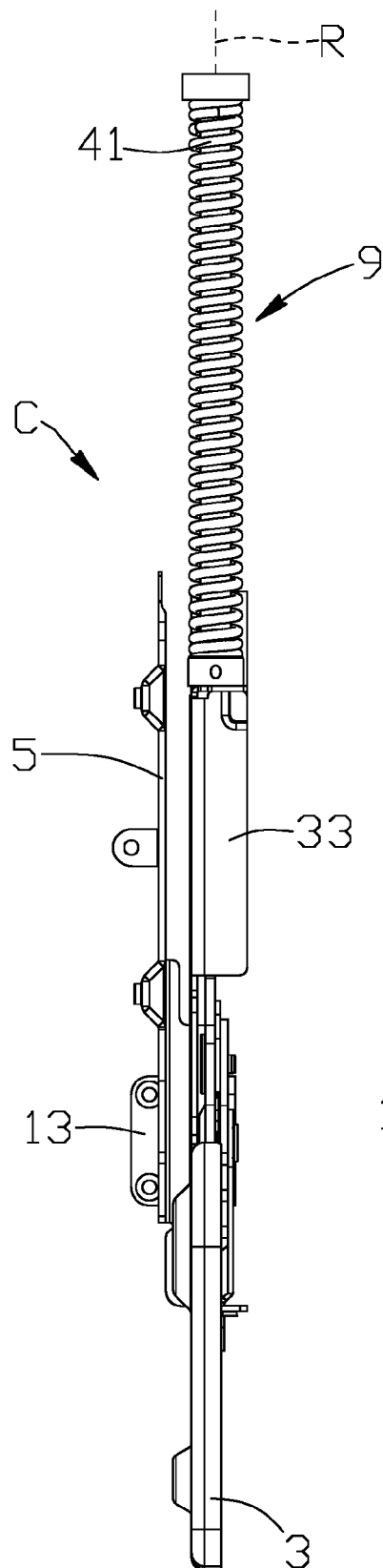


FIG. 3

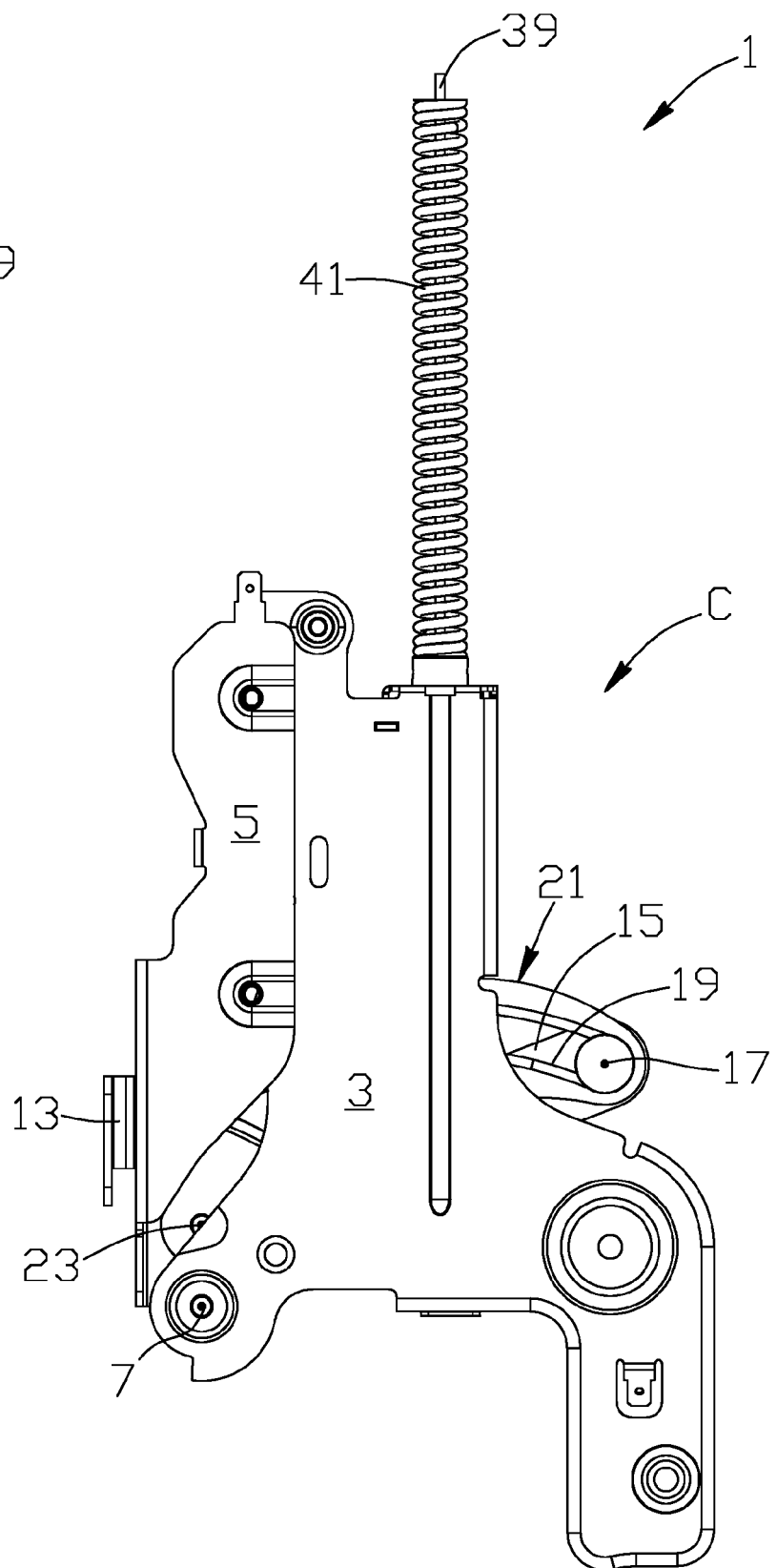


