



(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.08.2001 Bulletin 2001/31

(51) Int Cl.7: E05F 11/54

(21) Application number: 01300771.1

(22) Date of filing: 29.01.2001

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

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(30) Priority: 28.01.2000 GB 0001895

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(54) Apparatus and method of operating a door

(57) An apparatus for, and method of, operating a door, and particularly a sliding rear door of a vehicle, is described. The apparatus includes a door member which may consist of a door bracket and a connecting member, which may be 'L' shaped. First and second connection means which may be in the form of cables are provided such that the first connection means is operable between the door member and a first actuation

mechanism, such as a handle. The second connection means is operable between the door member and a second actuation mechanism, such as a second handle, such that operation of the first actuation mechanism moves the first connection means which causes movement of the door in a first direction, and operation of the second actuation mechanism moves the second connection means which causes movement of the door in a second direction.

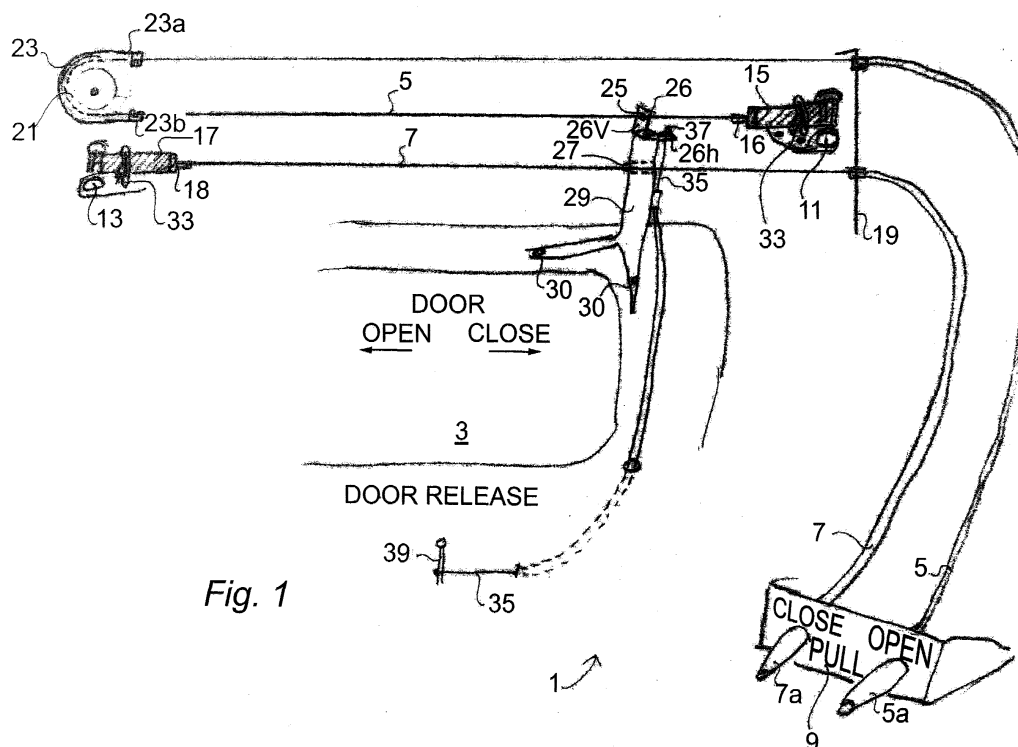


Fig. 1

Description

[0001] The present invention relates to an apparatus and method of operating a door, and more particularly, but not exclusively, relates to an apparatus and method of operating a door of a vehicle driven by a taxi, chauffeur, van or delivery driver.

