

July 7, 1931.

G. CAVICCHIOLI ET AL

1,813,145

VEHICLE DOOR

Filed Nov. 8, 1929

2 Sheets-Sheet 1

Fig. 1

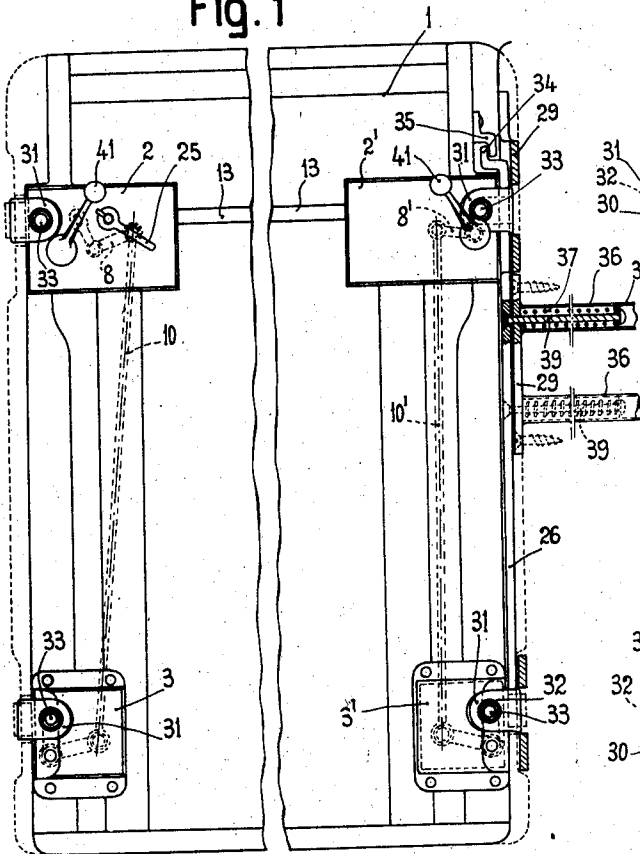


Fig. 7

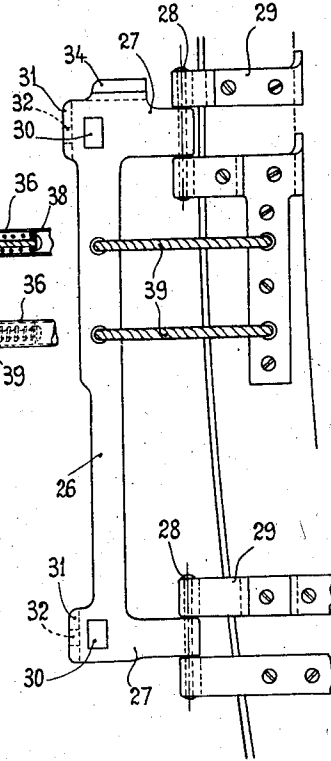
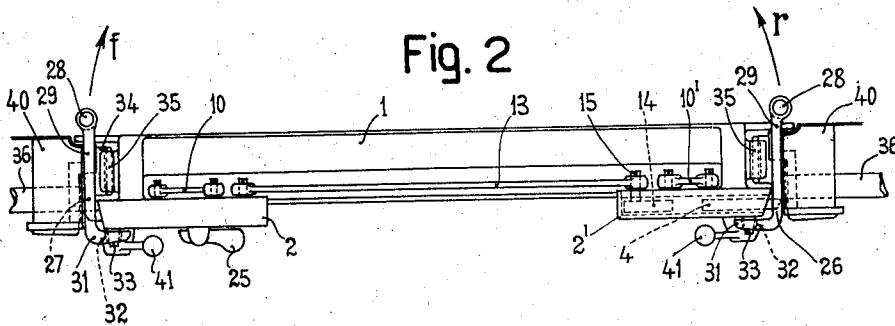