FIG. 4



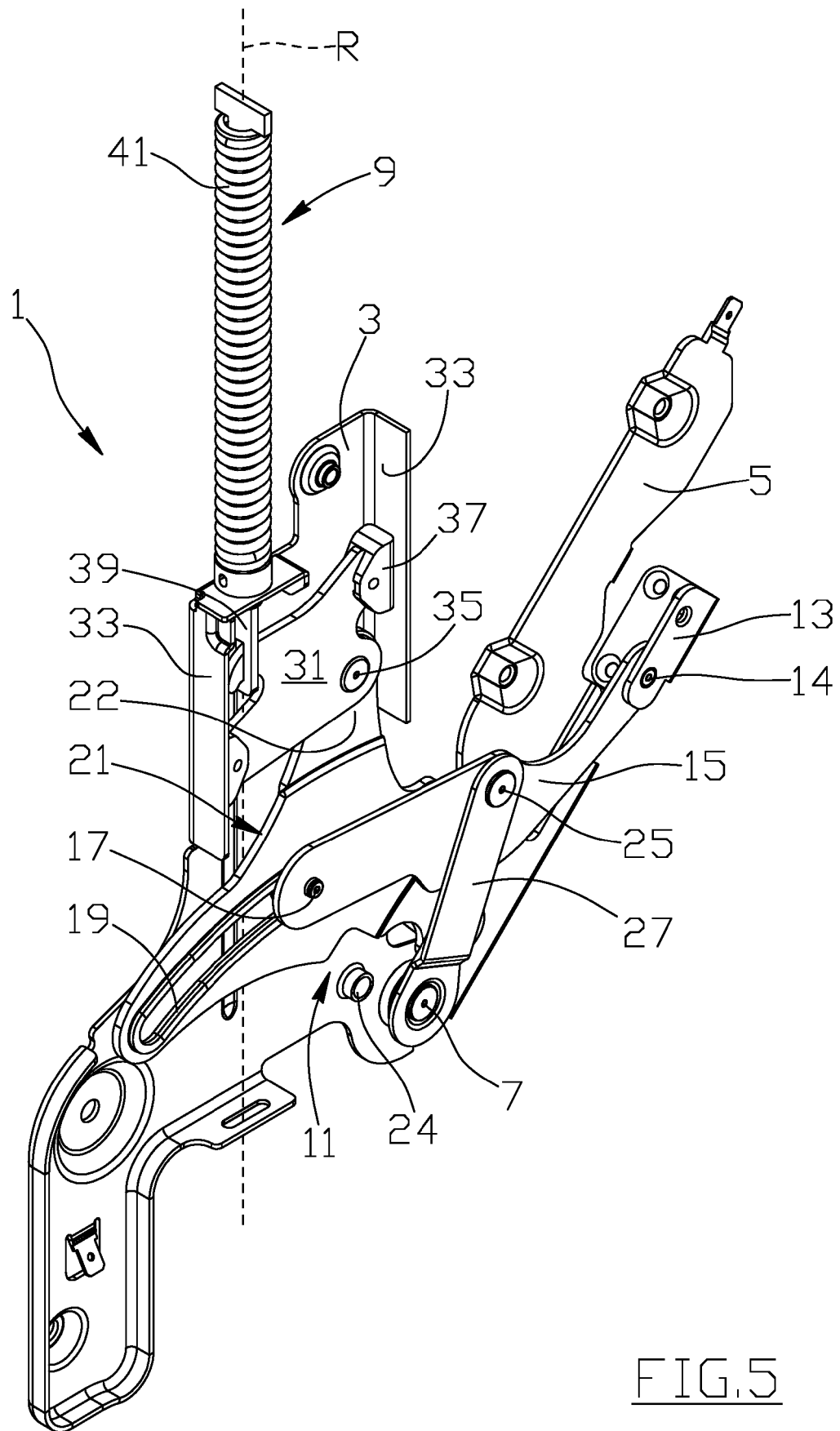


FIG. 5

FIG.6

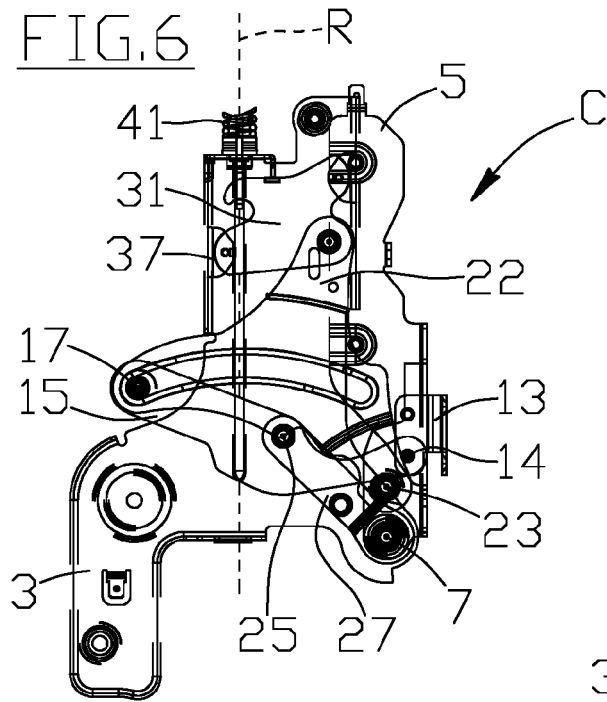


