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(54) **AUTOMATIC TIGHTENING CLOSURE DEVICE FOR DOORS AND HATCHES**

(57) An automatic closure device for doors and hatches which allows the user to close and properly tighten the door or hatch to which the closure device is applied, even when there is no space to use a closure handle or when the handle is in a position in which exerting the force required to tighten the door is difficult. The de-

vice the present invention further allows simplifying the management and assembly because the locks and handle forming the device are compatible with the installation in case of reduced spaces and when handles cannot be used.

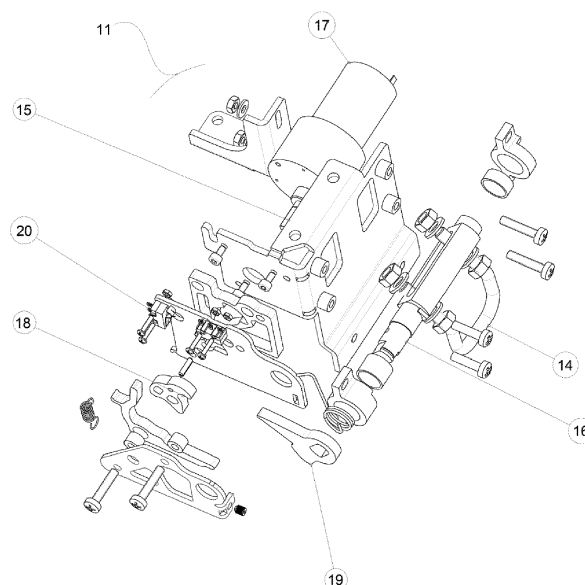


Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The object of the present invention relates to the field of closure devices and safety locks for doors and hatches, with particular reference to the doors and hatches of motor vehicles such as vans, caravans and the like.

BACKGROUND ART

[0002] In the technical field of motor vehicles such as vans, caravans and the like, and also in other fields such as for example the field of automatic vending machines, the field of safety cabinets etc., the doors and hatches used, or the openings corresponding to said doors, are often provided with gaskets of various type to ensure the insulation against external agents such as moisture, rain, wind, dust, etc.

[0003] The presence of gaskets requires the use of compression type locks which are adapted to tighten the door or hatch by exerting a given pressure between the door and the corresponding opening so as to press the gasket conveniently, thus allowing it to perform its function. Compression locks provide a quick and secure closure and the use thereof is particularly suitable where there are seals and where a given resistance to vibrations is required, such as in the case of the doors of motor vehicles.

[0004] Compression locks which are available on the market generally comprise a lock body - integrally applied to the door or hatch being examined - which in turn houses a shaft adapted to guide a closure rod integral with one of the ends of said shaft. A rotatable actuation knob is then associated with said shaft and is adapted to actuate it by rotating and translating it in axial direction and so as to close the rotatable tightening lock to which it belongs. Said rotatable knob is also generally provided with a cylinder lock which makes the locking thereof possible.

[0005] A closure of this type requires the user to actuate the handle with a given force so as to guide the shaft of the lock conveniently through the two movements described, a rotational one and a translating one, which is adapted to compress conveniently the gasket arranged at the edges of the door of the corresponding opening.

[0006] Therefore, it is an object of the present invention to introduce an automatic closure device for doors and hatches, with particular reference to the doors and hatches of motor vehicles such as vans, caravans and the like, which is adapted to solve the problems of the current closure devices and to facilitate the proper tightening of the door even when there is no space to use a closure handle or when the handle is in a position in which exerting the force required to carry out the tightening is difficult.

SUMMARY OF THE INVENTION

[0007] Referring to the embodiments described in the present application, it is an object of the present application to introduce an automatic closure device for doors and hatches, with particular reference to the doors and hatches of motor vehicles such as vans, caravans and the like, which solves the problems of the prior art.

[0008] In a preferred embodiment, the closure device according to the present invention comprises a first lock mounted onto the door and a second lock mounted onto the edge of the opening related to the door, in a position corresponding to said first lock.

[0009] The first lock comprises a rod, which may possibly be actuated by a handle, when present. The second lock comprises a movable mouth and moving means associated with said movable mouth. There are also means adapted to detect the position of said rod with respect to said mouth (or more generally, the position of said first lock with respect to said second lock), which means are associated with the aforesaid moving means of said movable mouth.

[0010] When the door is being closed, the position of the rod is detected with respect to the mouth, thus causing the need to actuate the mouth which is in an open position. Therefore, the moving means of the mouth therefore act to actuate the mouth which moves from the initial opening position, thus engaging the rod. The movable mouth continues its travel, pushing the door towards the complete closure, corresponding to the final closed position of the movable mouth. When the movable mouth reaches the final closure position, the moving means associated therewith act so as to hold it stably in closed position.

[0011] The closure of the door thus occurs in an assisted manner by simply accompanying the door towards the corresponding opening. There is no longer the need to push on the door so as to promote the pressing of the gaskets, and to act on the handle so as to guide the rod of the lock and complete the closure of the door itself, as in case of the systems of the prior art.

[0012] The door can be opened by actuating a handle associated with the rod. The handle acts on the rod, thus causing it to retract up to disengaging from the mouth. The door is no longer constrained to remain closed at this point and it opens, thus moving away from the corresponding opening. The means adapted to detect the position of the rod with respect to the mouth switch the status thereof and therefore the mouth is returned to the open position.

