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(54) **A HINGE MECHANISM**

(57) The present invention relates to a hinge mechanism (1) which enables opening and closing of the doors of appliances. The object of the invention is to provide a hinge mechanism (1) that enables the door to be opened

and closed in a balanced manner, that prevents hard collision in the event of the door being closed fast, that can be locked in the mounting position in order to enable easy mounting.

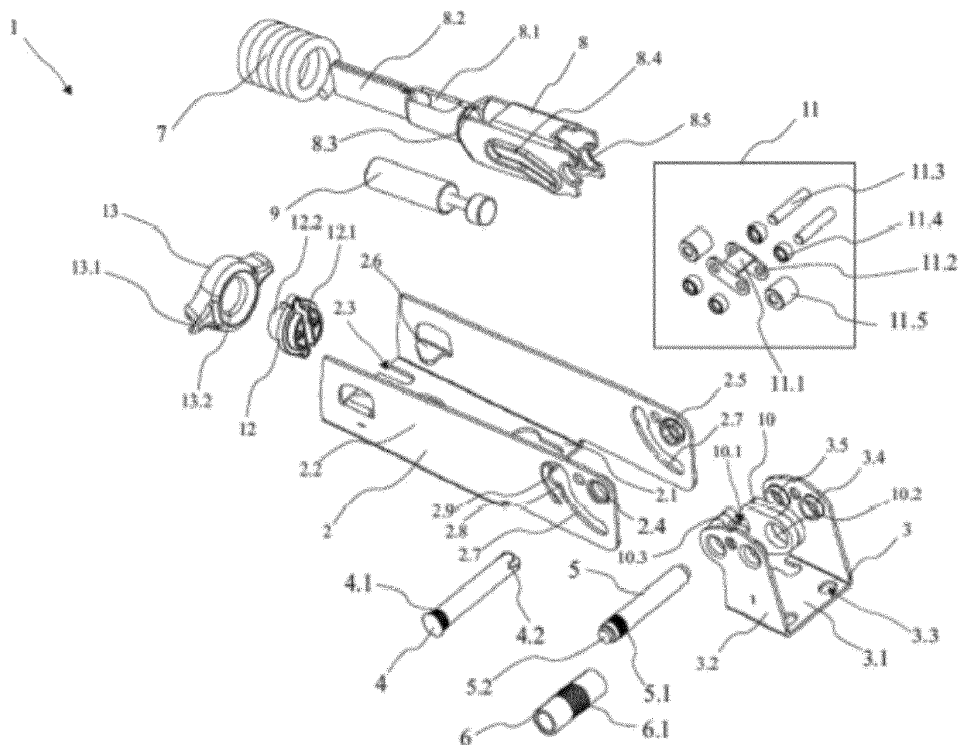


Figure 1

Description

Field of the Invention

[0001] The present invention relates to a hinge mechanism which enables opening and closing of the doors of household appliances.

Background of the Invention

[0002] In appliances that have doored structures such as refrigerators, ovens and deep freezers; hinge mechanisms which enable attaching the doors to the body of the appliance, and enable them to be opened and closed around an axis passing through the said edges. Besides having enough endurance to carry appliance bodies having doors of different weights, the hinge systems comprise counter-weight spring systems in order to provide convenience to the user while lifting the door. Additionally, hinge systems to which a damper is added in order to prevent the door from hitting against the body while closing the door, are present.

[0003] The United States patent document numbered US8533914 in the background of the invention discloses a hinge for the doors of the electrical appliances. Hinge, spring that controls and softens the movement of the door, and damper system is present. The damper steps in when the door is about to be closed, and provides a soft closing.

[0004] The German utility model document numbered DE20306043 in the background of the invention discloses a hinge for the doors of the appliances such as refrigerators and freezers. Hinge, spring that controls and softens the movement of the door, and damper system is present. The damper steps in when the door is about to be closed, and provides a soft closing.

[0005] The United States patent document numbered US8806718 in the background of the invention discloses a hinge that is used for the doors of the household appliances. The hinge comprises a damper in order to improve the movement of the door.

[0006] The damper systems that are present in the state of the art could not provide different absorptions of force at different positions of the door with respect to the appliance. These situations cause insufficiencies in providing the desired comfort while closing the door.

[0007] In the damper systems that are present in the state of the art, important parts such as spring and damper, are placed outside the body of the hinge, and for this reason, they are exposed to external effects. The system that is exposed to impacts, dirt and dust loses its function over time.

[0008] In the state of the art, the forces that are transmitted to the damper do not arrive perpendicularly at every position of the door. This situation causes the damper to get deformed over time because of the lateral forces arising on the damper.

[0009] The hinge systems could not stay at the mount-

ing position before being mounted, because of the spring they comprise. For an appropriate assembling, the hinge has to be held at the mounting position and it has to be fixed to its place thus and so. In the United States patent document numbered US6438799 that is present in the state of the art, a plastic part for fixing the hinge to the mounting position that is broken at the first use after the assembly is developed. As a result of this part being broken, it becomes functionless in the event of the hinge being demounted and mounted again. At the same time, the broken pieces constitute risk for the mechanism and the breaking process requires high forces to be exerted. A locking system that enables the hinge to be demounted and mounted multiple times, that does not cause breaking event, thereby that does not pose a risk for the mechanism, that does not require high forces to be exerted like the ones required in the breaking process has to be developed.

Short Description of the Invention

[0010] The object of the invention is to provide a hinge mechanism which comprises a damper inside the hinge in order to prevent accelerations during closing.

[0011] Another object of the invention is to provide a hinge mechanism which provides the motion to be transmitted to the damper with the help of a cam form, and that provides different closing comforts by the cam that is produced in the desired forms.

[0012] Another object of the invention is to provide a hinge mechanism which comprises a locking mechanism that holds the mechanism fixed at the mounting position in order to enable mounting multiple times.

Detailed Description of the Invention

[0013] The "Hinge mechanism" in order to fulfill the objects of the present invention is illustrated in the attached figures, where:

- Figure1 - Exploded view of the inventive hinge mechanism.
- Figure2 - Perspective view of the inventive hinge mechanism where the appliance door is in the opened state
- Figure3 - Side transparent view of the inventive hinge mechanism where the appliance door is in the opened state
- Figure4 - Perspective view of the inventive hinge mechanism where the appliance door is in the closed state
- Figure5 - Side transparent view of the inventive hinge mechanism where the appliance door is in the closed state
- Figure6 - View of the inventive hinge mechanism at the mounting position.
- Figure7 - View of the alternative embodiment of the lock protrusion of the inventive hinge mechanism.