FIG.7

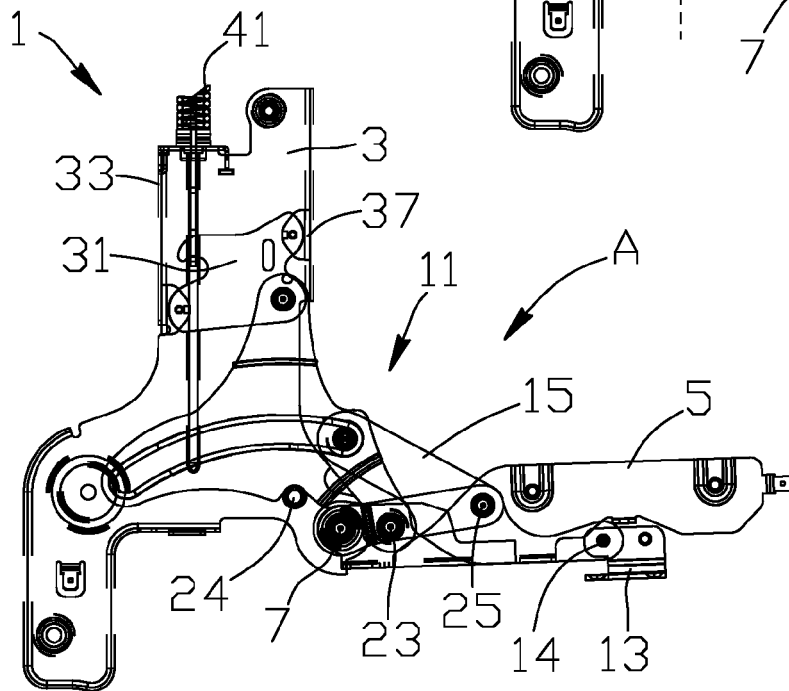
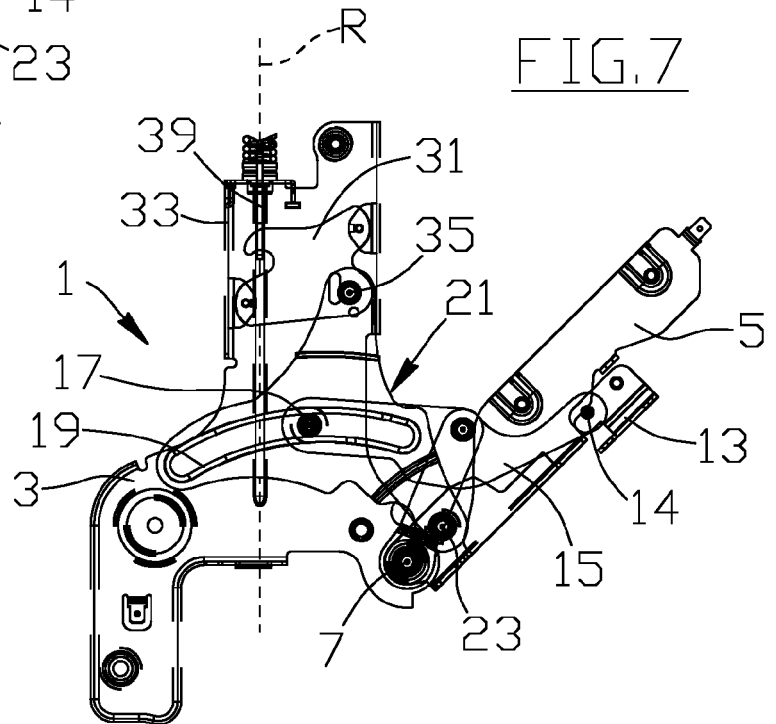