[0013] If there is no handle, the door can be opened by actuating a push button switch connected to said moving means of the mouth. In a preferred embodiment of the invention, pressing on the button forces the opening of the mouth which disengages from the rod, thus promoting the opening of the door. In another preferred embodiment of the invention, there are moving means of the rod included in said first lock. The button acts on these

moving means of the rod to ensure the rod itself retracts up to disengaging from the mouth, thus promoting the opening of the door.

[0014] Therefore, the present invention allows the problems of the current closure devices to be solved by allowing the proper tightening of the door even when there is no space to use a closure handle or when the handle is in a position in which exerting the force required to tighten the door is difficult.

[0015] Further objects, features and advantages of the present invention will become more apparent from the following detailed description, provided by way of non-limiting example and shown in the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Fig. 1 shows a partial exploded view of a preferred embodiment of a part of the closure device according to the present invention;

Fig. 2 shows a plan view of a preferred embodiment of a part of the closure device according to the present invention, with the mouth in open position;

Fig. 3 shows a plan view of a preferred embodiment of a part of the closure device according to the present invention, with the mouth in closed position;

Fig. 4 shows a partial plan and cross section view of a preferred embodiment of the closure device according to the present invention, in the open door position;

Fig. 5 shows a partial plan and cross section view of a preferred embodiment of the closure device according to the present invention, in a door being closed position;

Fig. 6 shows a partial plan and cross section view of a preferred embodiment of the closure device according to the present invention, in a closed door position;

Fig. 7 shows a partial plan and cross section view of a preferred embodiment of the closure device according to the present invention, in the open door position through the actuation of the handle.

DETAILED DESCRIPTION OF THE INVENTION

[0017] In reference to the accompanying drawings, a preferred embodiment of the automatic tightening closure device of the present invention comprises a first lock 10 mounted onto door 12 and a second lock 11 mounted onto the edge of the opening related to door 12, in a corresponding position, facing said first lock 10. Said first lock 10 and second lock 11 are provided with fastening means adapted to promote the fastening thereof to a door 12 or to a hatch and to the wall which houses door 12.

[0018] The first lock 10 comprises a rod 13.

[0019] In a preferred embodiment of the present inven-

tion, the first lock 10 also can comprise a handle associated with said rod 13 so as to actuate the movement thereof parallel to door 12, between an extended closure position and a retracted opening position.

[0020] The second lock 11 comprises a movable mouth 14, which is actuated by suitable moving means and is adapted to engage the end of said rod 13 protruding from the first lock 10. The movable mouth 14 is adapted to move between two limit positions: a first position, corresponding to the opening of door 12, in which mouth 14 does not interfere with the end of rod 13, and a second position, in which mouth 14 engages the end of rod 13 so as to force the closure of door 12.

[0021] The automatic tightening closure device of the present invention further comprises means adapted to detect the position of said rod 13 with respect to said mouth 14 (or the position of said first lock 10 with respect to said second lock 11), which may be created by means of any position sensor adapted to detect the mutual position of two objects, such as magnetic position sensors, for example. These magnetic sensors consist of two parts and are adapted to detect if the two parts of the sensor face each other or not, thus providing an electric output signal corresponding to the status detected.

[0022] The two parts of the magnetic sensor may advantageously be installed one on said first lock 10, the other on said second lock 11. Thereby, when the door is closed, the sensor detects the required alignment between the two locks 10, 11 and acts on the moving means of the movable mouth with which said sensor is associated so that the movable mouth 14 is conveniently guided from the open position to the closed position in which it engages rod 13 to close door 12.

[0023] Said sensor is conveniently configured and installed so as to switch the status thereof when said rod 13 and said mouth 14 (or the two locks 10, 11) are substantially aligned, that is when the alignment between said rod 13 and said mouth 14 (or between the two locks 10, 11) is sufficient for rod 13 and the movable mouth 14 to mutually engage each other.

[0024] Other types of position sensors available on the market may advantageously be used, such as induction sensors or RF sensors.

[0025] Said moving means of the movable mouth 14 advantageously may be made by means of an electric motor 17 associated with a suitable drive circuit and possibly provided with suitable reducer. For example, a 12 V or 24 V direct current power supply can be used, but other types of electric motor also may be used. Said drive circuit of the electric motor 17 is conveniently associated with the electric signal output from the position sensor adapted to detect the alignment between the two locks 10, 11. Thereby, the switching of said sensor affects the drive of the electric motor 17 and therefore ultimately the status and the rotation direction of the electric motor 17.

[0026] In reference to accompanying Fig. 1 which depicts a non-limiting example implementing a preferred embodiment of the second lock 11 according to the in-

vention, said second lock 11 comprises a support 15 adapted to be fastened on the edge of an opening of a wall and to carry a movable mouth 14 so as to allow the movement thereof between two limit positions, an opening position shown in accompanying Fig. 2 and a closure position shown in accompanying Fig. 3.

[0027] In further detail, the movable mouth 14 is connected to a shaft 16 associated with suitable moving means comprising an electric motor 17, for example. The connection between movable mouth 14 and said moving means comprising an electric motor 17 advantageously is achieved through two cams. A first cam 18 is integrally connected to the end of the shaft of said electric motor 17 and is adapted to engage a second cam 19 integrally connected to an end of said shaft 16. The second cam 19 is associated with resistant means adapted to hold said second cam 19 in the position corresponding to the open position of the movable mouth 14. Finally, both the cams 18, 19 may rotate between two end positions, one corresponding to the opening of the movable mouth 14, the other corresponding to the closure of the movable mouth 14.

