(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 548 221 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.06.2005 Bulletin 2005/26

(51) Int Cl.[7]: **E05F 15/14**

(21) Application number: **04000605.8**

(22) Date of filing: **14.01.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **23.12.2003 IL 15953303**

(71) Applicant: **Alex Original LTD**
New Industrial Area, PO Box 8521 (IL)

(72) Inventor: **Horwitz, Alexander**
Netanya 42504 (IL)

(74) Representative: **Gervasi, Gemma, Dr.**
Notarbartolo & Gervasi GmbH,
Bavariaring 21
80336 München (DE)

(54) Sliding door mechanism for vehicles

(57) The present invention relates to the operation of sliding doors. The invention provides a mechanism comprising two sub-mechanisms for opening and closing a sliding vehicle door of the type commonly found in vans, buses and commercial vehicles.

The invention provide a mechanism for electrically opening and closing a sliding door on the side of a vehicle, the mechanism comprising a first and a second sub-mechanism, each of the sub-mechanisms being driven by its own electric motor, the first sub-mechanism being arranged to move the door in a direction parallel to the direction of vehicle motion, and the second sub-mechanism being arranged to move the door in a direction substationaly perpendicular to the direction of vehicle motion for latching and unlatching of the door.

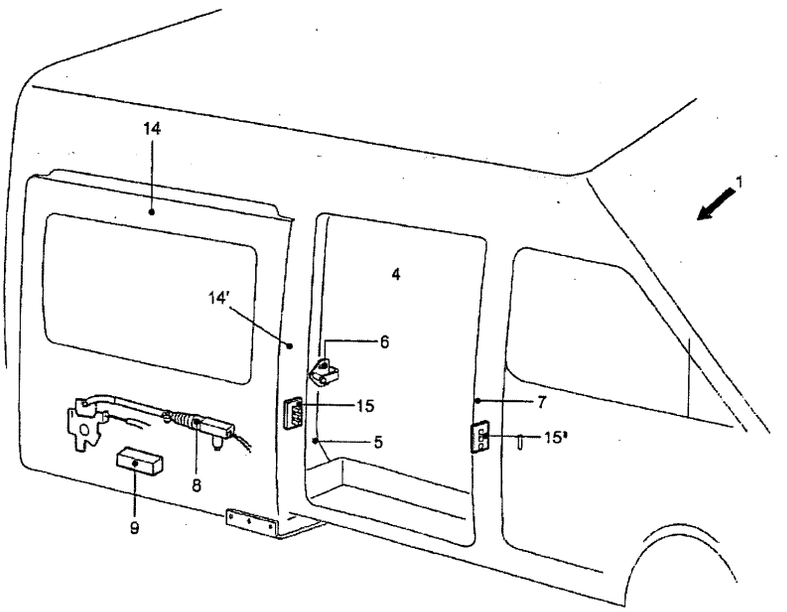

FIG. 1

EP 1 548 221 A2

Description

FIELD AND BACKGROUND OF THE INVENTION

[0001] The present invention relates to the operation of sliding doors.

More particularly, the invention provides a mechanism comprising two sub-mechanisms for opening and closing a sliding vehicle door of the type commonly found in vans, buses and commercial vehicles.

[0002] Vehicle sliding doors are often manually operated, which is quite satisfactory where the driver or an assistant dismounts for this purpose and operation is infrequent. A powered mechanism is however preferable where door operation is frequent and/or the driver is not to dismount during door operation. Today vans and minibuses are commonly used to transport typically 6 -22 passengers or delivery vans, and on taxis running on city routes door opening is frequent, and occurs on the side opposite the driver's seat and in a situation where the driver needs to remain in place. Clearly, such arrangement calls for a power-operated door.

[0003] Vehicle hinged doors can be pneumatically operated, but the long movement of a sliding door is more suitable for electrical operation.

[0004] Electrically operated vehicle sliding doors are known. A review of recent US Patents provides a fair picture of the state of the art.