FIG.8

FIG.9

C

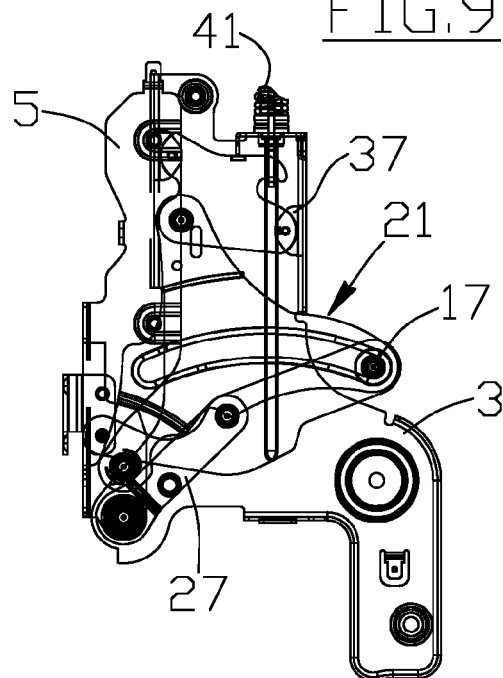
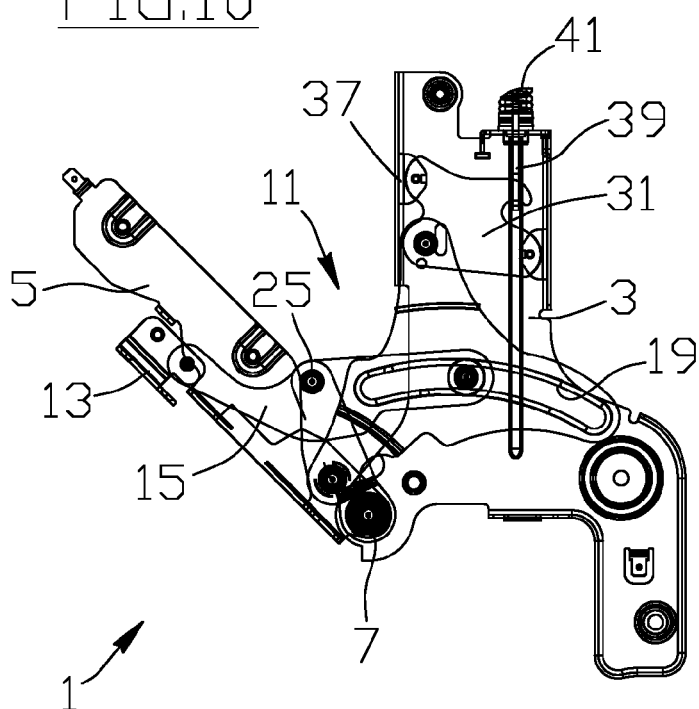