[0028] As shown in accompanying figures 4, 5 and 6, during the closing step, when the position sensor switches the status thereof - because it has caused the sufficient alignment between said rod 13 and said mouth 14 following the door 12 moving close to the closure position - the first cam 18 is actuated by the electric motor 17 so as to rotate in such a direction as to move the second cam 19, thus overcoming the actuation of the resistant means associated with said second cam 19. The second cam 19 brings shaft 16 into rotation with it, which shaft in turn moves the movable mouth 14, which is integral therewith, which engages rod 13, pushing it up to the closure of door 12. Therefore, the movable mouth 14 reaches the closed position, shown in accompanying Figure 3.

[0029] Upon reaching the position corresponding to the closure of the movable mouth 14, the second cam 19 actuates - directly or indirectly by means of a possible auxiliary mechanism - a first electrical switch 20, for example a micro-switch, associated with the drive circuit of the electric motor. The actuation of said first electrical switch 20 allows the rotation of the motor to be blocked, thus holding the movable mouth 14 stably in closed position.

[0030] If there is a handle associated with said rod 13, the opening actuation of said handle induces the return of rod 13 into the first lock 10. Thereby, rod 13 is released from mouth 14, as shown in accompanying Fig. 7, and the door begins to open - pushed by the gaskets or by possible closure resistant means associated with door 12 or with the corresponding opening - thus causing the switching of the position sensor which causes the mutual position of said rod 13 with respect to said mouth 14 (or the position of said first lock 10 with respect to said second lock 11). When said rod 13 and said mouth 14 (or the two locks 10, 11) are substantially no longer aligned

due to the opening of the door, the switching of the sensor acts on the driving of the electric motor 17. Said electric motor 17 thus is put into rotation and actuates the first cam 18 so as to rotate in such a direction as to leave cam 19 free to rotate, following the action of the resistant means associated with said second cam 19. The second cam 19 brings shaft 16 into rotation with it, which shaft in turn moves the movable mouth 14, which is integral therewith, towards the open position, shown in accompanying Figure 2. Upon reaching the position corresponding to the opening of the movable mouth 14, the first cam 18 actuates - directly or indirectly - a second electrical switch 21, for example a micro-switch, associated with the drive circuit of the electric motor. The actuation of said second electrical switch 21 allows the rotation of the motor to be blocked, thus holding the movable mouth 14 stably in open position.

[0031] Said handle may advantageously be provided with a cylinder lock, or similar key tightening means, which is adapted to lock the handle in closure position.

[0032] If there is no handle, the door is opened by a specific control circuit which is actuated by a third electrical switch, for example.

[0033] Said control circuit is conveniently associated with the drive circuit of the electric motor. When said control circuit is actuated - for example by means of a third electrical switch connected to a button arranged on door 12 in a position accessible to the user - it acts on the drive circuit of the electric motor so as to force the movement of the shaft of the electric motor in such a direction as to promote the opening of the movable mouth 14 and therefore of door 12. Similarly to what occurs in the case of opening by means of a handle, the electric motor 17 moves the first cam 18 so as to rotate in such a direction as to leave cam 19 free to rotate, following the action of the resistant means associated with said second cam 19, and to bring shaft 16 into rotation with it, which shaft in turn moves the movable mouth 14, which is integral with shaft 16, towards the open position, which is shown in accompanying Figure 2.

[0034] Alternatively, there may be moving means of rod 13 included in said first lock 10. The button here can act on these moving means of rod 13 to ensure the rod itself retracts up to disengaging from mouth 14, thus promoting the opening of door 12. The automatic tightening closure device according to the present invention allows the user to close and properly tighten the door or the hatch to which said device is applied, even when there is no space to use a closure handle or when the handle is in a position in which exerting the force required to tighten the door is difficult. The preceding description of the preferred embodiments of the invention refers to the accompanying drawings. The same reference numerals in the various drawings identify the same or similar elements. The above detailed description does not restrict the scope of the invention claimed because the scope of protection related to the present invention is defined by the appended claims.