In US Patent No. 4,289,995 Sorber et al. claim to an automatic motor-driven door closer provided with a slip clutch. By means of Zener diodes overspeeding of the motor is prevented. A slip clutch prevents motor overload.

Naganuma describes a system for controlling a vehicle power sliding door in US Patent 6,525,499 and application20010024093. The system uses a FET and PWM to regulate the motor, claiming to reduce the size of the power components needed.

Fukumoto et al disclose an opening and closing device for a sliding vehicle door in US Patent No. 6,530,619. The motor and cable drum are both to be built into the door, thus imposing strict size and power limits on these components. The system requires some flexible cable arrangement to power the motor.

A method for operating a vehicle power sliding door is disclosed by Long et al. in US Patent No. 6,588,829. The patent is primarily concerned with monitoring and control for preventing collision of the door with obstructions, and provides interconnection with a child guard mechanism.

Yokomori discloses a control method for sliding door operation in US Patent No. 6,618,997. The method entails the use of both an auxiliary wire drum brake and a clutch.

In patent application No US 2002/0112404A1 Minh Au Truong discloses a drive for a vehicle sliding door. A mechanical member transmits a torque provided by a slave motor. A flexible hauling element is connected to the door via a carriage running in a drive rail.

A basic problem with prior art door closures is that the motor provided is called upon to carry out two quite different tasks. The closing of car doors is so to say a two mode operation. In the first mode the door is moved to the closing position. In the second mode the locking mechanism attracts the locking pin to perform a latching operation which, so to say, seals the door. In order to open a door the first operation is to release the locking pin and the second to move the door to the open position. During door operation a fast, long, longitudinal stroke is required for covering/uncovering the open section of the vehicle side and to catch the locking pin. With regard to latching/unlatching, second mode, a short high-resistance lateral stroke is required. It is clear that prior art devices using a single motor for so to say both actions cannot perform in an optimum manner, and result in a requirement for superfluous electronic controls and oversized motors and gearing.

While it is possible to mount an electric motor inside the door, there are many disadvantages of doing so, such as space and power restrictions, the need for flexible power feed, and difficult maintenance access.

All known arrangement are mounted within the door or the side wall of the vehicle thus major changes are required, more so, electrical power must be supplied thus special wiring is required such wring supplying electric power to the components inside the door and for means provided for prevention of injury to users.

OBJECTS OF THE INVENTION

[0005] It is therefore one of the objects of the present invention to obviate the disadvantages of prior art mechanisms and to provide an electric sliding door operator which is powered by two separate motors sized and geared optimally to their tasks.

It is a further object of the present invention to position the assembly on the vehicle body to provide improved design flexibility and better maintenance access.

A further object of the present invention is to provide a sliding door without an electrical cable connection.

[0006] A further object of the present invention is to provide a controller for controlling all functions of operating the door.

[0007] It is yet a further object of the present invention to provide a low friction mechanism due to the use of two separate sub mechanisms.

It is finally an object of the present application to provide a stand alone assembly mechanism which could be mounted on any vehicle without the need to change the structure by mounting it underneath the vehicle and just by replacing the locking pin member.

SUMMARY OF THE INVENTION

[0008] The present invention achieves the above objects by providing a mechanism for electrically opening and closing a sliding door on the side of a vehicle, said

mechanism comprising a first and a second sub-mechanism, each of said sub-mechanisms being driven by its own electric motor, said first sub-mechanism being arranged to move said door in a direction parallel to the direction of vehicle motion, and said second sub-mechanism being arranged to move said door in a direction substationaly perpendicular to the direction of vehicle motion for latching and unlatching of said door.

[0009] In a preferred embodiment of the present invention there is provided an assembly mechanism for electrically opening and closing a sliding door attached to the body of the vehicle wherein said first sub mechanism comprises a cable drum driven by a geared electric motor, the extremities of the cable being anchored to said door and a second sub mechanism geared electric motor drives directly or indirectly a mechanism to operate said latching/unlatching of the door.

[0010] In a further preferred embodiment of the present invention there is provided a controller for controlling and synchronizing the two sub-mechanism and for controlling the movement of the door and the latching and unlatching thereof.