- anism.
Figure8 - View of the alternative embodiment of the lock protrusion of the inventive hinge mechanism.
Figure9 - View of an alternative embodiment of the inventive hinge mechanism in order to be fixed at the mounting position.

[0014] Elements shown in the figures are numbered as follows:

1. Hinge mechanism
2. Fixed piece

- 2.1. Lower wall of the fixed piece
- 2.2. Lateral wall of the fixed piece
- 2.3. Connection hole of the fixed piece
- 2.4. Shrink fit pin hole of the fixed piece
- 2.5. Triangular hole of the fixed piece
- 2.6. Flap
- 2.7. Slot
- 2.8. Lock protrusion
- 2.9. Lock groove
- 2.10. Lock hole of the fixed piece

3. Moving piece

- 3.1. Lower wall of the moving piece
- 3.2. Lateral wall of the moving piece
- 3.3. Connection hole of the moving piece
- 3.4. Fixed pin hole of the moving piece
- 3.5. Moving pin hole of the moving piece
- 3.6. Lock hole of the moving piece

4. Fixed pin

- 4.1. Knurled end
- 4.2. Triangular end

5. Moving pin

- 5.1. Knurled region
- 5.2. Protruded end

6. Cam pin

- 6.1. Knurled surface

7. Spring

8. Linear transmission piece

- 8.1. Damper hub
- 8.2. Flat end
- 8.3. Protrusion
- 8.4. Pulley slot
- 8.5. Unloader

9. Damper

10. Cam body

- 10.1. Moving pin unloader
- 10.2. Cam pin hole
- 10.3. Cam surface

11. Pulley assembly

- 11.1. Pulley body
- 11.2. Pulley hole
- 11.3. Pin
- 11.4. Slot pulley
- 11.5. Cam pulley

12. Male conical piece

- 12.1. Slit
- 12.2. Conical protrusion

13. Female conical piece

- 13.1. Flap protrusion
- 13.2. Conical unloader

14. Lock pin

[0015] The inventive hinge mechanism (1) which balances the door of the doored household appliances during the opening and closing of the door, which prevents accelerations during closing, which keeps the mechanism fixed at the mounting position in order to provide healthy mounting, comprises;

- at least one fixed piece (2) which is fixed to the appliance body,
- at least one moving piece (3) which is fixed to the appliance door,
- at least one fixed pin (4) that connects the fixed piece (2) and moving piece (3) to each other and around the axis of which the moving piece (3) revolves,
- at least one moving pin (5) that is fixed on the moving piece (3) and that revolves with the moving piece (3),
- at least one cam pin (6) that is engaged over the fixed pin (4), that has the shape of a hollow pipe, and that performs a revolving motion around the fixed pin (4),
- at least one spring (7) which balances the weight of the door of the appliance,
- at least one linear transmission piece (8) which transmits the weight of the door of the appliance from the moving piece (3) to the spring (7),
- at least one damper (9) which prevents the door of the appliance to hit against the appliance body during fast closings by reducing its speed,
- at least one cam body (10) which enables the speed of the door of the appliance to be transferred to the desired amount of dampers (9) at the desired hinge positions during fast closings,

- at least one pulley assembly (11) which enables the perpendicular transmission of the incident forces from cam body (10) to the damper (9),
- at least one male conical piece (12) on which the end of the spring (7) that does not rest on the linear transmission piece (8) rests,
- at least one female conical piece (13) inside of which the male conical piece (12) is engaged, and that is fixed on the fixed piece (2).

[0016] The fixed piece (2) comprises;

- at least one lower wall of the fixed piece (2.1) which rests on the appliance body,
- at least two lateral walls of the fixed piece (2.2) at the opposing sides of the lower wall of the fixed piece (2.1), which are perpendicular to the lower wall of the fixed piece (2.1),
- at least one connection hole of the fixed piece (2.3) which enable fixing to the appliance body and which are present on the lower wall of the fixed piece (2.1),
- at least one shrink fit pin hole of the fixed piece (2.4) inside of which the fixed pin (4) is shrink fitted, and that is present on one of the lateral walls of the fixed piece (2.2),
- at least one triangular hole of the fixed piece (2.5) inside of which the fixed pin (4) passes, that is present on one of the lateral walls of the fixed piece (2.2) and which prevents turning as a result of it being triangular,
- at least two flaps (2.6) that are present at each of the lateral walls of the fixed piece (2.2), and to which the female conical piece (13) is attached,
- at least two slots (2.7) that are present at each of the lateral walls of the fixed piece (2.2), and inside of which the moving pin (5) moves,
- at least one lock protrusion (2.8) which fixes the moving pin (5) to its place at the mounting position, and that is present on one surface of the slots (2.7),
- at least one lock groove (2.9) on which the moving pin (5) gets placed during mounting, and that is present on one surface of the slots (2.7).

[0017] Moving piece (3) comprises;

- at least one lower wall of the moving piece (3.1) which rests on the appliance door,
- at least two lateral walls of the moving piece (3.2) at the opposing sides of the lower wall of the moving piece (3.1), which are perpendicular to the lower wall of the moving piece (3.1),
- at least one connection hole of the moving piece (3.3) which enables fixing to the appliance door and is present on the lower wall of the moving piece (3.1),
- at least two fixed pin holes of the moving piece (3.4) that are present at each of the lateral walls of the moving piece (3.2), and inside of which the fixed pin (4) passes,

- at least two moving pin holes of the moving piece (3.5) that are present at each of the lateral walls of the moving piece (3.2), and inside of which the fixed pin (4) passes.

[0018] Fixed pin (4) comprises;

- one knurled end (4.1) that shrink fits to the shrink fit pin hole of the fixed piece (2.4) and that has a knurled surface in order to prevent it from slipping and turning,
- at least one triangular end (4.2) that fits into the triangular hole of the fixed piece (2.5) and which prevents turning as a result of it being triangular.

[0019] Moving pin (5) comprises;

- one knurled region (5.1) that shrink fits to the moving pin hole of the moving piece (3.5) and that has a knurled surface in order to prevent it from slipping and turning,
- at least two protruded ends (5.2) which fit inside the slot (2.7), which enable movement along the slot, which are present on both two ends and which prevents the lock protrusion (2.8) from moving to inside or outside of the fixed piece (2).