Claims

1. An automatic tightening closure device for doors and hatches comprising:

a first lock (10) adapted to be mounted onto a door (12) associated with a corresponding opening, said first lock (10) comprising a rod (13);
 a second lock (11) adapted to be mounted onto the edge of said opening in a corresponding position, facing said first lock (10), said second lock (11) comprising a mouth (14) movable between a first position, corresponding to the opening of the door (12), in which said mouth (14) does not interfere with the end of the rod (13), and a second position, in which said mouth (14) can engage the end of the rod (13) and force the closing of the door (12);
 moving means connected to said movable mouth (14) and further associated with means for detecting the position of said rod (13) with respect to said mouth (14), wherein said movement means connected to said movable mouth (14) are adapted to hold said movable mouth (14) in a closed position when the alignment between said rod (13) and said mouth (14) is sufficient to allow the mutual engagement thereof.
2. A device according to claim 1, wherein said means for detecting the position of said rod (13) with respect to said mouth (14) comprise a magnetic position sensor.
3. A device according to one or more of the claims from 1 to 2, wherein said moving means connected to said movable mouth (14) comprise a shaft (16) connected to said movable mouth (14) associated with an electric motor (17) provided with a drive circuit.
4. A device according to claim 3, wherein said means for moving the movable mouth (14), comprise a first cam (18) integrally connected to the end of the shaft of said electric motor (17) and adapted to engage a second cam (19) integrally connected to an end of said shaft (16) and associated with resistant means adapted to hold said second cam (19) in the position corresponding to the open position of the movable mouth (14), said first cam (18) and said second cam (19) being capable of rotating between two end positions, one corresponding to the opening of the movable mouth (14), the other corresponding to the closure of said movable mouth (14).
5. A device according to claim 4, wherein the second cam (19) is associated with a first electrical switch (20), which is associated, in turn, with the drive circuit of the electric motor (17) so that, upon reaching the position corresponding to the closure of said movable mouth (14), the second cam (19) actuates said first electrical switch (20) so as to block the rotation of the motor (17) and hold stably the movable mouth (14) in a closed position.
6. A device according to claim 5, wherein the first cam (18) is associated with a second electrical switch (21), which is associated, in turn, with the drive circuit of the electric motor (17) so that, upon reaching the position corresponding to the opening of the movable mouth (14), the first cam (18) actuates said second electrical switch (21) so as to block the rotation of the motor (17) and hold stably the movable mouth (14) in an open position.
7. A device according to one or more of the claims from 5 to 6, wherein said second cam (19) indirectly actuates said first electrical switch (20) by means of an auxiliary mechanism.
8. A device according to one or more of the claims from 5 to 7, wherein said first cam (18) indirectly actuates said second electrical switch (21) by means of an auxiliary mechanism.
9. A device according to one or more of the claims from 3 to 8, wherein said electric motor (17) comprises a reducer.
10. A device according to one or more of the claims from 1 to 9, wherein the first lock 10 comprises a handle associated with the rod (13) so as to actuate the movement of said rod (13) parallel to the plane of the door (12), between an extended closure position and a retracted opening position.
11. A device according to claim 10, wherein said handle is provided with key locking means, adapted to lock the handle in the position corresponding to the extended closure position of said rod (13).
12. A device according to one or more of the claims from 1 to 9 comprising a control circuit which can be operated by an external control and associated with the drive circuit of the electric motor (17), said control circuit being adapted to act on the drive circuit of the electric motor (17) so as to force the movement of the shaft of the electric motor (17) in such a direction as to promote the opening of the movable mouth (14).
13. A device according to one or more of the claims from 1 to 9 comprising a control circuit which can be operated by an external control and rod movement means (13) associated with said control circuit, said control circuit being adapted to act on said rod movement means (13) so as to guide said rod (13) towards the retracted opening position.

- 14.** A device according to one or more of the claims from 12 to 13, wherein said control circuit can be operated by means of a third electrical switch connected to a button.

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- 15.** A device according to claim 14, wherein said button is provided with key tightening means adapted to block the button.

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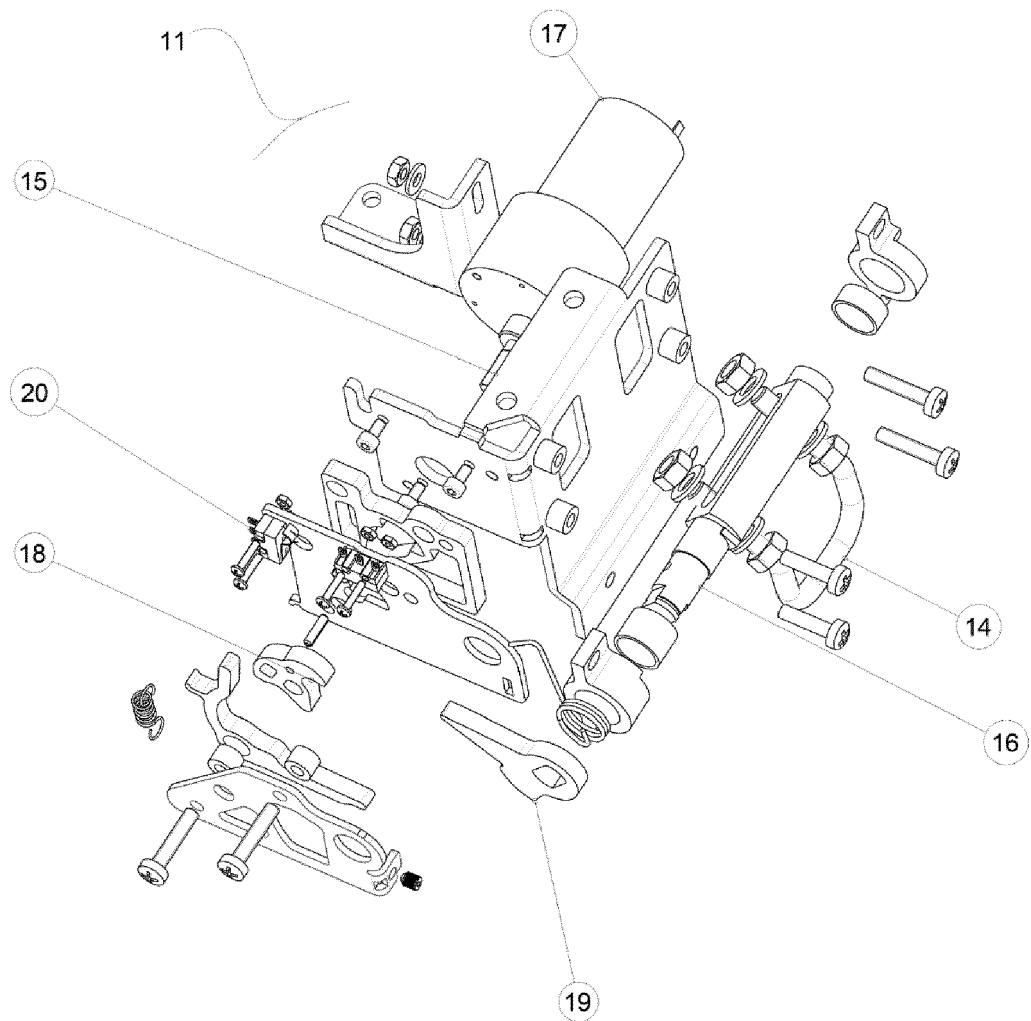