Fig. 2



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2 Sheets-Sheet 2

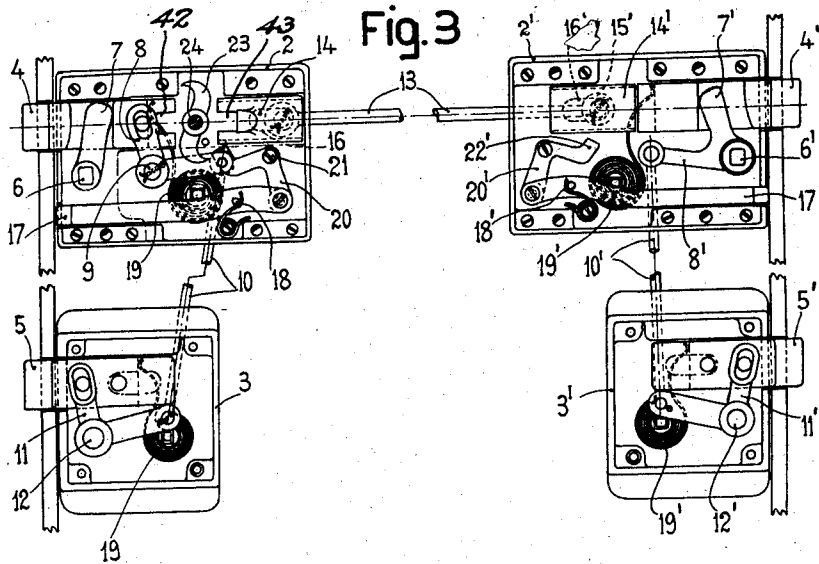


Fig. 6

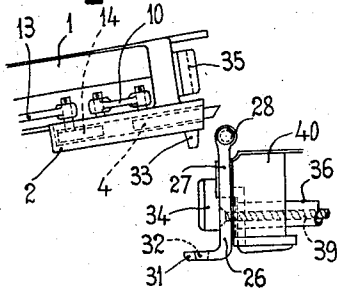


Fig. 5

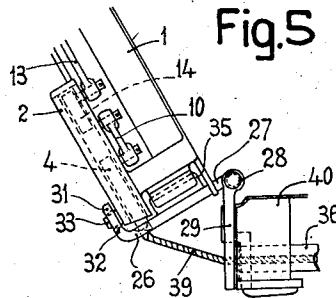
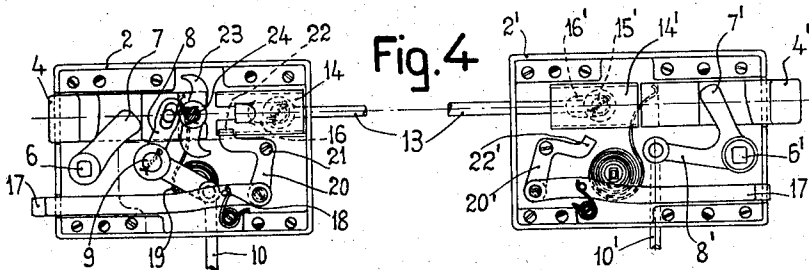


Fig. 4



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UNITED STATES PATENT OFFICE

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VEHICLE DOOR

Application filed November 8, 1929, Serial No. 405,755, and in Italy May 1, 1929.

This invention has for its object a door for bodies of vehicles, which may be opened by turning it right or left at will.

Such an arrangement provides each side of the body of a vehicle with a single door which affords access both to front and to rear seats. It is thus possible to simplify the construction of the vehicle body and moreover to ensure convenient access to the whole interior while at the same time improving the appearance of the vehicle.

One embodiment of the invention is illustrated by way of example in the accompanying drawings in which

Figure 1 is a fragmentary elevation of a door and adjacent body structure, looking toward the inner face of the door;

Fig. 2 is a plan view thereof;

Fig. 3 is a diagrammatic view of door locks and of their connecting means, the same being on an enlarged scale;

Fig. 4 shows a pair of the upper door locks with the parts shifted;

Fig. 5 shows a socket hinge in open position and the door latched thereto;

Fig. 6 shows the socket hinge with the door unlatched therefrom; and

Fig. 7 is an elevation of the hinge in open position with the adjacent portion of the vehicle body in edge view.

A door in accordance with this invention is provided both on its front edge and rear edge with locks, the bolts of which engage in recesses in a hinged element pivoted on the vehicle body and these locks are provided with inter-locking means actuated by the one of the locks which is operated to open the door, said means holding in their recesses the bolts of locks which are located on the edge of the door about which it is intended to turn. In this manner it is possible to turn the door about either edge since it remains rigidly connected to the hinge element which is located at this edge and which supports the door while permitting its rotation.