FIG.10



A

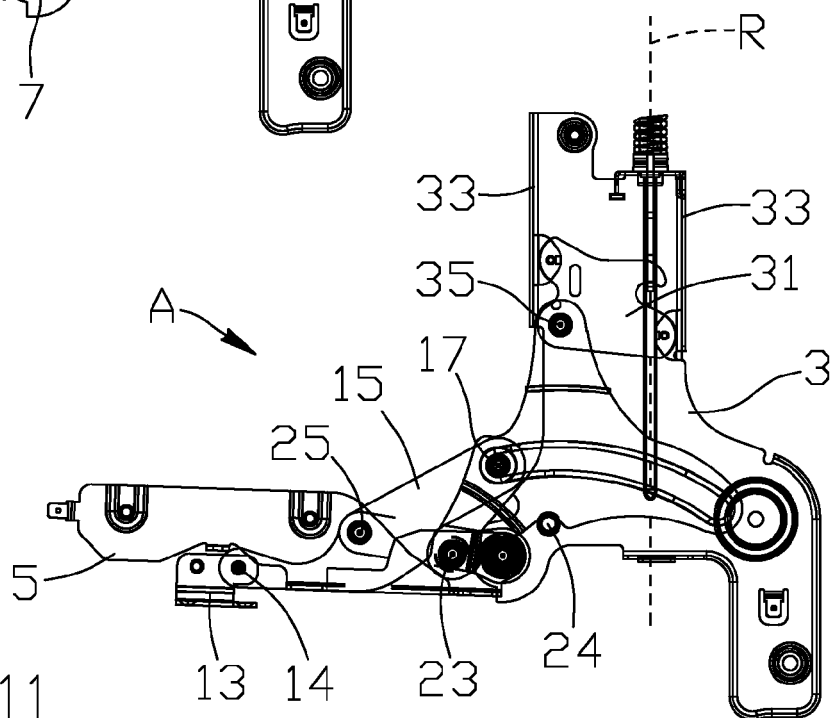


FIG.11

FIG.12

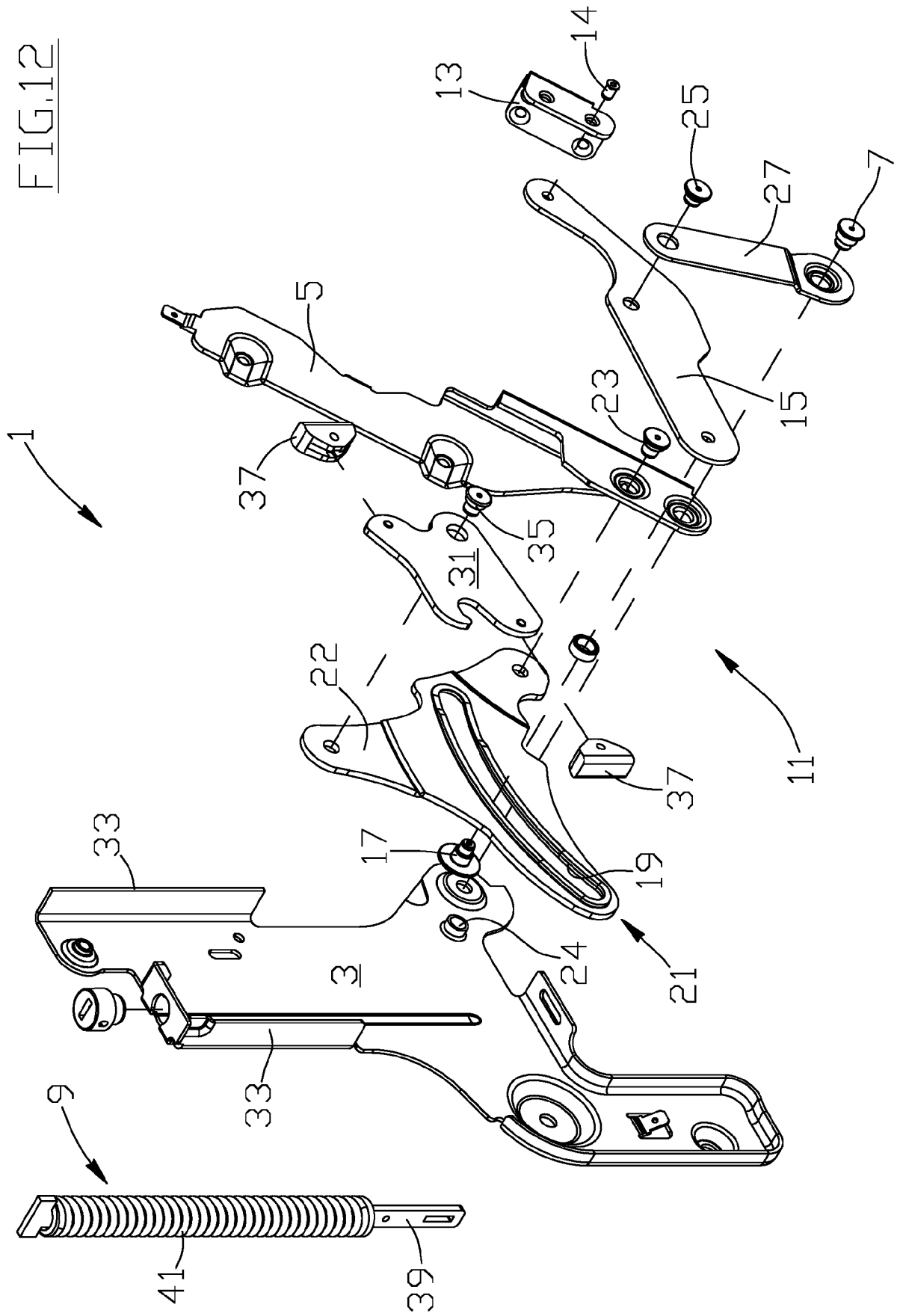


FIG.13a

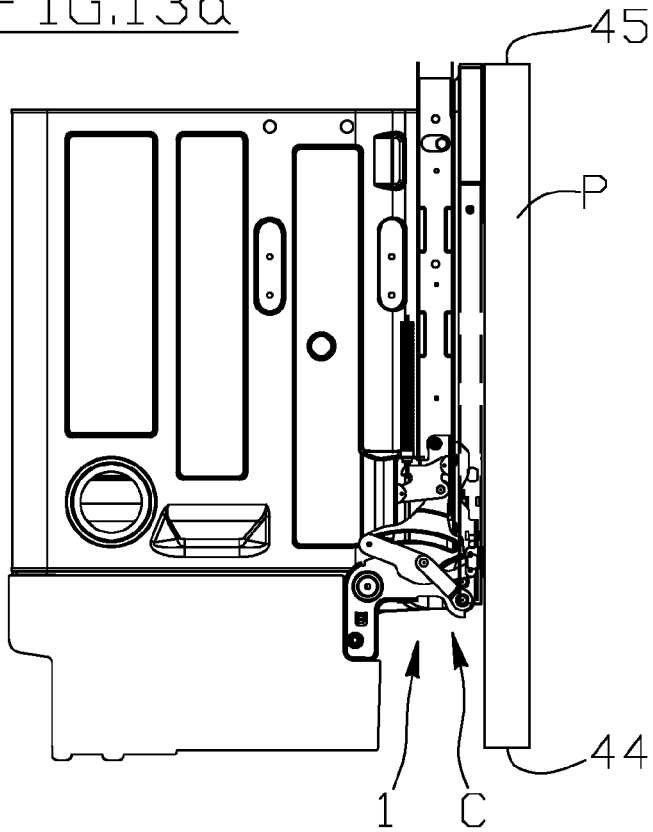