Fig. 1

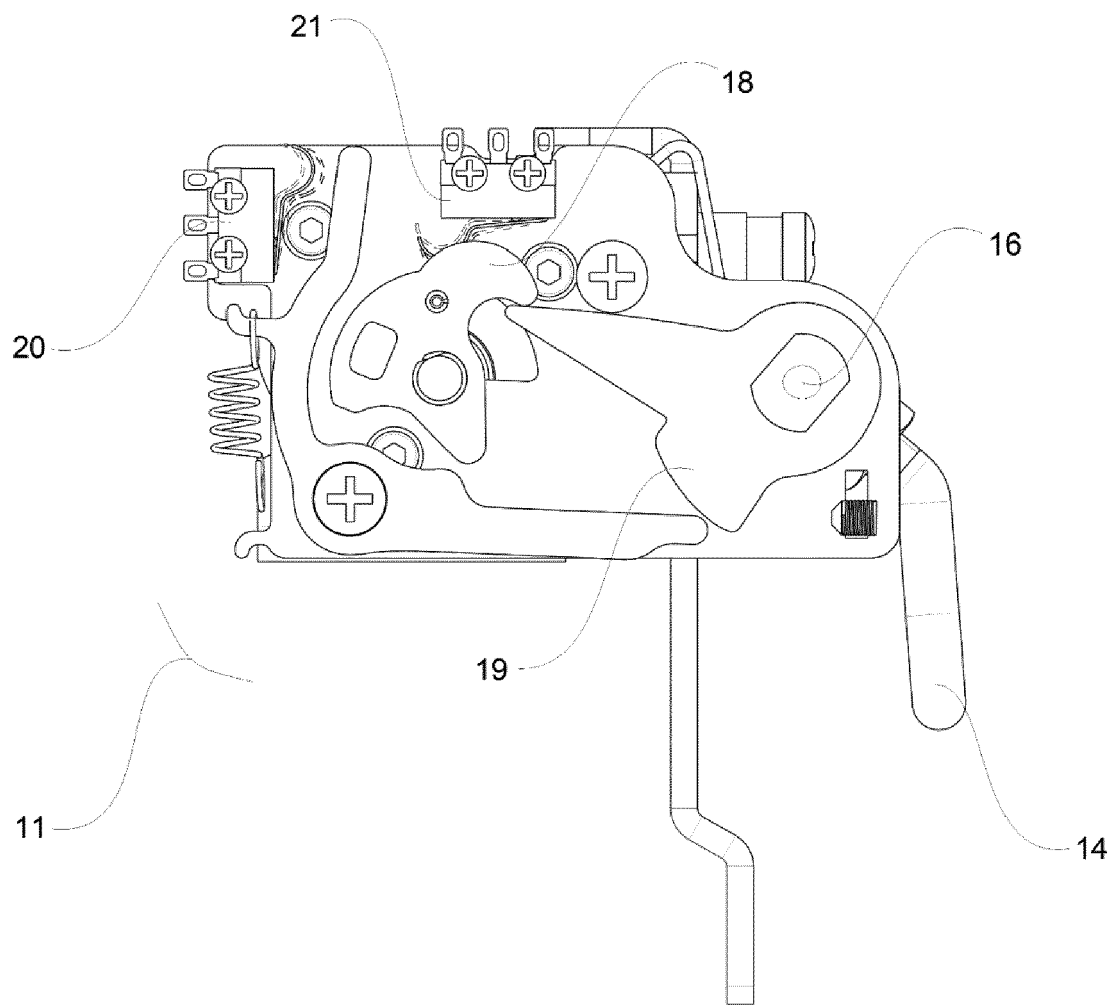


Fig. 2

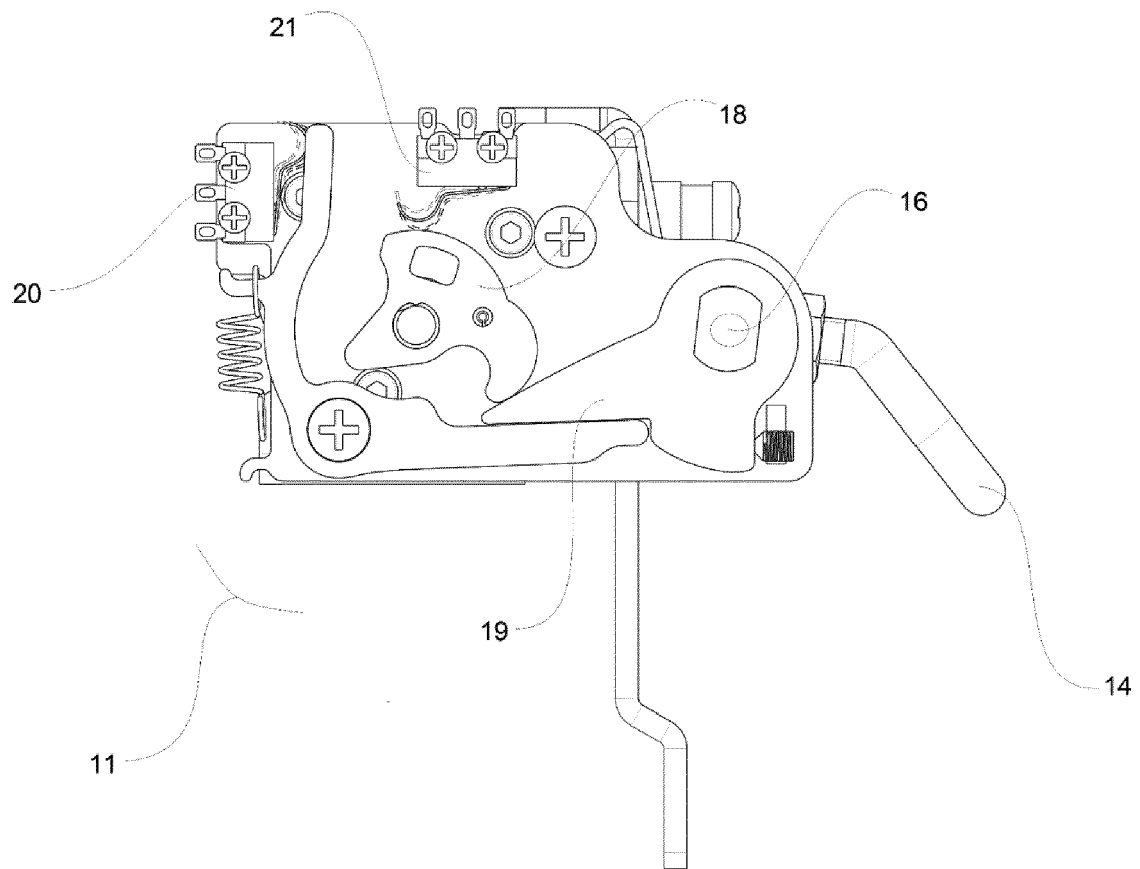


Fig. 3