[0020] Cam pin (6) comprises;

- one knurled surface (6.1) that shrink fits to the cam body (10) and that has a knurled surface in order to prevent it from slipping and turning on the cam body (10).

[0021] Linear transmission piece (8) comprises;

- at least one damper hub (8.1) inside of which the damper (9) is placed, fixed and which prevents the damper (9) from external effects,
- at least one flat end (8.2) that passes from inside the spring (7),
- at least one groove (8.3) in which the spring (7) is fitted,
- at least one pulley slot (8.4) inside of which the pulley body (11) moves, which enables the forces received by the pulley body (11) from the cam body (10) to be transferred to the damper (9) perpendicularly and in the desired amount,
- at least one unloader (8.5) on which the moving pin (5) rests and to which the moving piece (3) transmits its motion.

[0022] Cam body (10) comprises;

- at least one moving pin unloader (10.1) on which the moving pin (5) rests and which enables it to be fixed via the moving piece (3),
- at least one cam pin hole (10.2) through which the

cam pin (6) shrink fits, and which enables it to be fixed via the moving piece (3),

- at least one cam surface (10.3) which has a sloped surface that enables the movement of the moving piece (3) to be transmitted to the pulley assembly (11) at a desired position and in a desired amount.

[0023] Pulley assembly (11) comprises;

- at least one pulley body (11.1) that has two reciprocal parallel walls and one wall which connects the said two walls to each other and which is perpendicular to the parallel walls,
- at least four pulley holes (11.2) on the parallel walls, two of them are placed in one wall and the other two of them are placed on the other wall reciprocally,
- at least two pins (11.3) passing through the pulley holes (11.2),
- at least four slot pulleys (11.4) that are fitted into the ends of the pins (11.3) which stays out of the pulley body (11.1), that are placed inside the pulley slots (8.4), that reduce the friction between the pulley slot (8.4) by freely rotating around their axes during their movement inside the pulley slot (8.4),
- at least two cam pulleys (11.5) which are present in the middle region of the pins (11.3) that remain inside the pulley body (11.1), one of which is in contact with the cam surface (10.3) and one of which is in contact with the damper (9); which reduce friction, depreciation, and noise production on the surfaces to which they contact.

[0024] Male conical piece (12) comprises;

- at least one slit (12.1) inside of which the flat end (8.2) can pass,
- at least one conical protrusion (12.2) which passes into the female conical piece (13).

[0025] Female conical piece (13) comprises;

- at least two flap protrusions (13.1) which are attached to the flaps (2.6) and which are present in opposite positions from each other,
- at least one conical unloader (13.2) which passes into the conical protrusion (12.2) and which prevents the lateral movement.

[0026] The fixed piece (2) and the moving piece (3), the lower wall of the fixed piece (2.1) and the lower wall of the moving piece (3.1) have to be held in a position in which they are parallel to each other for the hinge mechanism (1) to be able to be mounted to the appliance body. This position is called mounting position. The protruded ends (5.2), that preferably have an inverse conical shape, that are present on the moving pin (5) that moves inside the slot (2.7), are positioned on the lock groove (2.9) at the mounting position, and their movement is prevented

by the lock groove (2.8). After the mounting, in order to get the hinge mechanism in a useable state, the movement of opening the appliance door is realized, thus enabling the protruded ends (5.2) get out of the lock groove (2.9) and passing over the lock protrusion (2.8). During the passing of the protruded ends (5.2) over the lock protrusion (2.8), the lock protrusion (2.8) bends so that it moves away from the way of the protruded ends (5.2). When a remounting is necessary, the lock protrusion (2.8) is restored to its previous position, and the protruded ends (5.2) are positioned on the lock groove (2.9) again. As no breaking occurs during the deactivating and reactivating processes of the lock protrusion (2.8), no distribution of the particles that may pose a risk for the mechanism occurs.

[0027] In an alternative embodiment of the invention, the lock protrusion (2.8) is in a shape of a rod that is positioned perpendicularly to the slot (2.6) surface. (Figure 7)

[0028] In an alternative embodiment of the invention, the lock protrusion (2.8) is in a closed, hollow form. (Figure 8)

[0029] In an alternative embodiment of the invention, the hinge mechanism (1) that is fixed to the mounting position comprises;

- at least one fixed piece (2) having at least one lock hole of the fixed piece (2.10) that is present on at least one of the lateral walls of the fixed piece (2.2),
- at least one moving piece (3) having at least one lock hole of the moving piece (3.6) that is present on at least one of the lateral walls of the moving piece (3.2) and that is aligned with the lock hole of the fixed piece (2.10) at the mounting position,
- at least one lock pin (14) that prevents the movement of the moving piece (3) with respect to the fixed piece (2) by passing through the lock hole of the fixed piece (2.10) and the lock hole of the moving piece (3.6) at the mounting position. (Figure 9)

Claims

1. A hinge mechanism (1) which balances the door of the doored household appliances during the opening and closing of the door, which prevents accelerations during closing, which keeps the mechanism fixed at the mounting position in order to provide healthy mounting, **characterized by**

- at least one fixed piece (2) which is fixed to the appliance body,
- at least one moving piece (3) which is fixed to the appliance door,
- at least one fixed pin (4) that connects the fixed piece (2) and moving piece (3) to each other and around the axis of which the moving piece (3) revolves,