As shown in the drawings the door 1 which may be of any approved construction comprises on one of its edges a top lock 2 and a bottom lock 3 having bolts 4, 5 re-

spectively. The bolt 4 of the upper lock 2 is actuated by the square spindle 6 of handle 41 and by arm 7 (Figs. 1, 2, 3 and 4). The bolt 5 of the lower lock 3 located on the same door edge as the upper lock 2 is actuated from bolt 4 by a bell crank lever 8 pivoted at 9 in the said upper lock, and rod 10 and bell crank lever 11 pivoted at 12 in the lower lock body 3. Each bolt 4—4' and 5—5' is provided with a spring 19 or 19', respectively, acting to close it.

On its opposite edge the door 1 has an upper lock 2' and a lower lock 3' (Figs. 1 and 3). The bolt 4' of the lock 2' is actuated by the arm 7' solid with arm 8' actuating rod 10', arm 11' and bolt 5' of the lower lock 3'.

Intermediate the two upper locks 2 and 2' is provided a rod 13 which extends into the casings of said locks and has head end portions 14 and 14' movably mounted in said locks by means of pins 15 and 15' and slots 16 and 16'. Each head 14 or 14' is located opposite the inner end of the bolt 4 or 4' of cooperating locks 2 and 2'.

The length of the rod 13 and its heads 14 and 14' is such that when one of the heads 14 or 14' is in contact with the adjacent face of registering bolt 4 or 4' while the latter is in socket engaging position, the other head 14 or 14' of rod 13 is a sufficient distance from the registering bolt 4 or 4' of its adjacent lock 2' or 2 to permit the retraction of that bolt and the opening of the door. In other words, when one of the bolts is retracted into door opening position it pushes back the rod 13 and brings its opposite head 14 and 14' into a position which holds in closing or socket engaging position the bolt of the lock adjacent the last named head.

In each lock 2 or 2' is mounted a bar 17 or 17' pressed back by spring 18 or 18' and this bar acts on a bell crank lever 20 or 20' pivoted at 21 or 21' and having a nose 22 or 22' intended to engage the adjacent head 14 or 14' of the rod 13 in the position in which said rod and its opposite head prevent movement of the bolt of the other lock 2' or 2.

Lock 2 has a safety catch formed by a cross member 23 pivoted in the lock casing and actuated by spindle 24 of a finger piece 25. This cross member 23 is located between the bolt 4 and the head 14 of the rod 13, these parts being provided with notches to receive the spindle 24; the said cross member may be moved into the transverse position shown in Fig. 3 in which it permits the lock to operate, while when it is moved through 90° one of its ends acts directly on the bolt 4 of the lock 2 and the other end acts, through the head 14, the rod 13 and the other head 14', on the bolt 4' of the lock 2'.

As shown in Fig. 7 the hinge elements supporting the door are each formed of a vertical flat plate 26 provided with two arms 27 pivoted at 28 in the stationary elements 29 fixed to the uprights 40 of the body structure. The movable element 26 of the hinge has sockets 30 in which the bolts 4 and 5 or 4' and 5' of the upper and of the lower lock engage, and lugs 31 provided with seats 32 in which centering cones 33 carried by the locks (Figs. 2, 5 and 6) engage.

At the upper end, the hinge element 26 is formed with a square hook 34 in which engages a corresponding lug 35 fixed to the edge of the door and intended to hold the door in place.

In the thickness of the body structure, externally of the uprights 40 to which the stationary elements 29 of the hinge are connected, is arranged a socket 36 in which is located a coil spring 37, which presses at one end against the front wall of the socket 36 and at the other acts on a movable head 38 to which is secured one end of a flexible rope or cord 39, the other end of which is connected with the movable element 26 of the hinge.

When the door 1 is closed as shown in Figs. 1, 2 and 3, the two hinge parts 26 located on the front and rear vertical edges of the door abut against the surface of the adjacent upright 40. The centering cones 33 of the several locks engage in the seats 32 in the parts 26 and the bolts 4, 5 enter their sockets 30; moreover the lugs 35 on the door are engaged in the lugs 34 of the parts 26. The door is consequently held rigid on the uprights 40 both on its front and rear edges and when the safety lever 25 is in safety position the four locks 2, 2', 3, 3' are held in closed position and the door cannot be opened.