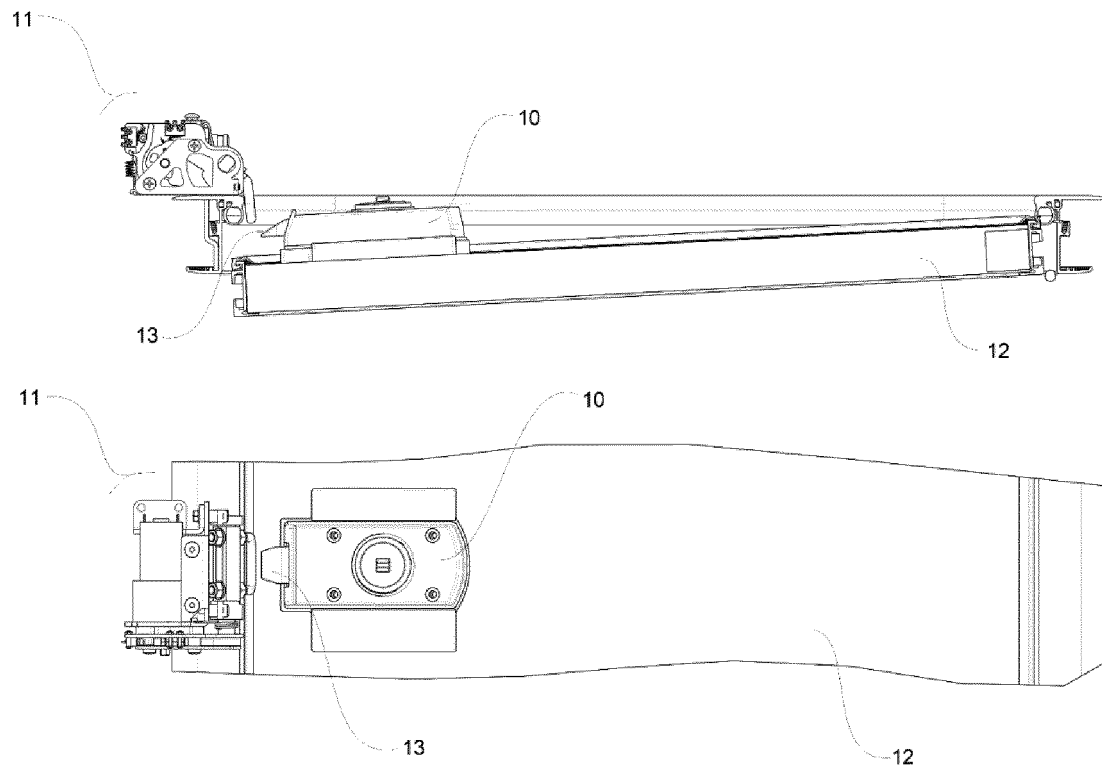


Fig. 4

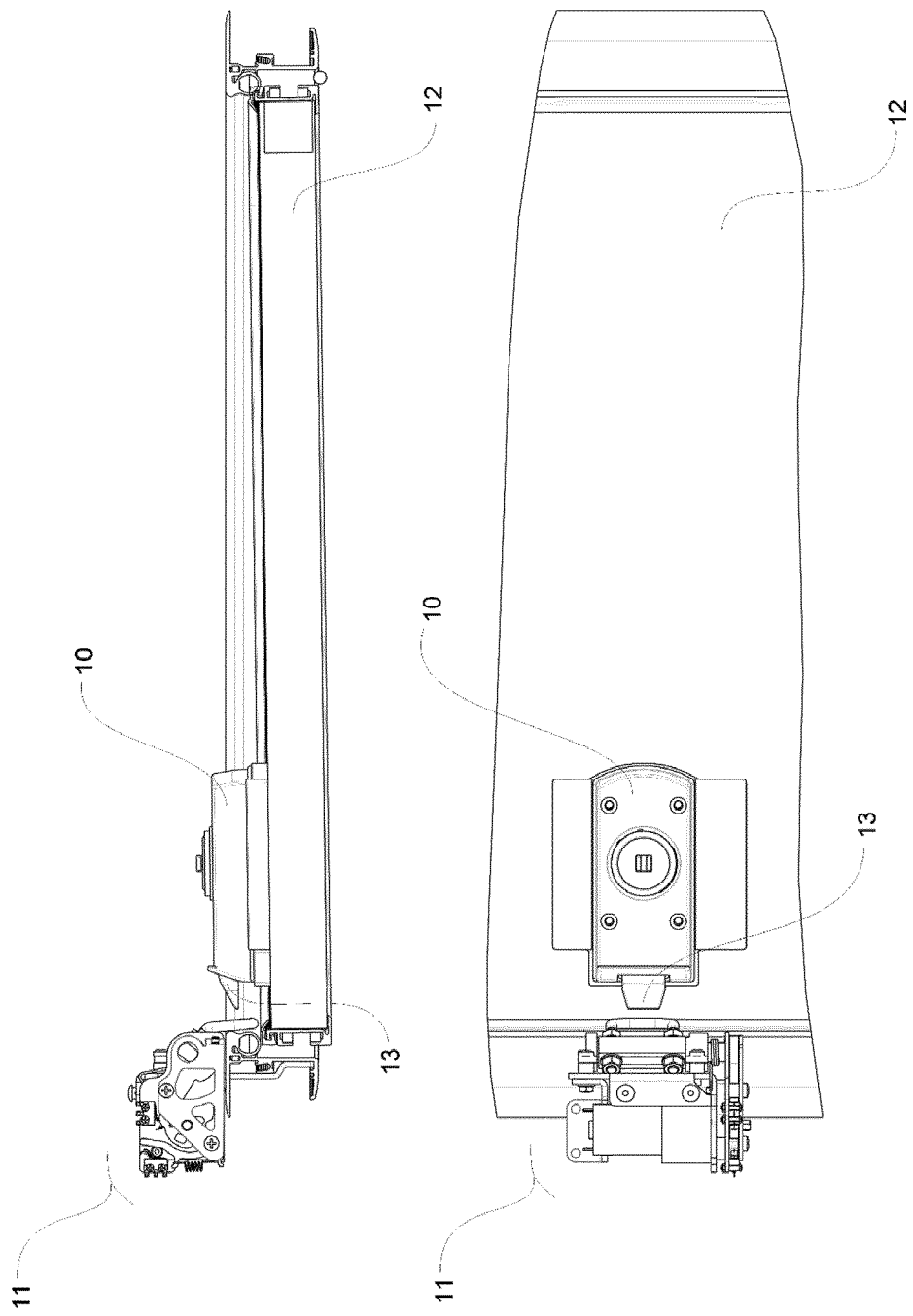


Fig. 5

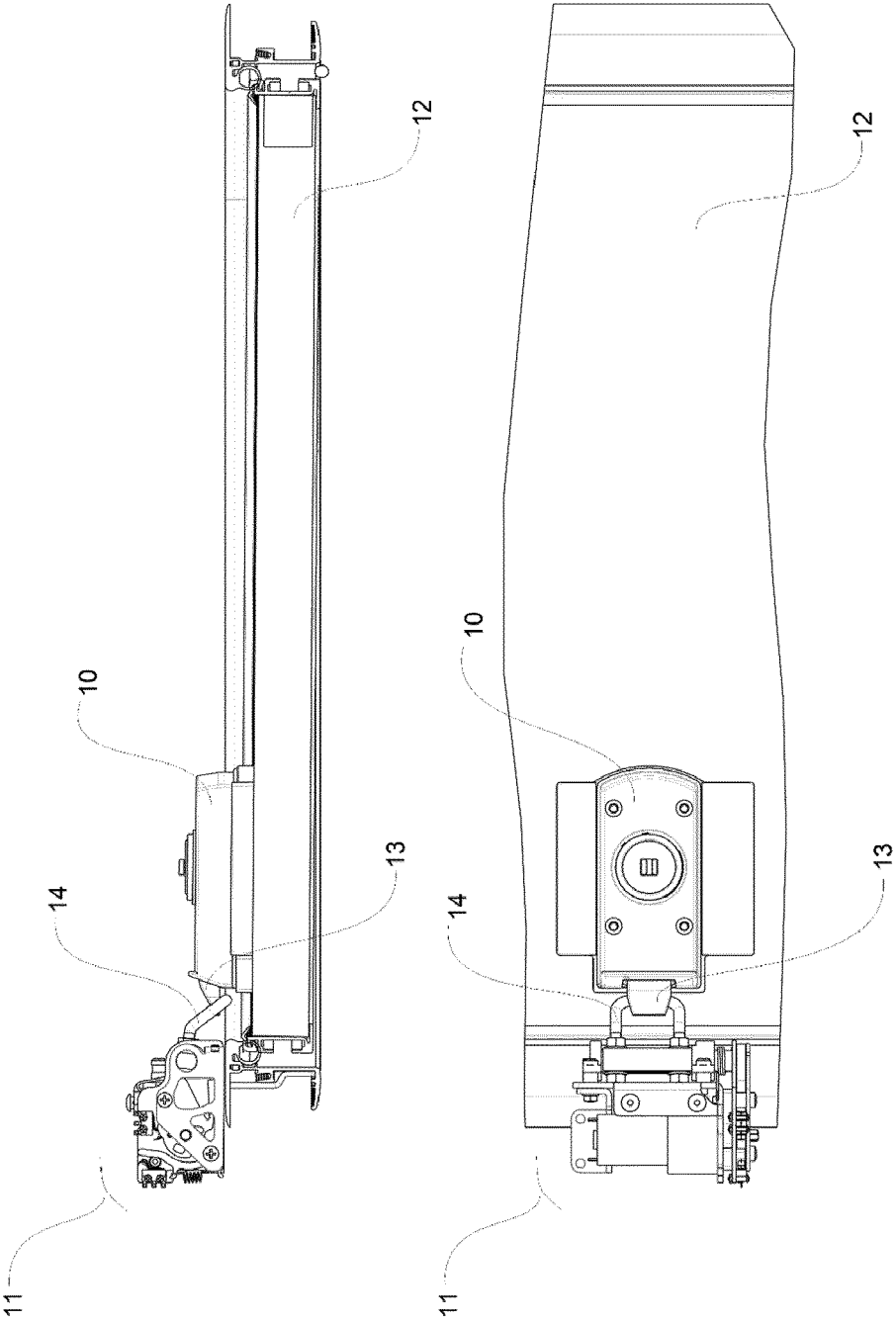