[0002] Conventionally, many vehicles used by taxi drivers, particularly those with more than five seats, have sliding doors to allow passenger access to the rear seats in the vehicle; examples of such vehicles are a mini-bus, people carrier, mini-van etc.. Presently, the sliding door can either be operated by the passengers to open and close the door, or can be operated by the driver who has to leave their front seat in the vehicle and walk around to the sliding door to operate it from the outside. For some types of passengers such as children, or the infirm, it is essential for the driver to leave the driving cabin to open and close the sliding door in such a manner, and hence this is an inconvenience to, as well as a time consuming exercise for, the driver. Alternatively, an electrically operated sliding door mechanism is available, and which can be actuated by the driver to open and close the rear sliding door, but this arrangement is relatively complex and expensive.

[0003] According to a first aspect of the present invention, there is provided an apparatus for operating a door, the apparatus comprising:-

a first connection means; and
a second connection means;
the first connection means being operable between the door and a first actuation mechanism;
the second connection means being operable between the door and a second actuation mechanism;
such that operation of the first actuation mechanism moves the first connection means which causes movement of the door in a first direction; and
operation of the second actuation mechanism moves the second connection means which causes movement of the door in a second direction.

[0004] According to a second aspect of the present invention, there is provided:-

a first connection means; and
a second connection means;
the first connection means being operable between the door and a first actuation mechanism;
the second connection means being operable between the door and a second actuation mechanism;
the method comprising operating the first actuation mechanism to move the first connection means which causes movement of the door in a first direction; and
operating the second actuation mechanism to move the second connection means which causes movement of the door in a second direction.

[0005] Preferably, the apparatus further comprises a door member. Preferably, operation of the first actuation mechanism moves the first connection means which causes movement of the door member which further causes movement of the door in a first direction.

[0006] According to a third aspect of the present invention, there is provided an apparatus for operating a door, the apparatus comprising:-

a door member;
a first connection means; and
a third connection means;
the first connection means being operable between the door member and a first actuation mechanism;
the third connection means being operable between the door member and a door release mechanism;
such that operation of the first actuation mechanism moves the first connection means which causes movement of the door member which further moves the third connection means to operate the door release mechanism.

[0007] According to a fourth aspect of the present invention, there is provided a method of operating a door, the door comprising:-

a door member;
a first connection means; and
a third connection means;
the first connection means being operable between the door member and a first actuation mechanism;
the third connection means being operable between the door member and a door release mechanism;
the method comprising operating the first actuation mechanism to move the first connection means which causes movement of the door member which further moves the third connection means to operate the door release mechanism.

[0008] Preferably, further operation of the first actuation mechanism further moves the first connection means which causes further movement of the door member which causes movement of the door in a first direction.

[0009] Preferably, a second connection means is also provided, where the second connection means is operable between the door member and a second actuation mechanism, such that operation of the second actuation mechanism moves the second connection means which causes movement of the door in a second direction.

[0010] According to a fifth aspect of the present invention, there is provided an apparatus for operating a door, the apparatus comprising:-

a door member; and
a first connection means; wherein

the first connection means being operable between the door member and a first actuation mechanism; such that operation of the first actuation mechanism moves the first connection means which causes movement of the door from a closed door configuration towards an open door configuration.

[0011] According to a sixth aspect of the present invention, there is provided a method of operating a door, the door being provided with:-

a door member; and
a first connection means; wherein
the first connection means being operable between the door member and a first actuation mechanism; the method comprising operating the first actuation mechanism to move the first connection means which causes movement of the door from a closed door configuration towards an open door configuration.

[0012] According to a seventh aspect of the present invention, there is provided an apparatus for operating a door, the apparatus comprising:-

a door member; and
a second connection means; wherein
the second connection means being operable between the door member and a second actuation mechanism;
operation of the second actuation mechanism moves the second connection means which causes movement of the door from an open door configuration towards a closed door configuration.

[0013] According to an eighth aspect of the present invention, there is provided a method of operating a door, the door being provided with:-

a door member; and
a second connection means; wherein
the second connection means being operable between the door member and a second actuation mechanism;
the method comprising operating the second actuation mechanism to move the second connection means which causes movement of the door from an open door configuration towards a closed door configuration.