- at least one moving pin (5) that is fixed on the moving piece (3) and that revolves with the moving piece (3),
 - at least one cam pin (6) that is engaged over the fixed pin (4), that has the shape of a hollow pipe, and that performs a revolving motion around the fixed pin (4),
 - at least one spring (7) which balances the weight of the door of the appliance,
 - at least one linear transmission piece (8) which transmits the weight of the door of the appliance from the moving piece (3) to the spring (7),
 - at least one damper (9) which prevents the door of the appliance to hit against the appliance body during fast closings by reducing its speed,
 - at least one cam body (10) which enables the speed of the door of the appliance to be transferred to the desired amount of dampers (9) at the desired hinge positions during fast closings,
 - at least one pulley assembly (11) which enables the perpendicular transmission of the incident forces from cam body (10) to the damper (9),
 - at least one male conical piece (12) on which the end of the spring (7) that does not rest on the linear transmission piece (8) rests,
 - at least one female conical piece (13) inside of which the male conical piece (12) is engaged, and that is fixed on the fixed piece (2).
2. A hinge mechanism as in Claim 1 **characterized by** at least one fixed piece (2) that is fixed on the appliance body, that comprises;
- at least one lower wall of the fixed piece (2.1) which rests on the appliance body,
 - at least two lateral walls of the fixed piece (2.2) at the opposing sides of the lower wall of the fixed piece (2.1), which are perpendicular to the lower wall of the fixed piece (2.1),
 - at least one connection hole of the fixed piece (2.3) which enable fixing to the appliance body and which are present on the lower wall of the fixed piece (2.1),
 - at least one shrink fit pin hole of the fixed piece (2.4) inside of which the fixed pin (4) is shrink fitted, and that is present on one of the lateral walls of the fixed piece (2.2),
 - at least one triangular hole of the fixed piece (2.5) inside of which the fixed pin (4) passes, that is present on one of the lateral walls of the fixed piece (2.2) and which prevents turning as a result of it being triangular,
 - at least two flaps (2.6) that are present at each of the lateral walls of the fixed piece (2.2), and to which the female conical piece (13) is attached,
 - at least two slots (2.7) that are present at each of the lateral walls of the fixed piece (2.2), and inside of which the moving pin (5) moves,
 - at least one lock protrusion (2.8) which fixes the moving pin (5) to its place at the mounting position, and that is present on one surface of the slots (2.7),
 - at least one lock groove (2.9) on which the moving pin (5) gets placed during mounting, and that is present on one surface of the slots (2.7).
3. A hinge mechanism (1) as in Claim 2 **characterized by** at least one moving piece (3) that is fixed on the appliance door, that comprises;
- at least one lower wall of the moving piece (3.1) which rests on the appliance door,
 - at least two lateral walls of the moving piece (3.2) at the opposing sides of the lower wall of the moving piece (3.1), which are perpendicular to the lower wall of the moving piece (3.1),
 - at least one connection hole of the moving piece (3.3) which enables fixing to the appliance door and is present on the lower wall of the moving piece (3.1),
 - at least two fixed pin holes of the moving piece (3.4) that are present at each of the lateral walls of the moving piece (3.2), and inside of which the fixed pin (4) passes,
 - at least two moving pin holes of the moving piece (3.5) that are present at each of the lateral walls of the moving piece (3.2), and inside of which the fixed pin (4) passes.
4. A hinge mechanism (1) as in Claim 2 **characterized by** at least one fixed pin (4) that connects the fixed piece (2) and moving piece (3) to each other and around the axis of which the moving piece (3) revolves,
- that comprises one knurled end (4.1) that shrink fits to the shrink fit pin hole of the fixed piece (2.4) and that has a knurled surface in order to prevent it from slipping and turning,
 - at least one triangular end (4.2) that fits into the triangular hole of the fixed piece (2.5) and which prevents turning as a result of it being triangular.
5. A hinge mechanism (1) as in Claim 3 **characterized by** at least one moving pin (5) that is fixed on the moving piece (3) and that revolves with the moving piece (3), comprising
- one knurled region (5.1) that shrink fits to the moving pin hole of the moving piece (3.5) and that has a knurled surface in order to prevent it from slipping and turning,
 - at least two protruded ends (5.2) which fit inside

the slot (2.7), which enable movement along the slot, which are present on both two ends and which prevents the lock protrusion (2.8) from moving to inside or outside of the fixed piece (2).

6. A hinge mechanism (1) as in Claim 1, **characterized by** at least one cam pin (6) that is engaged over the fixed pin (4), that has the shape of a hollow pipe, comprising

- at least one knurled surface (6.1) that shrink fits to the cam body (10) and that has a knurled surface in order to prevent it from slipping and turning on the cam body (10).

7. A hinge mechanism (1) as in Claim 2, **characterized by** at least one linear transmission piece (8) which transmits the weight of the door of the appliance from the moving piece (3) to the spring (7), comprising;

- at least one damper hub (8.1) inside of which the damper (9) is placed, fixed and which prevents the damper (9) from external effects,
- at least one flat end (8.2) that passes from inside the spring (7),
- at least one groove (8.3) in which the spring (7) is fitted,
- at least one pulley slot (8.4) inside of which the pulley body (11) moves, which enables the forces it receives from the pulley body (11) and the cam body (10) to be transferred to the damper (9) perpendicularly and in the desired amount,
- at least one unloader (8.5) on which the moving pin (5) rests and to which the moving piece (3) transmits its motion.

8. A hinge mechanism (1) as in Claim 7, **characterized by** at least one cam body (10) which enables the speed of the door of the appliance to be transferred to the desired amount of dampers (9) at the desired hinge positions during fast closings, comprising;

- at least one moving pin unloader (10.1) on which the moving pin (5) rests and which enables it to be fixed via the moving piece (3),
- at least one cam pin hole (10.2) through which the cam pin (6) shrink fits, and which enables it to be fixed via the moving piece (3),
- at least one cam surface (10.3) which has a sloped surface that enables the movement of the moving piece (3) to be transmitted to the pulley assembly (11) at a desired position and in a desired amount.

9. A hinge mechanism (1) as in Claim 8, **characterized by** at least one pulley assembly (11) which enables the perpendicular transmission of the incident forces from cam body (10) to the damper (9),

- at least one pulley body (11.1) that has two reciprocal parallel walls and one wall which connects the said two walls to each other and which is perpendicular to the parallel walls,
- at least four pulley holes (11.2) on the parallel walls, two of them are placed in one wall and the other two of them are placed on the other wall reciprocally,
- at least two pins (11.3) passing through the pulley holes (11.2),
- at least four slot pulleys (11.4) that are fitted into the ends of the pins (11.3) which stays out of the pulley body (11.1), that are placed inside the pulley slots (8.4), that reduce the friction between the pulley slot (8.4) by freely rotating around their axes during their movement inside the pulley slot (8.4),
- at least two cam pulleys (11.5) which are present in the middle region of the pins (11.3) that remain inside the pulley body (11.1), one of which is in contact with the cam surface (10.3) and one of which is in contact with the damper (9); which reduce friction, depreciation, and noise production on the surfaces to which they contact.

10. A hinge mechanism (1) as in Claim 7, **characterized by** at least one male conical piece (12) on which the end of the spring (7) that does not rest on the linear transmission piece (8) rests, comprising;

- at least one slit (12.1) inside of which the flat end (8.2) can pass,
- at least one conical protrusion (12.2) which passes into the female conical piece (13).