FIG.13b

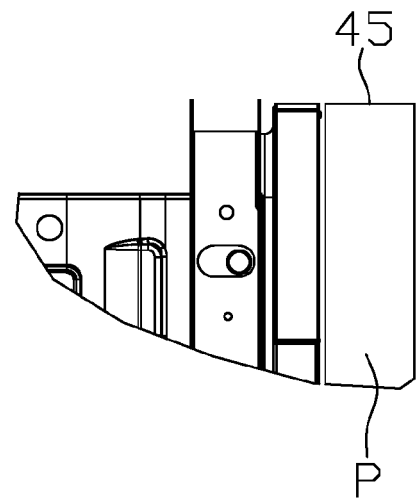


FIG.14a

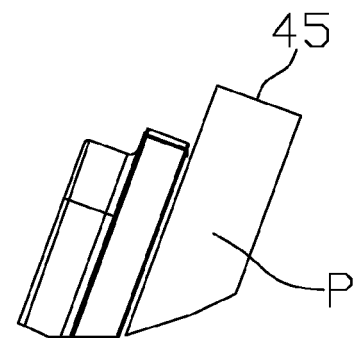
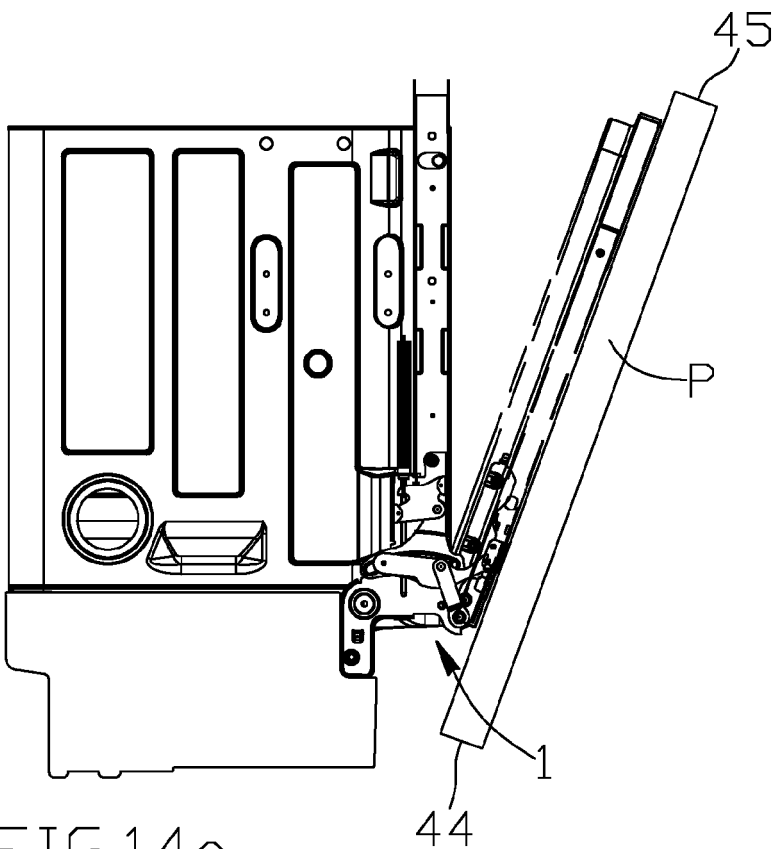