[0014] Typically, the first direction of the door is movement from a closed door configuration toward an open door configuration, and the second direction is movement from an open door configuration toward a closed door configuration.

[0015] Preferably, one, some or all of the first, second and third connection means comprise cables, wires or the like (hereinafter referred to as cables), where the

first and/or second cables are preferably provided with a handle formed at one end thereof, and a biasing mechanism at the other end thereof. Typically, the biasing mechanism comprises a return device which assists in return of the first and/or second cables to a rest configuration.

[0016] The first and/or second cables are typically provided with a striking member which is adapted to provide a friction fit with a door member. The door is typically provided with a bracket, frame, member or the like (hereinafter referred to as bracket), and typically, the door member comprises a connecting member and a bracket, wherein the connecting member is coupled to the bracket. Preferably, the door member is pivotally coupled to the bracket. The striker member of the first cable preferably forms a friction fit with an aperture formed in a portion of the connecting member, and the striker member of the second cable preferably forms a friction fit with an aperture formed in the bracket. Preferably, the connecting member is an "L" shaped member which, in a rest configuration, has a vertical leg, and a horizontal leg, the lower end of the vertical leg being secured to the horizontal leg. Typically, with the connecting member in a rest configuration, the horizontal leg preferably extends outwardly from the vertical leg in a direction parallel to the second direction of movement of the door. Typically, the connecting member is biased toward the rest configuration.

[0017] Typically, the door is a sliding door of a vehicle, such as a passenger sliding door, which may be a rear passenger sliding door.

[0018] The apparatus is preferably provided with a mounting means to support and/or retain the handles in a rest configuration, and more preferably, the mounting means is located in close proximity to a driver, such as a location within the driver's cabin.

[0019] Typically, the first cable is provided with a roller unit to transform the direction of travel of the first cable through 180°, and the roller may be provided with a groove around the outer diameter thereof to facilitate location of the first cable therein.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which -

Fig. 1 is a schematic view of an apparatus in accordance with the present invention;

Figs. 2a - 2d are various views of a gear for a gearing mechanism used with the apparatus of the present invention; and,

Fig. 3 is a perspective view of a gearing mechanism used with the apparatus of the present invention.

[0020] Fig. 1 shows a remote control mechanism 1 for operating a side mounted sliding door 3 of a vehicle (not shown) such as a taxi which may be in the form of a minibus, people carrier, mini-van or the like.

[0021] The remote control mechanism 1 comprises

two cables, the first of which is an open cable 5 which can be pulled by the driver of the vehicle to open the sliding door 3, and the second of which is a close cable 7 which can be pulled by the driver to close the sliding door 3. Each of the open 5 and close 7 cables is provided with a suitably shaped handle 5a, 7a to facilitate the driver pulling upon respective cable 5, 7. The handle 5a, 7a end of the respective cables 5, 7 pass through apertures (not shown) formed in an anchor plate 9, where the anchor plate 9 is mounted within the driver's cab at a suitable location, such as the dashboard, such that the driver can easily reach both handles 5a, 7a whilst sitting in the driver's seat of the vehicle.

[0022] The other end of the cables 5, 7 is attached to respective first 11 and second 13 return springs via respective rollable straps 15, 17, such that the return springs 11, 13 return the respective cables 5, 7 and hence respective handles 5a, 7a to their initial position once they have been pulled, and this initial position is that illustrated in Fig. 1. In alternative embodiments the return springs 11 and 13 may be provided in a cylindrical housing (not shown) and connected directly to the cables 5, 7. The return spring biasing force may be adjustable to provide greater control over the return action of the cables 5, 7.

[0023] The cables 5, 7 run from the driver's anchor plate 9 to a door anchor point 19 which is located above and to the front of the door 3 closed position. The open cable 5 continues through an aperture in the door anchor point 19, around a roller 21 and onward to the rollable strap 15. The cable 5 locates within a groove (not shown) formed in the roller 21, and location of the cable 5 within the groove is facilitated by means of a cable guide 23, such that the roller has transformed the direction of travel of the cable 5 through 180°.