11. A hinge mechanism (1) as in Claim 10, **characterized by** at least one female conical piece (13) inside of which the male conical piece (12) is engaged, and that is fixed on the fixed piece (2), comprising;

- at least two flap protrusions (13.1) which are attached to the flaps (2.6) and which are present in opposite positions from each other,
- at least one conical unloader (13.2) which passes into the conical protrusion (12.2) and which prevents the lateral movement.

12. A hinge mechanism (1) as in Claim 3, **characterized by** at least one lock pin (14) that prevents the movement of the moving piece (3) with respect to the fixed piece (2) by passing through the lock hole of the fixed piece (2.10) and the lock hole of the moving piece (3.6) at the mounting position, inside of which the male conical piece (12) is engaged, and that is fixed on the fixed piece (2) comprising;

- at least one fixed piece (2) having at least one

lock hole of the fixed piece (2.10) that is present on at least one of the lateral walls of the fixed piece (2.2),

- at least one moving piece (3) having at least one lock hole of the moving piece (3.6) that is present on at least one of the lateral walls of the moving piece (3.2) and that is aligned with the lock hole of the fixed piece (2.10) at the mounting position.

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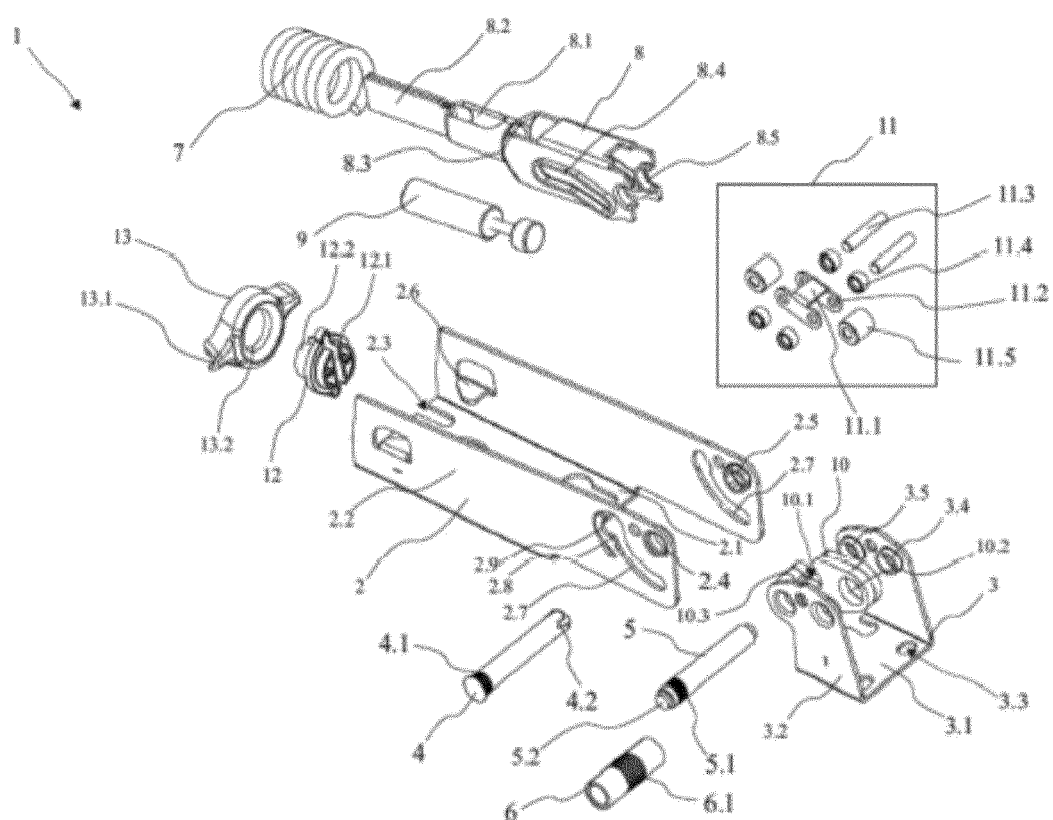