FIG.14b

FIG.15a

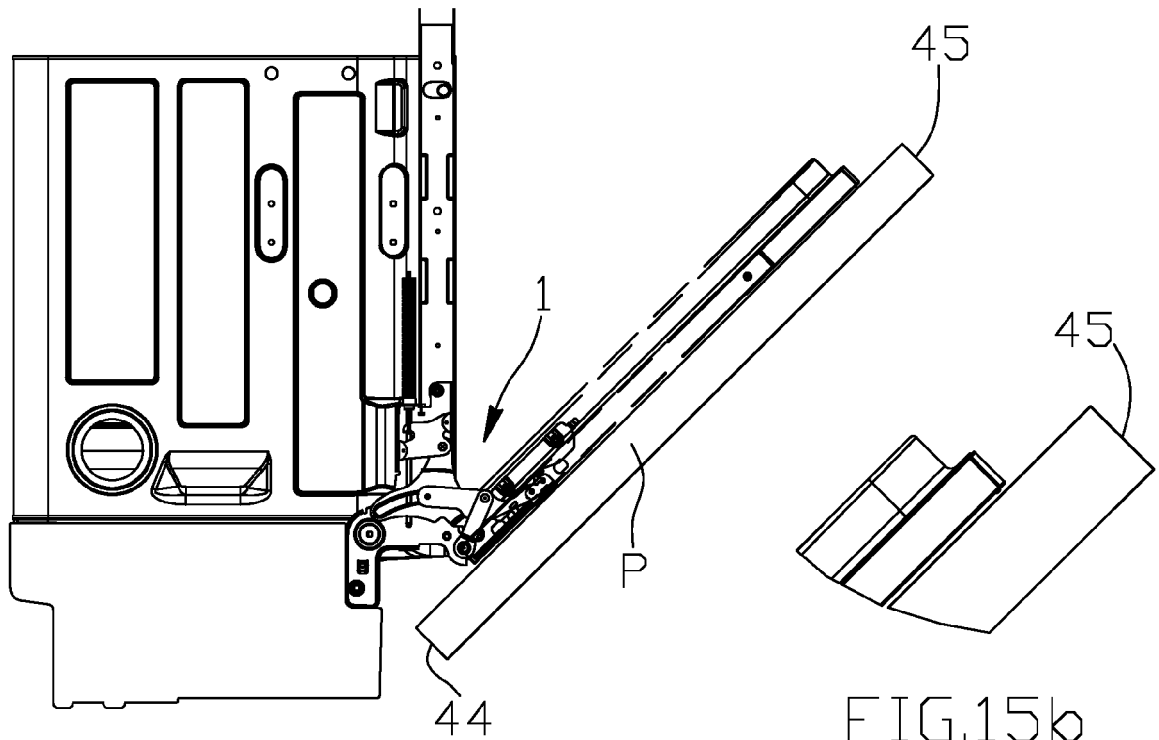


FIG.15b

FIG.16b

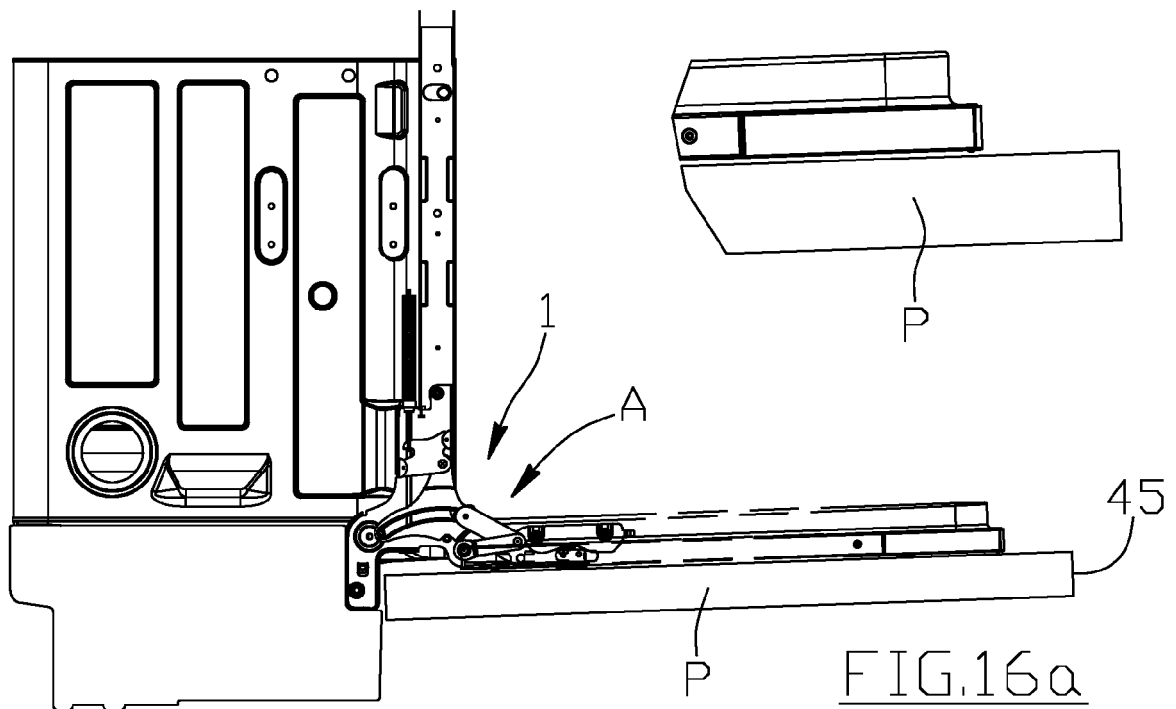
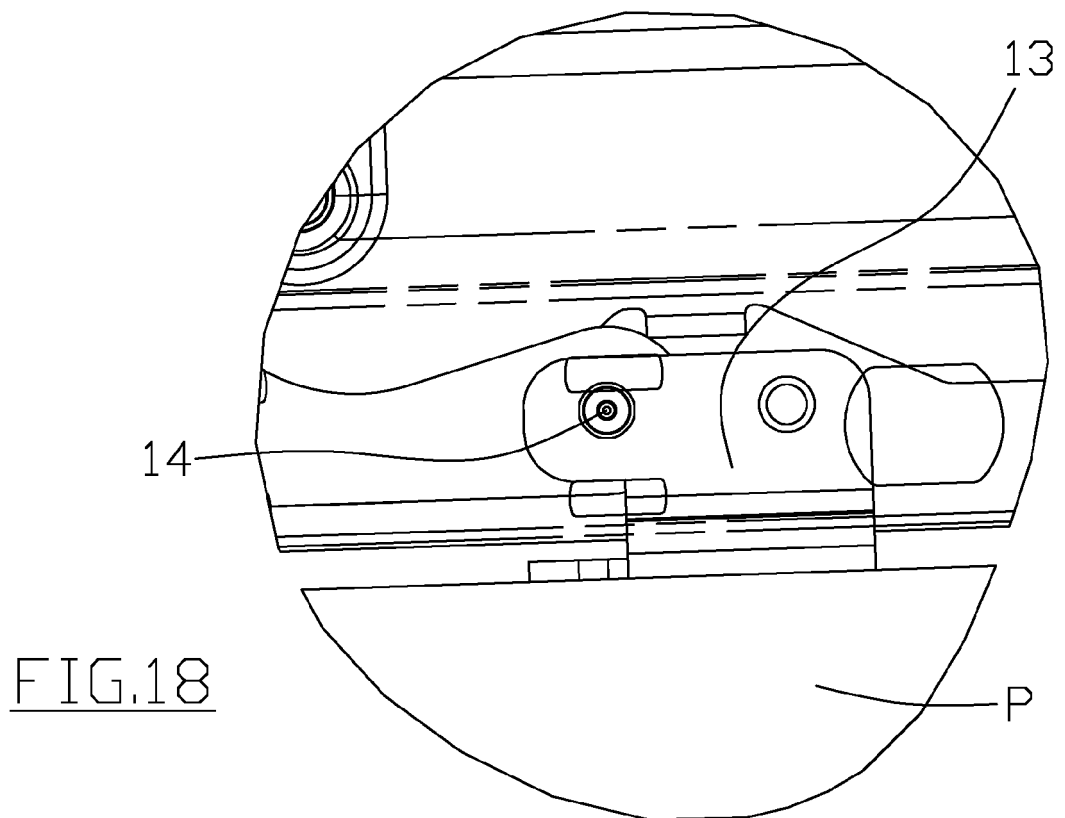
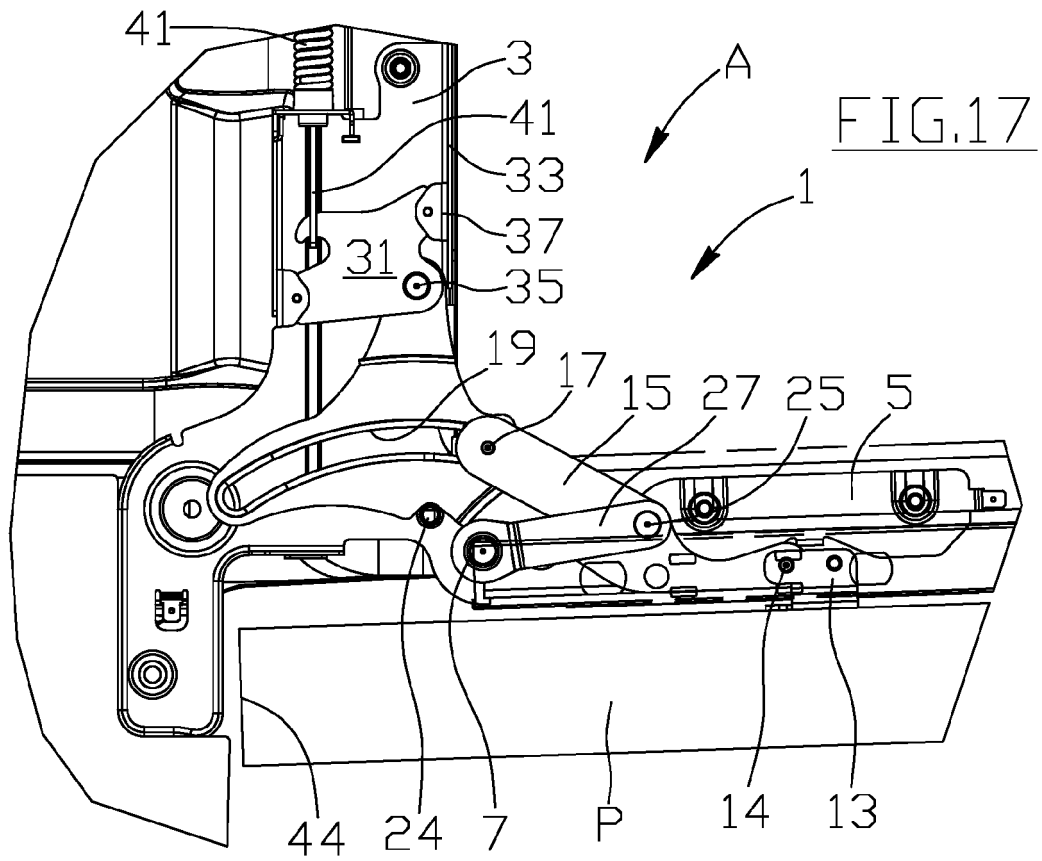


FIG.16a





## EUROPEAN SEARCH REPORT

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|  |  |   | E05D<br>A47L<br>F25D<br>E05F                            |
| The present search report has been drawn up for all claims   |  |   |   |
| Place of search<br><b>The Hague</b>  |  | Date of completion of the search<br><b>10 November 2023</b>   | Examiner<br><b>Witasse-Moreau, C</b>                    |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |  | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |   |



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

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The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-11-2023

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