[0024] The cable 5 is secured to the rollable strap 15 via a striker plate 16. The cable guide 23 has an entrance 23a and an exit 23b, and the cable 5 passes freely through an aperture 25 formed in the vertical leg 26v of an "L" shaped hinged catch 26, where the hinged catch 26 is located between the exit 23b and the striker plate 16.

[0025] It should be noted that the cable 5 should be configured such that, when the door 3 is in the closed position, the striker plate 16 is arranged in relatively close proximity to the vertical leg 26v, and the return spring 11 maintains a return pressure or bias upon the rollable strap 15 and hence cable 5. In this manner, the cable 5 is kept relatively taught when in the normal rest position, as shown in Fig. 1.

[0026] The door close cable 7 runs from one end which is attached to the handle 7a, through an aperture in the anchor plate 9 and up to the door anchor point 19. The cable 7 passes through an aperture formed in the door anchor point 19 and onwards through an aperture 27 formed in a door bracket 29 which is secured to the door 29 by any suitable means, such as screws 30. However, other suitable securing means could also be

used, such as welding or bolts, or the door bracket could be formed integrally with the door 3. The close cable 7 continues freely through the aperture 27 in the door bracket 29, and is secured to one end of a rollable strap 17 by means of a striker plate 18. The other end of the rollable strap 17 is secured to the second return spring 13.

[0027] It should be noted that the "L" shaped hinged catch 26 is pivotally hinged to the upper end of the door bracket 29 at a location above the aperture 27 through which the close cable 7 passes. The close cable 7 should be configured such that, when the door 3 is in the open position (not shown), the striker plate 18 is in relatively close proximity to the aperture 27 in the door bracket 29, and also that when the door is in this open position the return spring 13 maintains a return pressure or bias on the closed cable 7. However, it should be noted that the "L" shaped hinged catch 26 could be replaced by a part-circular (such as quarter or half) or fully circular wheel (not shown) which is similarly pivotally mounted with respect to the door bracket 29 and upper end of close cable 7.

[0028] The first and second return springs 11, 13 can suitably be in the form of a modified inertia reel seat belt (with the braking/locking mechanism disabled or removed), and roller strap guides 33 are provided to aid the paying out and return of the rollable straps 15, 17 from the first 11 and second 13 return springs.

[0029] The remote control mechanism 1 further comprises a third cable 35 which is anchored at its upper end to the horizontal leg 26h of the "L" shaped hinge catch 26 by any suitable means such as passing through an aperture therein and being provided with a cable end stop 37 at its very uppermost end, where the cable end stop 37 is of a greater diameter than the aperture through the horizontal leg 26h. The third cable 35 runs downwardly from the cable end stop 37, through the aperture in the horizontal leg 26h, through the interior of the door frame 3, and the lower end of the cable 35 is secured to the door release lever 39. It should be noted that the "L" shaped hinged catch 26 is configured such that it normally lies in the position shown in Fig. 1.

[0030] A method of operating the remote controlled mechanism 1 will now be described. The driver of the vehicle 5, in order to open the door 3, pulls upon the handle 5a. This results in the striker plate 16 moving toward the vertical leg 26v. The striker plate 16 is arranged such that it forms an interference fit with the aperture 25, and continued pulling of the handle 5a results in the hinged catch 26 being forced to pivot around the pivot point. This results in the hinged catch 26 rotating anti-clockwise with reference to Fig. 1 such that the outer end of the leg 26h pulls the third cable 35 upwardly, thus operating the door release lever 39. The door 3 is now capable of sliding, from right to left as shown in Fig. 1, to the open position. Continued pulling of the handle 5a results in the striker plate 16 continuing to move, from right to left as shown in Fig. 1, such that it drags the

hinged catch 26, door bracket 29 and hence door 3 from right to left such that the door 3 is moved to the open position. When the sliding door 3 has been moved to the required open extent, the driver can release his grip upon handle 5a, and the first return spring 11 operates to pay in the rollable strap 15 and hence moves cable 5 to its return position as shown in Fig. 1.