[0011] In a most preferred embodiment of the present invention the door is operated by RF signals.

[0012] Yet further embodiments of the invention will be described hereinafter.

[0013] It will thus be realized that the novel device of the present invention serves to relieve strain on the driver or assistant whether the vehicle is outfitted for carrying passengers or goods.

The electric motors used are powered by the vehicle electric system. Each motor is designed to drive at an optimum point on its speed/torque graph, and the design of one motor and drive system in no way inhibits design of the other. The motors and drive are accessible for maintenance.

The present invention refers to moving and latching the door. After closure of the door the door may be locked using any prior-art method. Preferably the lock is electrically operated, being easiest to merge into the door operation system.

For safety purposes it is possible to open the door by hand if power is unavailable or there is a breakdown or accident. This can be arranged by various means, for example by attaching the beam driving the door in a detachable manner, by designing the cable anchors to be removable, by adding slip clutches, or separating the motor from the pully in a mechanical manner. The apparatus of the present invention may be used with these - or other- types of emergency drive release mechanisms, which are not described in the present text. Likewise the whole assembly could be disconnected to enable operating the door manually.

SHORT DESCRIPTION OF THE DRAWINGS

[0014] The invention will now be described further with reference to the accompanying drawings, which represent by example preferred embodiments of the invention. Structural details are shown only as far as necessary for a fundamental understanding thereof. The described examples, together with the drawings, will make apparent to those skilled in the art how further forms of the invention may be realized.

[0015] In the drawings:

FIG. 1 is a schematic perspective illustration of a van type vehicle provided with the mechanism according to the invention.

FIG. 2 is a plan view of a preferred embodiment of the first sub-mechanism of the door operating mechanism according to the invention;

FIG. 3 is an elevational view of the same embodiment;

FIG. 4 is a view of the first sub-mechanism further provided with cable spring-loaded tensioner;

FIG. 5 is a plan view of a first embodiment of the second sub-mechanism;

FIG. 6 is a plan view of a second embodiment of the second sub-mechanism and

FIG. 7 is a block diagram representing the mechanism.

FULL DESCRIPTION OF THE INVENTION

[0016] There is seen in FIG. 1 a van 1 provided with a sliding door 14 to close opening 4. On side piler 5 there is mounted locking pin member 6. The original van's locking pin member 6 is replaced by a movable mechanism 60 (FIG. 5 and 6). Within door 14 there is further provided the locking pin release mechanism 8, which is operated by the controller.

[0017] On the door's side piler 14 there are provided electric spring contacts 15 adapted to engage contacts 15' mounted on side piler 7. There will be further provided within door 14 a receiver/transmitter 9 adapted to receive signals from the controller in order to activate release mechanism 8. The transmitter will be powered by a chargeable battery.

[0018] Contacts 15 are adapted to charge the battery on the hand and enable the controller to recognize the position of the door on the other hand.

[0019] There is seen in FIG. 2 and FIG. 3 a first sub-mechanism 12 for electrically opening and closing a sliding door 14 on the side of a vehicle. The first sub-mechanism 12 is a part of the mechanism assembly 10 represented in FIG. 7.

A geared electric motor 18 drives a cable drum 20. As both extremities 22, 24 of the cable 26 are firmly anchored to the sliding door 14 itself, or as seen in the figure, anchored to a beam 28 projecting therefrom, the door 14 is pulled longitudinally along prior-art rails (not seen) accessible along the outer side of the vehicle to close/open the vehicle aperture 4. The cable drum 20 together with plurality of cable pulleys 30, 32, 34, 36, 38, 40, 42 revolvably supported on a bracket 44 rigidly

attached to the vehicle pulls the door 14 in a direction parallel to the direction of vehicle motion, to open/close door 14.

With reference to the rest of the figures, similar reference numerals have been used to identify similar parts.

[0020] Referring now to FIG. 4, there is seen a part of a first sub-mechanism 50 for electrically opening and closing a sliding vehicle door 14. The first sub-mechanism 50 is provided with two spring-loaded tensioner pulleys 34, 38 in contact with the cable 26, as seen in the previous figures.