Fig. 6

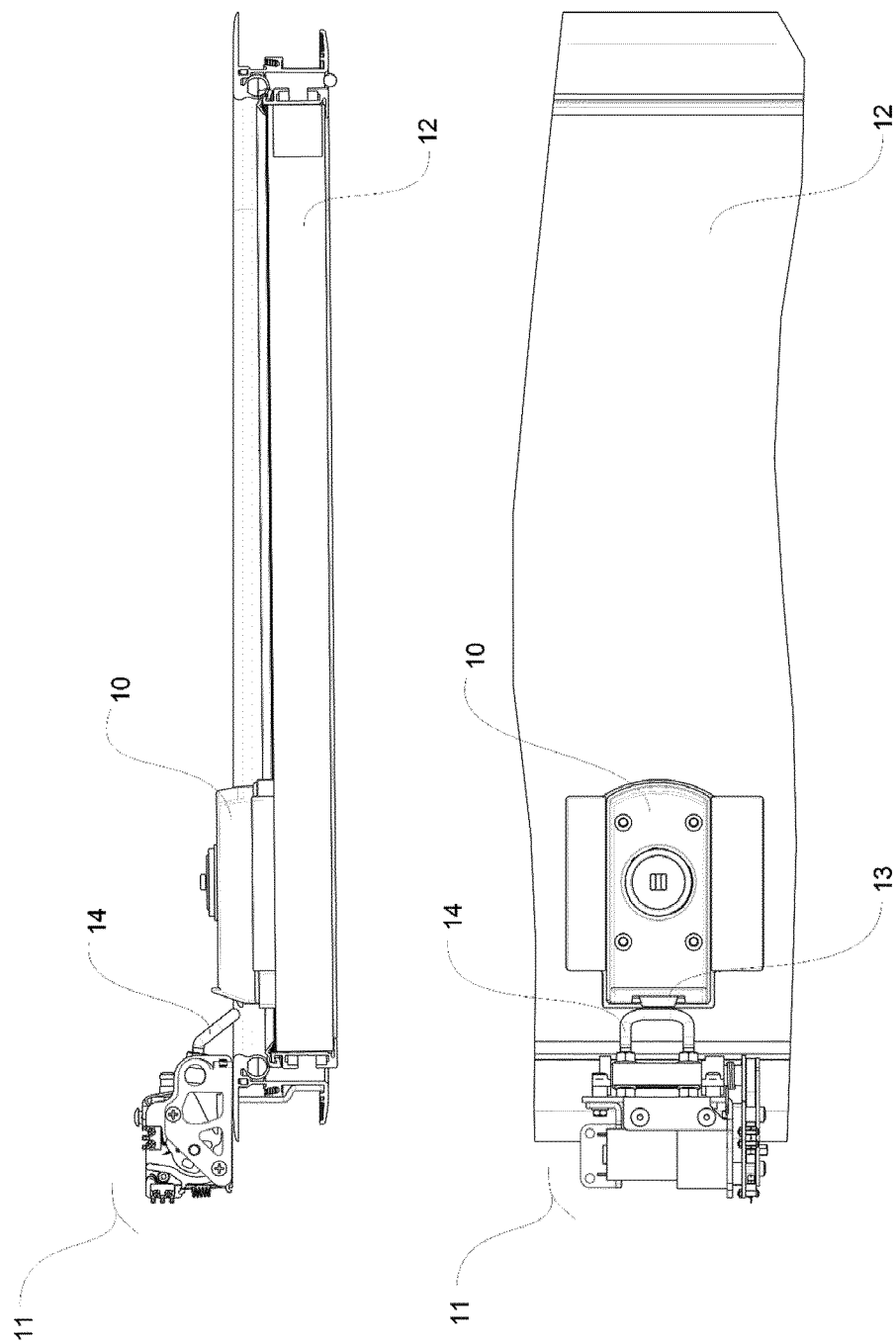


Fig. 7



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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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