[0031] When the driver requires to close the sliding door 3, he pulls upon handle 7a. This results in cable 7 and hence striker plate 18 moving from left to right as shown in Fig. 1. This movement results in the striker plate 18 forming an interference fit with aperture 27 formed in the door bracket 29, and hence the striker plate 18 drags the door bracket 29 and hence door 3 from left to right until the door reaches the closed position. In the meantime, due to its configuration, the hinged catch 26 has rotated back to the rest position as shown in Fig. 1 and hence the door release lever 39 is free to lock the door 3 closed. Once the door 3 is closed, the driver can release handle 7a, and the return spring 13 pays the rollable strap 17 around the return spring 13, and hence moves the cable 7 back to the starting position as shown in Fig. 1.

[0032] It should be noted that the remote control mechanism 1 does not hinder normal operation of the door 3 opening and closing handle 3, and hence conventional operation of the sliding door 3 can be utilised if required, since the door bracket 29 and "L" shaped hinged catch 26 will simply run freely along the cables 5, 7.

[0033] For safe operation, the three cables 5, 7, 35 should be securely tied in place, and a cover should be fitted over the working parts of the remote control mechanism 1.

[0034] The embodiment has the additional advantage that it can either be fitted at the point of manufacture of the door 3 and vehicle, or can be retrofitted as required.

[0035] Further embodiments of the invention comprise a gearing mechanism 41, shown in Fig. 3. The mechanism 41 comprises two gears 45, 47 provided behind the anchor plate 9 although they may be provided at any position along the cables 5, 7. The cables 5, 7 are each attached to an outer groove 42 of the gears 45, 47 respectively. Secondary portions of cable 55, 57 are connected at one end to an inner groove 43 of each gear 45, 47 and the cables 55, 57 extend through the anchor plate 9, and their opposite ends are attached to handles 5a and 7a. A pull of the handles 5a, 7a by the driver of the vehicle results in a longer movement of travel of the cables 5, 7 when compared to the movement of travel of the cables 55, 57 although this would clearly require additional force to be applied by the driver. Preferably, the cables 5, 7 are arranged to move twice the distance of the cables 55, 57.

[0036] Modifications and improvements may be made to the embodiment without departing from the scope of the invention.

Claims

1. An apparatus for operating a door (3), the apparatus comprising:-

a first connection means (5); and
a second connection means (7);
the first connection means (5) being operable between the door (3) and a first actuation mechanism (5a);
the second connection means (7) being operable between the door (3) and a second actuation mechanism (7a);
such that operation of the first actuation mechanism (5a) moves the first connection means (5) which causes movement of the door (3) in a first direction; and
operation of the second actuation mechanism (7a) moves the second connection means (7) which causes movement of the door (3) in a second direction.

2. An apparatus according to claim 1, wherein the apparatus further comprises a door member (26,29) and, operation of the first actuation mechanism (5a) moves the first connection means (5) which causes movement of the door member (26,29) which further causes movement of the door (3) in a first direction.

3. An apparatus according to either of claims 1 or 2, wherein further operation of the first actuation mechanism (5a) further moves the first connection means (5) which causes further movement of the door member (26,29) which causes movement of the door (3) in a first direction.

4. An apparatus according to any preceding claim, wherein the first direction of the door (3) is movement from a closed door (3) configuration toward an open door (3) configuration, and the second direction is movement from an open door (3) configuration toward a closed door (3) configuration.

5. An apparatus according to any preceding claim, wherein a gearing means (45,47) is provided for at least one of the first and second connection means (5,7) such that operation of the said first and second actuation means (5a,7a) causes a greater movement of the door (3) than the said first and second actuation means.