[0021] FIG. 5 illustrates a second sub-mechanism 54 for electrically opening and closing a sliding door 14. When the door 14 is fully closed an electrical signal generated by pressure on the "OPEN" button 56 (see FIG. 7), accessible to the vehicle driver, will activate the second sub-mechanism 54 which comprises a geared electric motor 58 driving an eccentrically-mounted excenter element 60 which replaced the original locking pin member 6 and adapted to engage latching mechanism 78. Latching mechanism 78 is released either in a conventional manner or by release mechanism 8 (FIG. 1), which enable the first sub-mechanism to slide-open the door.

[0022] Seen in FIG. 6 is a preferred embodiment of a second sub-mechanism 66 which is useful for vehicles wherein lateral space is limited. The sub-mechanism 66 electrically moves the vehicle sliding door 14 between its inner, latched position and its outer position allowing longitudinal travel.

A geared electric motor 68 drives a rack 70 and pinion 72. The rack 70 drives a crank mechanism 74 to operate the latching/unlatching slide 76.

[0023] The system functions in the following manner: Assuming the door 14 is in an open position, pressure on "close" button 64 (see FIG.7) will cause the controller to generate a signal to geared motor 18 to move the door 14 longitudinally to close position. When electric spring contacts 15' will engage contacts 15 the controller will activate second geared motor 68 for ½ a second, consequently the door will be attracted and latched.

In order to open the door, pressure on button 56 (see FIG.7) will cause the controller to generate a signal to the second sub-mechanism which will activate motor 68 for ½ a second pushing the door out and thus release the load on locking pin 60. Release mechanism 8 will release the lock, and geared motor 18 will move the door to its open position.

It would be within the scope of the invention to provide micro-switches on the door handle to enable the opening or closing of the door from the out side or inside. The switches operate in parallel to push buttons 56 and 64. The controller (not seen) is monitoring the torque required for moving the door to the closing position, to the slightest resistance - due to an obstruction - a signal generated by the controller will reverse the movement of the door. The signals to the motors will preferably transmitted by an RF transmitter.

FIG. 7 is a diagrammatic representation of the mechanism 10. The mechanism 10 comprises a first 12 and a second sub-mechanism 54, each of the sub-mechanisms being driven by its own electric motor which have been described. The Mechanism further comprises a release mechanism 8 and a transmitter 9.

[0024] The scope of the described invention is intended to include all embodiments coming within the meaning of the following claims. The foregoing examples illustrate useful forms of the invention, but are not to be considered as limiting its scope, as those skilled in the art will readily be aware that additional variants and modifications of the invention can be formulated without departing from the meaning of the following claims.

Claims

1. A mechanism for electrically opening and closing a sliding door on the side of a vehicle, said mechanism comprising a first and a second sub-mechanism, each of said sub-mechanisms being driven by its own electric motor, said first sub-mechanism being arranged to move said door in a direction parallel to the direction of vehicle motion to open/close said door, and said second sub-mechanism being arranged to move said door in a direction substantially perpendicular to the direction of vehicle motion for latching and unlatching of said door.

2. The mechanism for electrically opening and closing a sliding door as claimed in claim 1, wherein said first sub mechanism comprises a cable drum driven by a geared electric motor, the extremities of said cable being anchored to said door.

3. The mechanism for electrically opening and closing a sliding door as claimed in claim 2, further provided with at least one spring-loaded tensioner pulley in contact with said cable.

4. The mechanism for electrically opening and closing a sliding door as claimed in claim 1, wherein said mechanism is mounted underneath the vehicle.

5. The mechanism for electrically opening and closing a sliding door as claimed in claim 1, wherein said second sub-mechanism comprises a geared electric motor driving an eccentrically-mounted element driving a latching/unlatching slide.

6. The mechanism for electrically opening and closing a sliding door as claimed in claim 5, wherein said geared electric motor drives a rack and pinion and said rack drives a crank mechanism to operate said latching/unlatching slide.