Figure 1

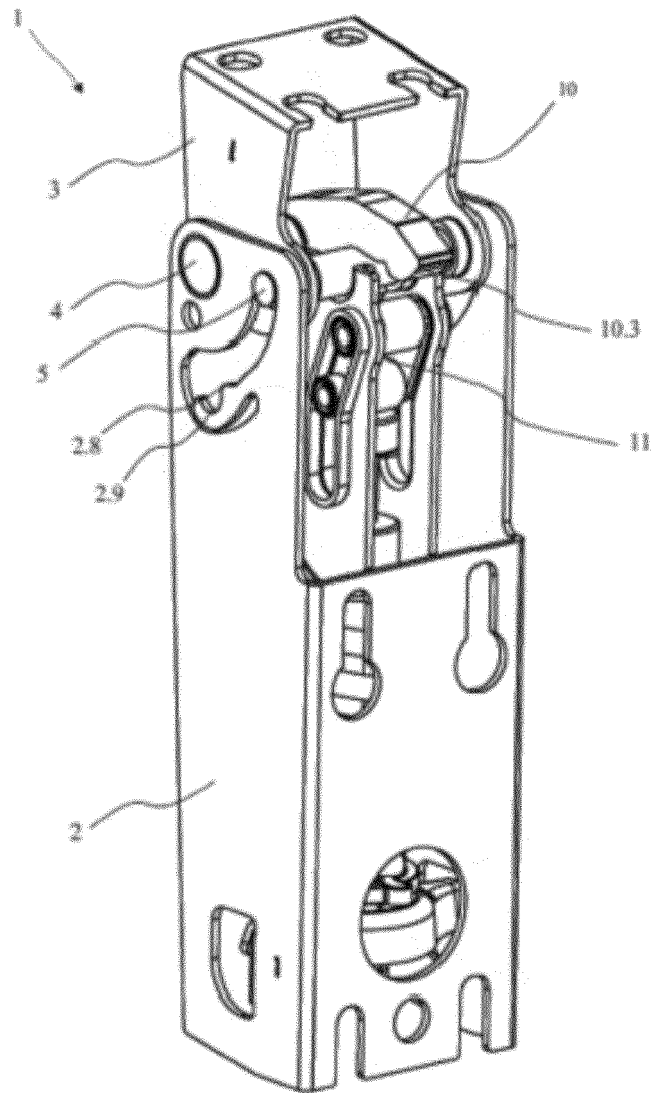


Figure 2

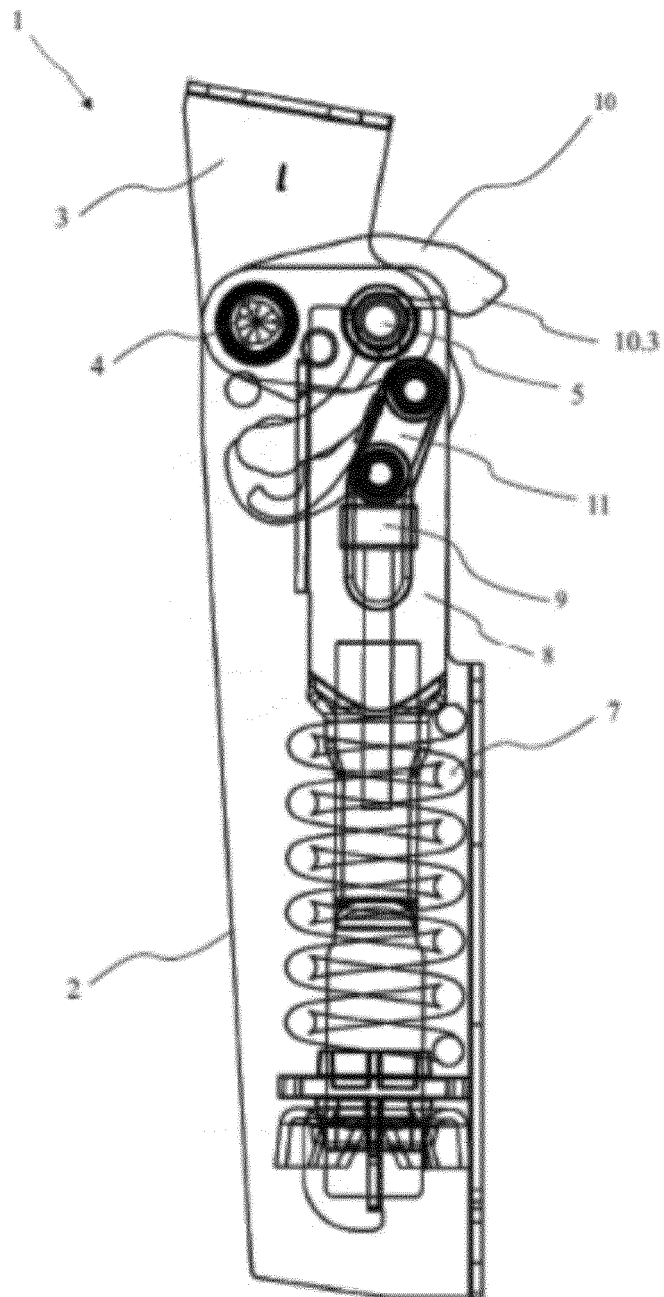


Figure 3

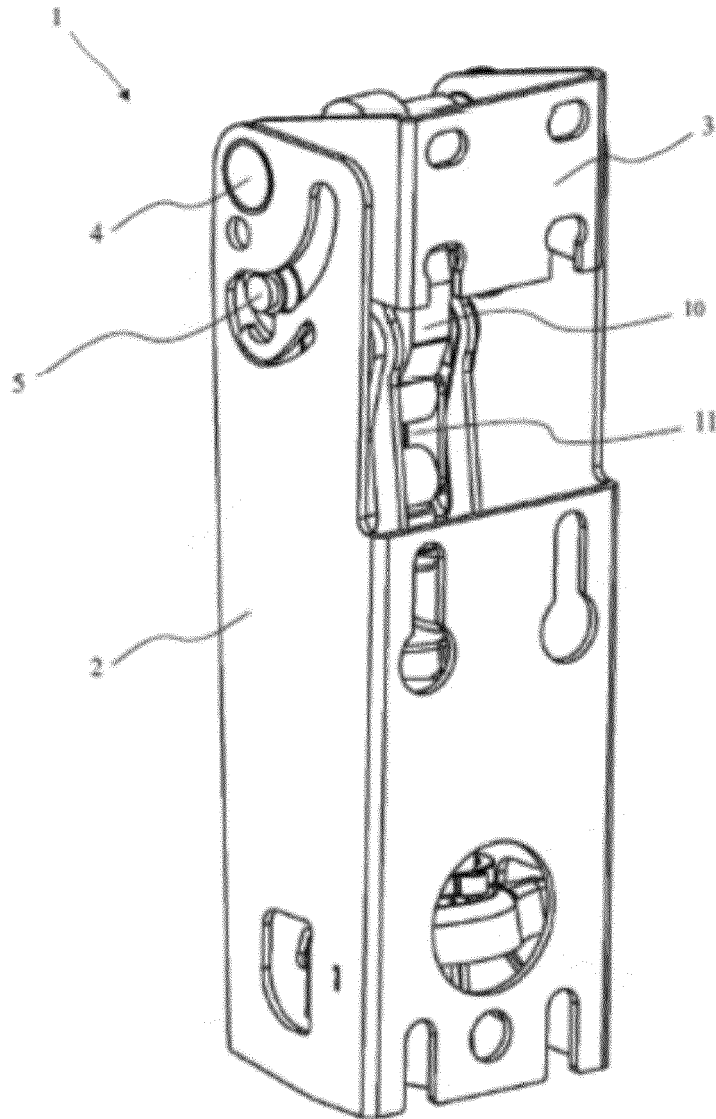


Figure 4

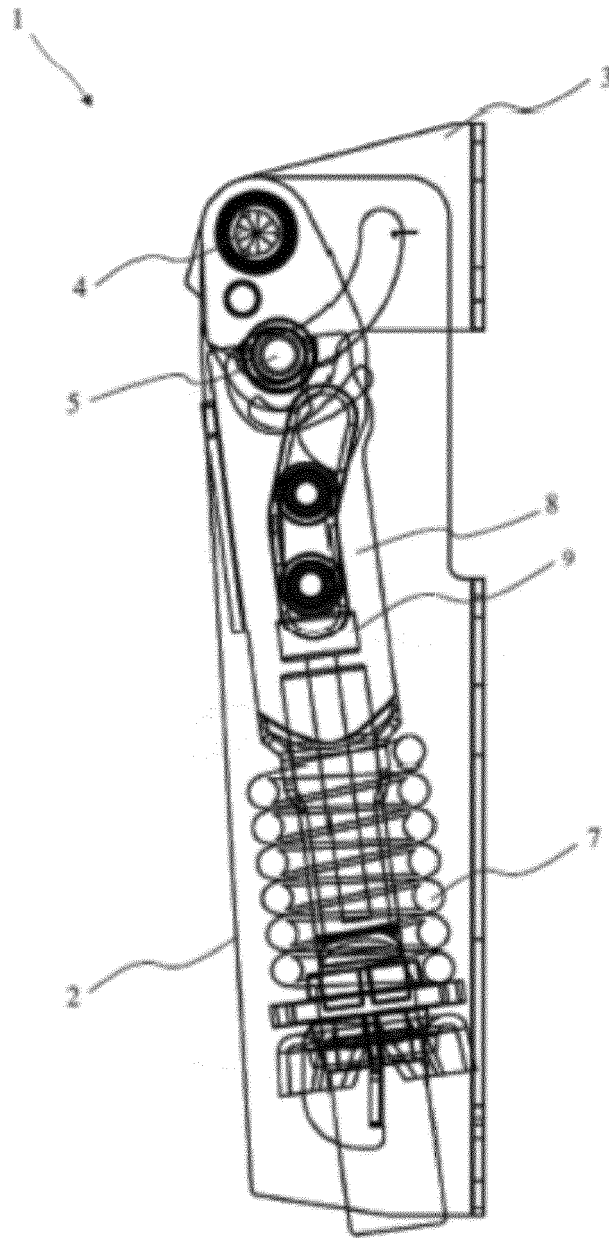


Figure 5

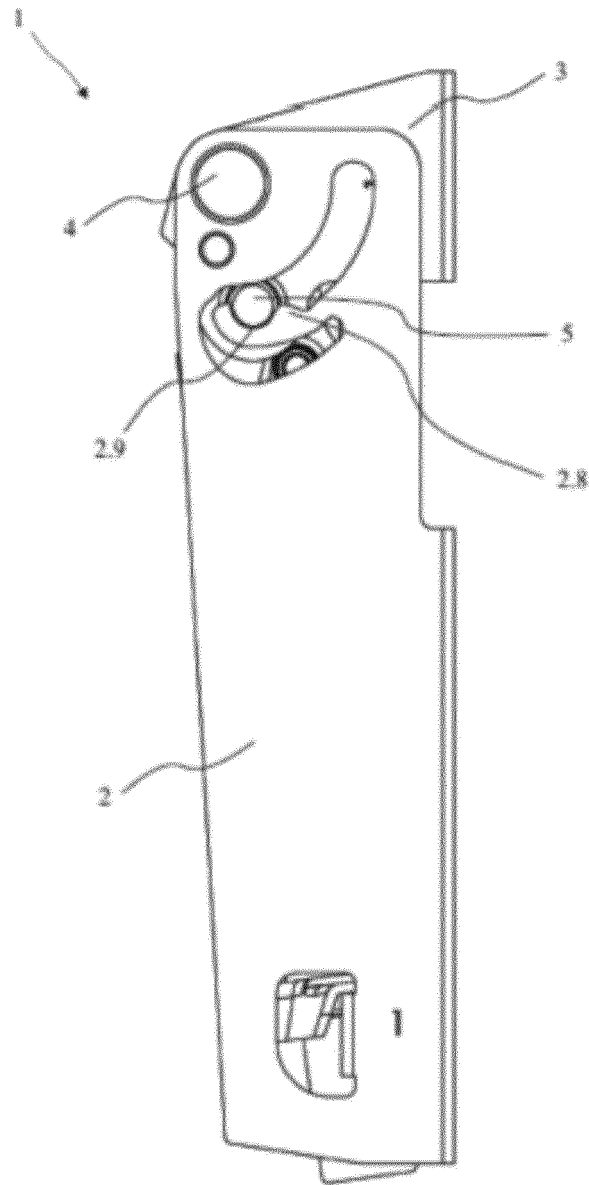