6. An apparatus according to any preceding claim, wherein at least one connection means comprises cables (5,7).

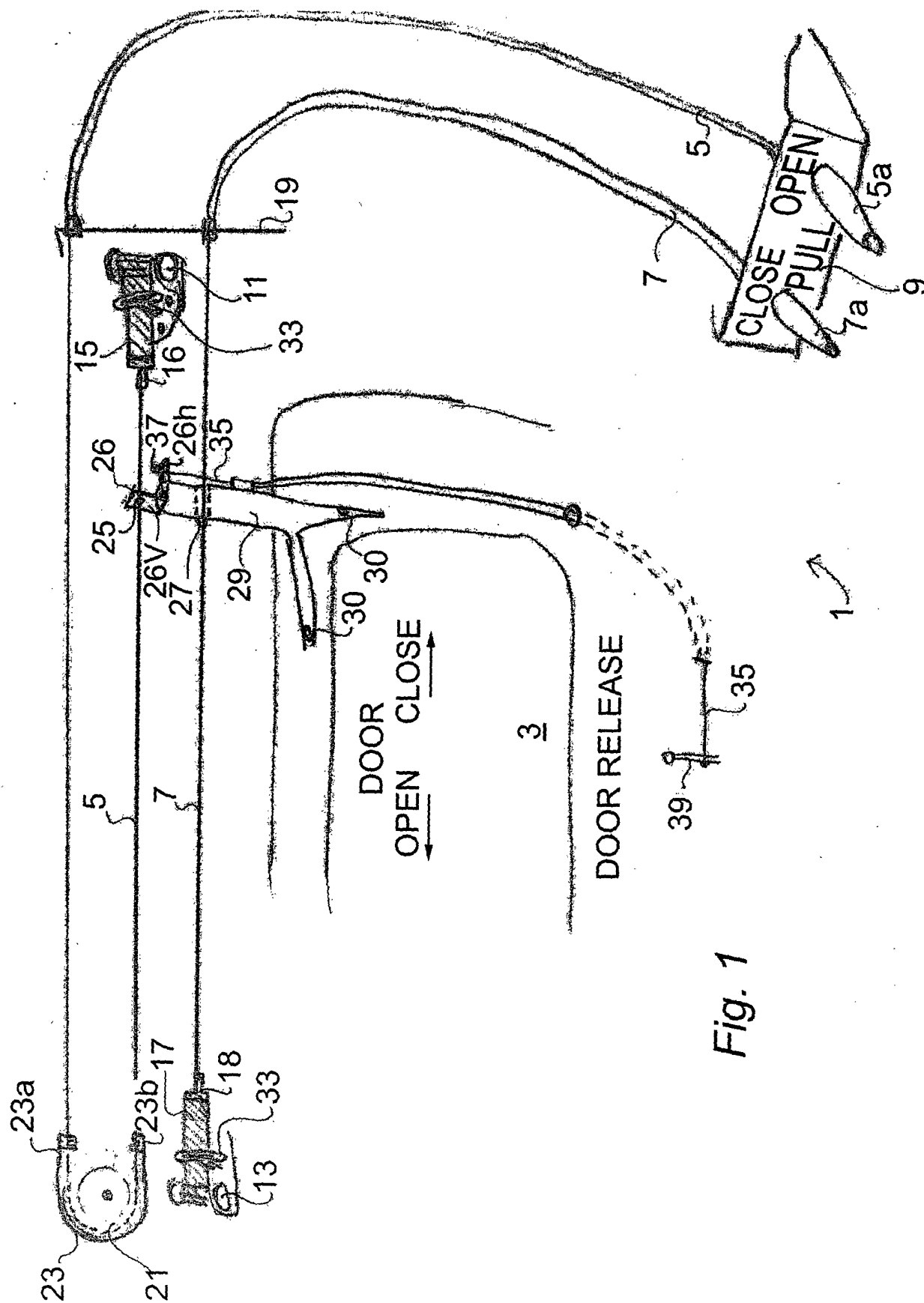
7. An apparatus according to claim 6, wherein at least one of the first and second cables (5,7) are provided

with the actuation mechanism (5a,7a) at one end thereof, and a biasing mechanism (11,13) at the other end thereof.