7. The mechanism for electrically opening and closing

a sliding door as claimed in claim 1, wherein there is further provided a receiver/transmitter mounted within the door.

8. The mechanism for electrically opening and closing a sliding door as claimed in any of claims 1 to 7 wherein a controller is provided to control and synchronize the mechanism.

9. The mechanism for electrically opening and closing a sliding door as claimed in claim 7 wherein said controller generates RF signals to said receiver/transmitter and/or vise versa.

10. A mechanism for electrically opening and closing a sliding door on the side of a vehicle, said mechanism comprising a first and a second sub-mechanism, each of said sub-mechanisms being driven by its own electric motor, substantially as described hereinbefore and with reference to the accompanying drawings.

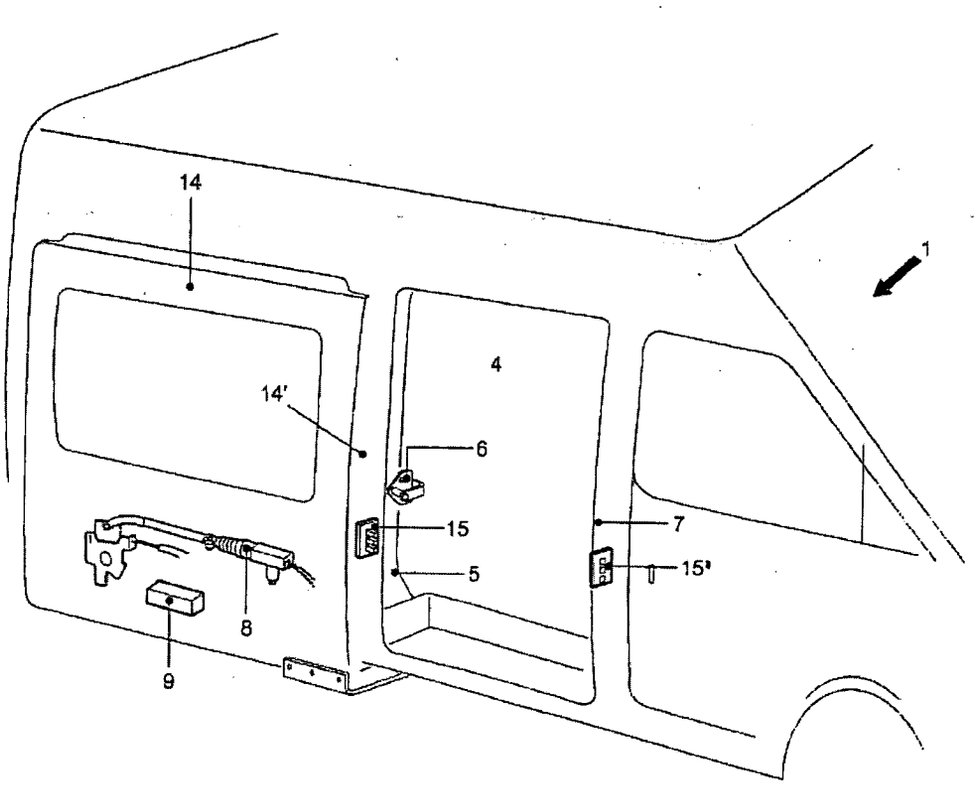

FIG. 1

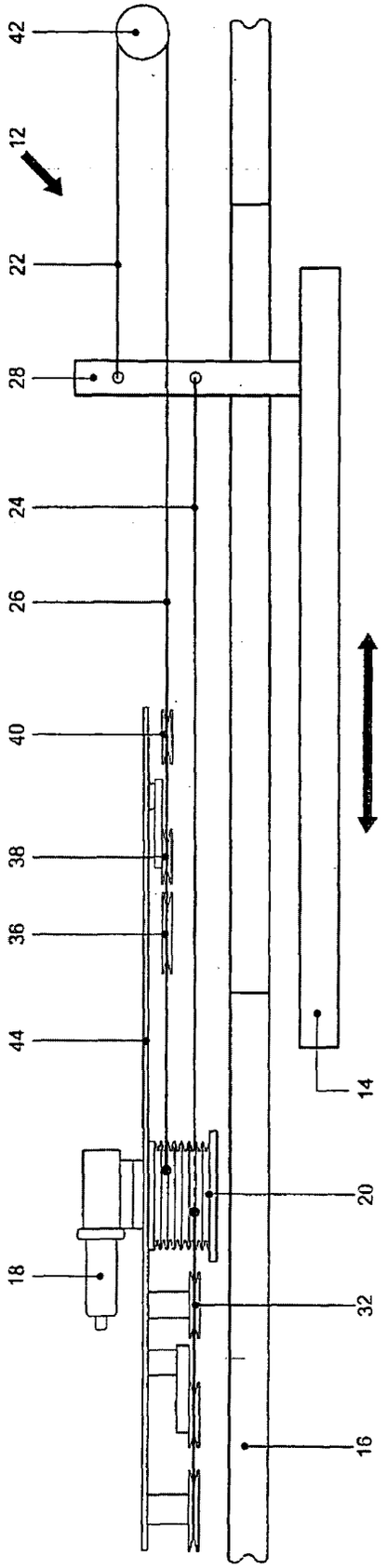

FIG. 2

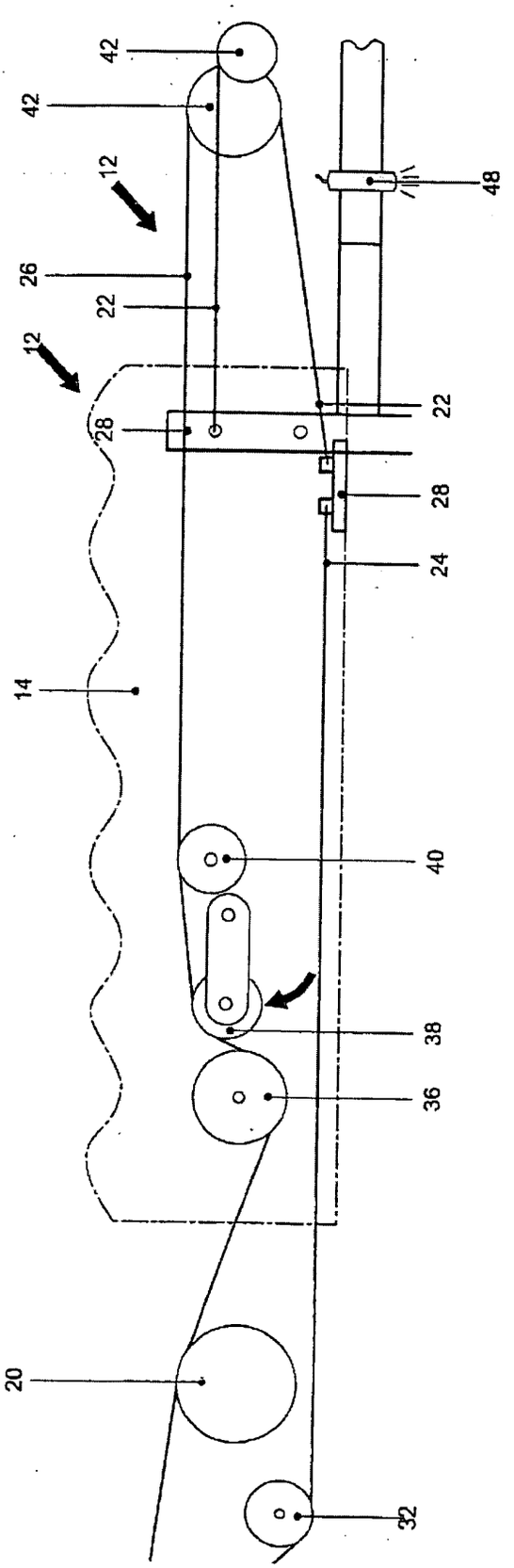

FIG. 3

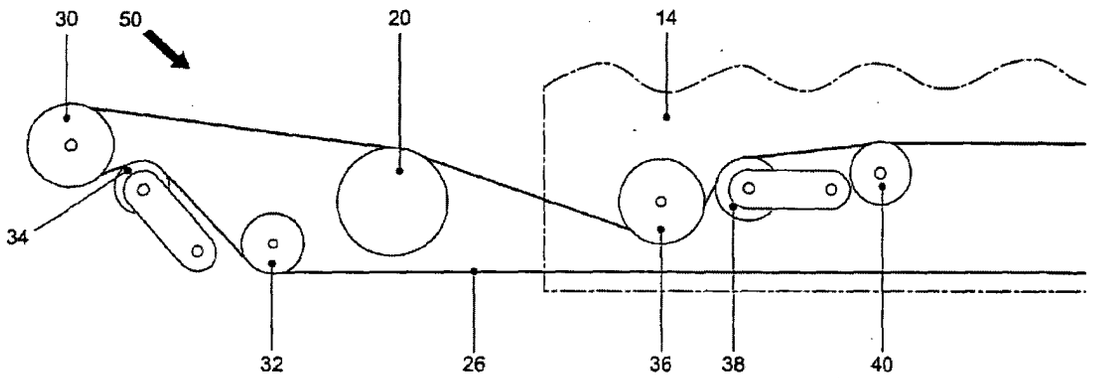

FIG. 4

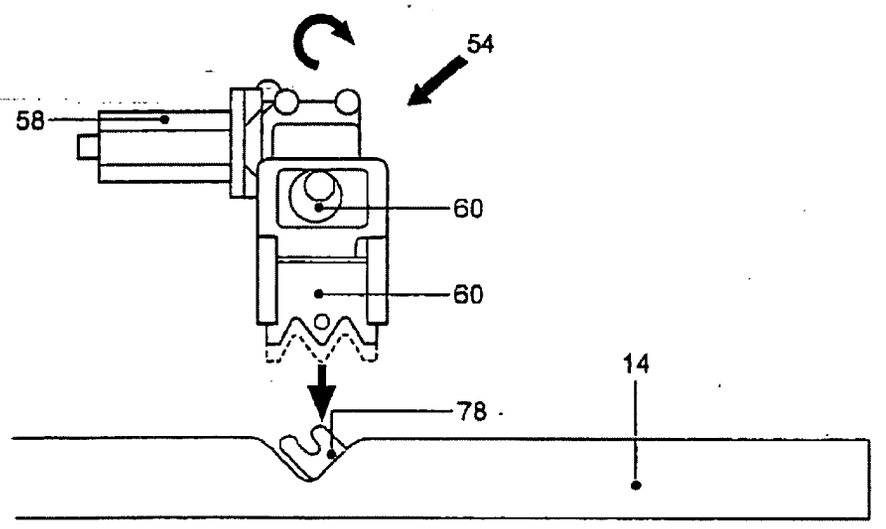

FIG. 5