Figure 6

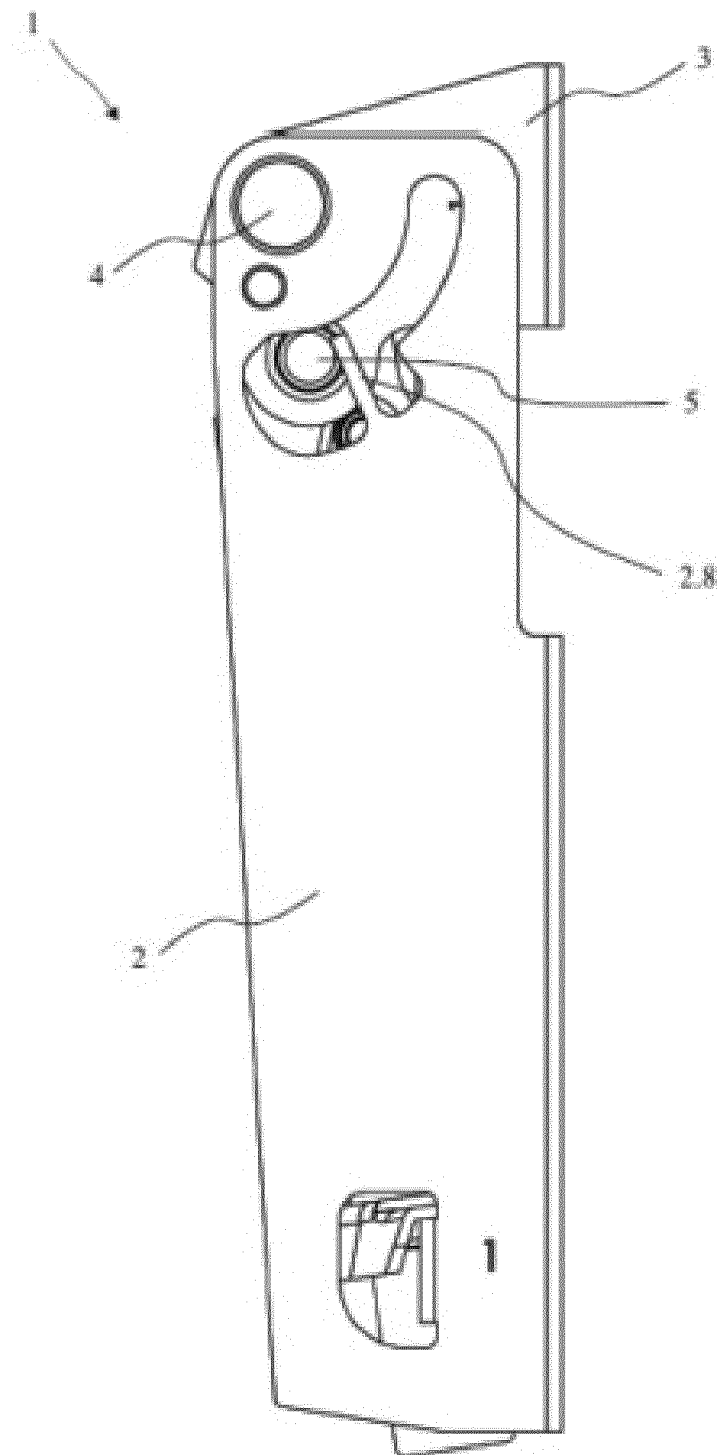


Figure 7

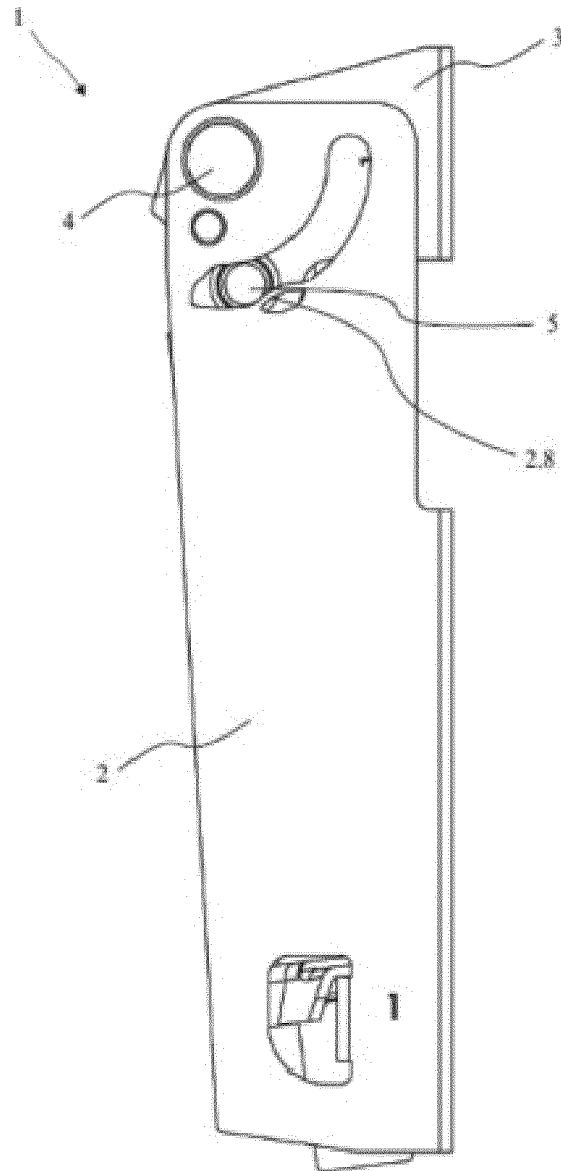


Figure 8

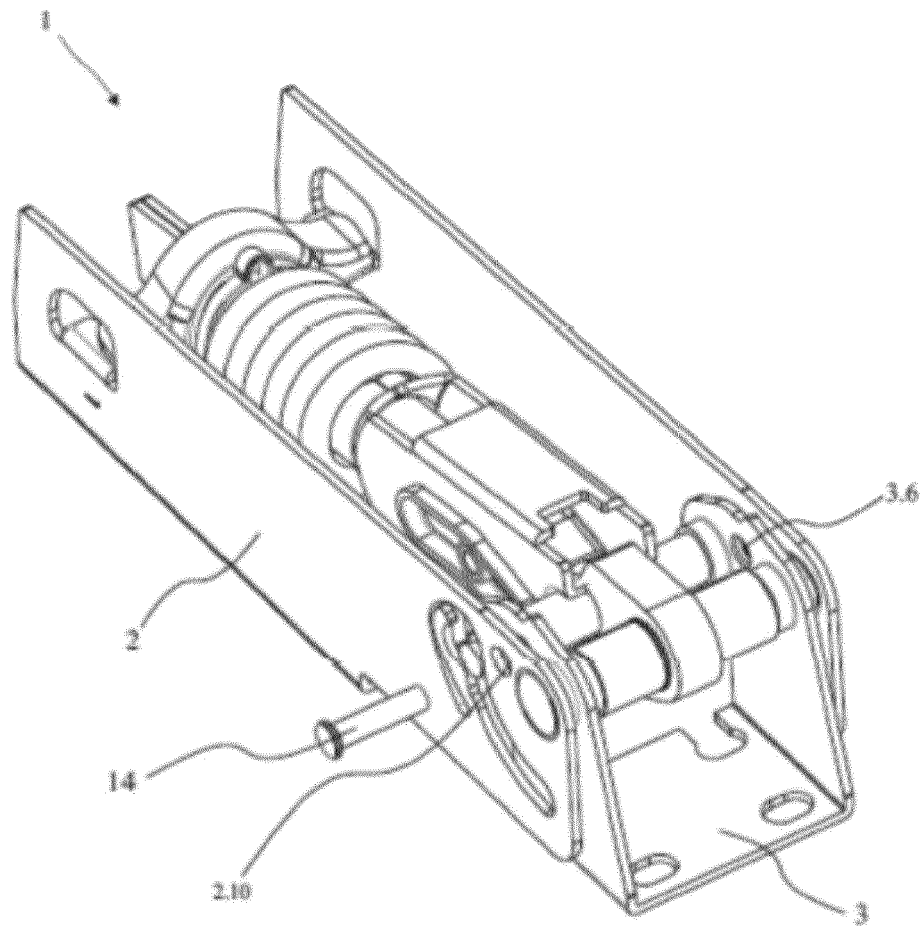


Figure 9



EUROPEAN SEARCH REPORT

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			E05F F24C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 September 2016	Examiner Guillaume, Geert
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			

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