8. An apparatus according to claim 7, wherein the biasing mechanism (11,13) comprises a return device (11,13) which assists in return of the said first and second cables (5,7) to a rest configuration. 5
9. An apparatus according to any of claims 6 to 8 when dependent on claim 2, wherein at least one of the first (5a) and second (7a) cables are provided with a striking member (16,27) which is adapted to provide a friction fit with a door member (26,29). 10
10. An apparatus according to claim 9, wherein the door member (26,29) comprises a bracket (29) and a connecting member (26) coupled to the bracket (29). 15
11. An apparatus according to claim 10, wherein the connecting member (26) is pivotally coupled to the bracket (29). 20
12. An apparatus according to either of claims 10 or 11, wherein the striker member (16) of the first cable (5) forms a friction fit with an aperture (25) formed in a portion of the connecting member (26). 25
13. An apparatus according to any of claims 10 to 12, wherein the striker member (27) of the second cable (7) forms a friction fit with an aperture formed in the bracket (29). 30
14. An apparatus according to any of claims 10 to 13, wherein the connecting member (26) is an "L" shaped member which, in a rest configuration, has a vertical leg (26V), and a horizontal leg (26h), the lower end of the vertical leg (26V) being secured to the horizontal leg (26h). 35 40
15. An apparatus according to claim 14, wherein when the connecting member (26) is in a rest configuration, the horizontal leg (26h) extends outwardly from the vertical leg (26V) in a direction parallel to the second direction of movement of the door (3). 45
16. An apparatus according to either of claims 14 or 15, wherein the connecting member (26) is biased toward the rest configuration. 50
17. An apparatus according to any preceding claim, wherein the door (3) is a sliding door of a vehicle.
18. An apparatus according to claim 17, wherein the door (3) is a passenger sliding door. 55
19. An apparatus according to claim 18, wherein the

door (3) is a rear passenger sliding door.

20. An apparatus according to any of claims 7 to 19, wherein the apparatus is provided with a mounting means (9) to support and/or retain the handles in a rest configuration.
21. An apparatus according to claim 20, wherein the mounting means (9) is located in a location within the driver's cabin.
22. An apparatus according to any of claims 6 to 21, wherein the first cable (5) is provided with a roller unit (21) to transform the direction of travel of the first cable (5) through 180°. 15
23. An apparatus according to claim 22, wherein the roller (21) is provided with a groove (23) around the outer diameter thereof for location of the first cable (5) therein. 20
24. An apparatus according to any preceding claim, further comprising a third connection means (35) being operable between the door member (26,29) and a door release mechanism (39) such that operation of the first actuation mechanism (5a) moves the first connection means (5) which causes movement of at least a portion of the door member (26,29) which further moves the third connection means (35) to operate the door release mechanism (39).
25. A method of operating a door, the door (3) being provided with:-
 - a first connection means (5); and
 - a second connection means (7) ;
 - the first connection means (5) being operable between the door (3) and a first actuation mechanism (5a) ;
 - the second connection means (7) being operable between the door (3) and a second actuation mechanism (7a) ;
 - the method comprising operating the first actuation mechanism (5a) to move the first connection means (5) which causes movement of the door (3) in a first direction; and
 - operating the second actuation mechanism (7a) to move the second connection means (7) which causes movement of the door (3) in a second direction.