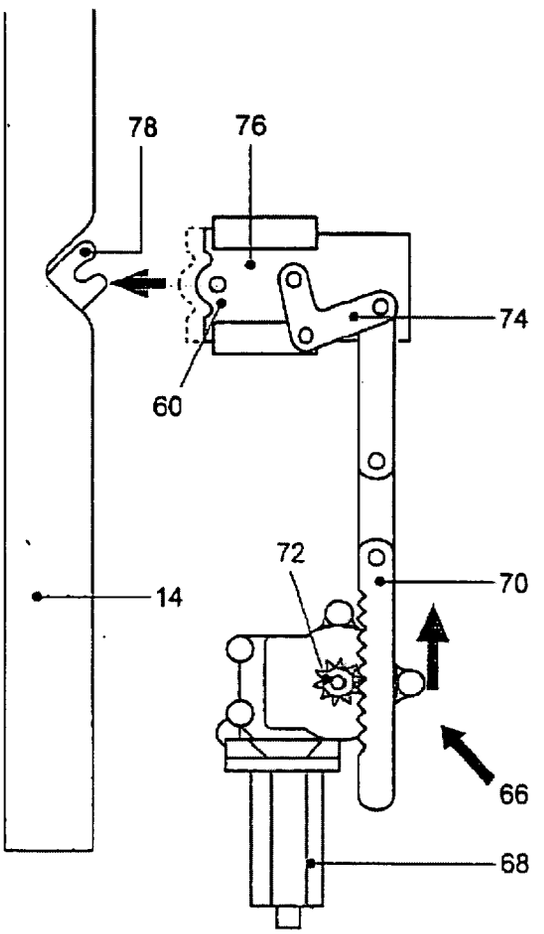

FIG. 6

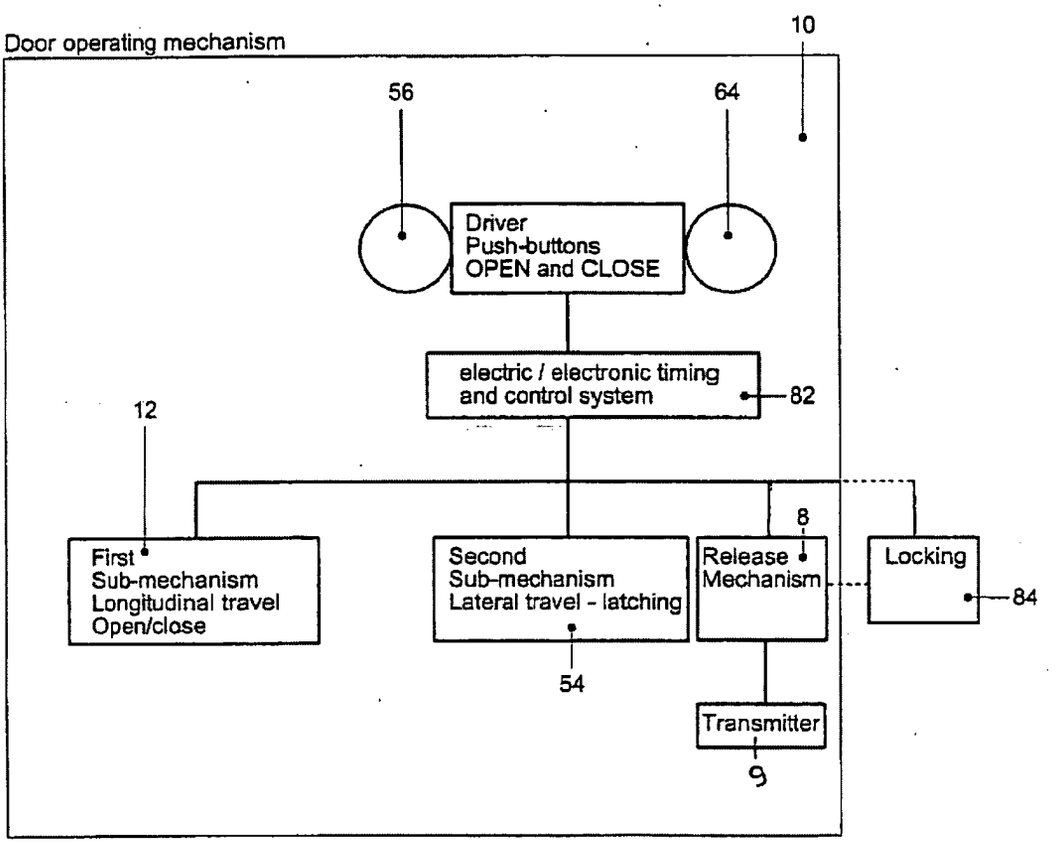
Door operating mechanism
10
56
64
Driver
Push-buttons
OPEN and CLOSE
electric / electronic timing
and control system
82
12
8
First
Sub-mechanism
Longitudinal travel
Open/close
Second
Sub-mechanism
Lateral travel - latching
Release
Mechanism
Locking
84
54
Transmitter
9

FIG. 7