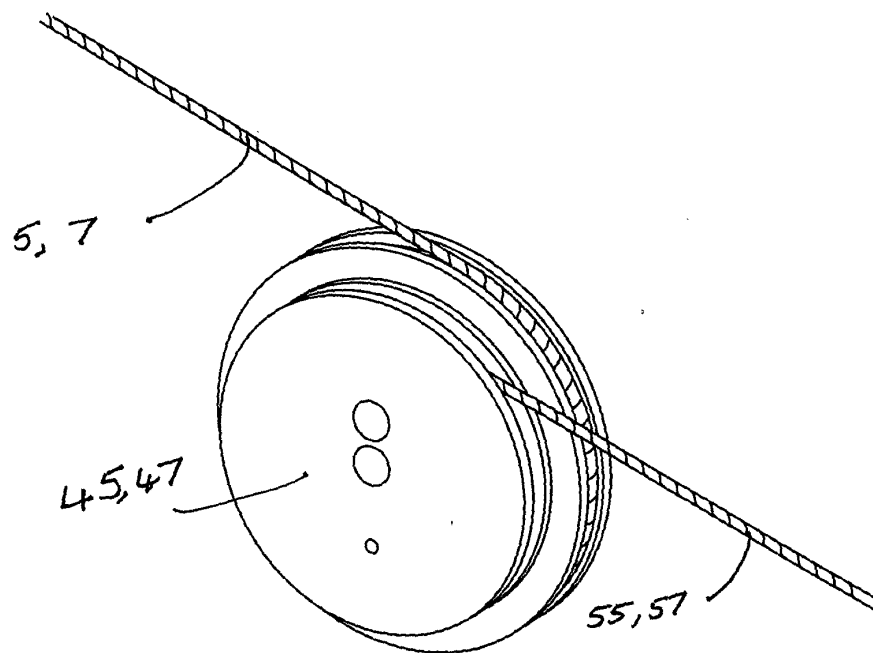


Fig. 2a

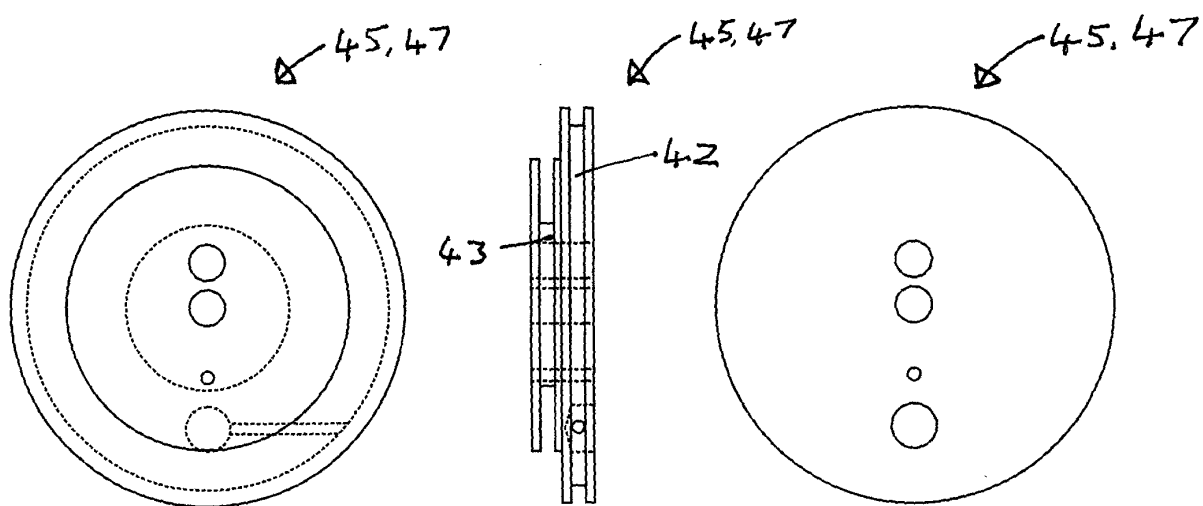


Fig. 2b

Fig. 2c

Fig. 2d