When door 1 is in this condition, bars 17 of the locks 2, 2' are held within the casings of the corresponding locks by the opposite face of the corresponding part 26 and consequently noses 22 leave heads 14 and 14' of the rod 13 free (Fig. 3).

To open the door 1 for example by turn-

ing it about its rear edge in the direction of the arrow *f*— in Fig. 2, after having removed the safety stop 25 the handle 41 of the upper front lock 2 is turned. The rotation of the spindle 6 retracts the bolt 4 and consequently actuates the bell crank lever 8 and moves the rod 10 to retract the bolt 5 of the lower front lock 3.

At the same time the bolt 4 of the upper front lock 2 on moving back acts on the opposite head 14 of rod 13 to move this rod towards the opposite lock 2', so that the rear head 14' of said rod holds the bolt 4' of the upper rear lock 2' and consequently also the bolt 5' of the lower rear lock in locked position. The door, while thus released from the front hinge element 26, remains connected to the rear hinge element 26, since the bolts 4', 5' of the rear locks are in their sockets 30 and hold the door engaged in the hinge element 26 by means of the centering cones 33; the door may then turn with the hinge element 26 about its hinge pins 28 (Fig. 5).

Immediately the door is opened in the direction of arrow *f*, the bar 17 of the front lock 2 is pressed outwards by spring 18 being no longer held by the opposite surface of the hinge part 26 which remains against the upright 40. Under these conditions the bell crank lever 20, 22 actuated by the said bar holds the head 14 of rod 13 in the position shown in Fig. 4 and consequently holds in closing position the two locks 2' and 3' at the edge of the door about which it turns, this condition being secured during the whole of the time the door remains open.

The door turns as above stated about the hinge pin 28 of the rear hinge element 26 with respect to the stationary elements 29. In this movement the element 26 in turning about its hinge pins 28 makes the flexible rope 29 and the spring 37 operative, this spring tending to return the door to closed position.

When the door is closed the bar 17 moves back into the lock casing of lock 2 and releases the rod 13 as also the bolts of the rear locks.

If it is desired to open the door at its rear edge and thus to rotate it around its front edge (arrow *r* in Fig. 2), the rear lock 2' is operated after the safety lever 25 of the front lock 2 has been released.

Then the operation is similar to that described above, that is to say the bolts 4', 5' of the rear locks are moved back under the action of the spindle 6', lever 7', arm 8' and rod 10' while the retraction of the bolt 4' of the lock 2' shifts the rod 13 which holds the bolt 4 of the front upper lock 2 and through it also that of the front lower lock 3 in closed position.

When the door is open the bar 17 is displaced as above described in lock 2' and

holds the rod 13 in the position in which it holds the front locks in closed position.

When the door turns about one edge the hinge element 26 at the opposite edge and from which it is freed is held against the surface of the upright 40 of the body structure by the flexible rope 39 and spring 37 (Figures 1 and 6).

With the described construction in which sockets of the locks on each edge of the door are formed in a movable hinge element and the corresponding bolts may be locked in said sockets so as to hold the locks and the door in engagement with the movable hinge element, or may operate as ordinary bolts; it is possible to turn the door about one or the other of its lateral edges while the door remains automatically connected to the movable hinge element with which it turns due to the automatic stops 17, 20, 22 which come into operation as soon as the door is moved from its closing position.

Of course the described arrangement is given only by way of example and the present invention may be embodied in a plurality of constructions within the spirit of appended claims.

What we claim as our invention and desire to secure by United States Letters Patents is:

1. A door structure for a vehicle body comprising posts in said body, hinges each comprising a stationary member fastened on one of said posts and a movable member pivoted on said stationary member, a door, engaging means on each movable hinge member and cooperating engaging means on the registering edge of said door, each of said movable hinge members having a bolt socket, bolts located on opposite side edges of the door, each bolt adapted to engage one of the said bolt sockets, means for bolt actuation on each door edge, and means for locking a bolt on either door edge when a bolt of the other door edge is actuated for release.

2. A door structure for a vehicle body comprising posts in said body, hinges each comprising a stationary member fastened on one of said posts and a movable member pivoted on said stationary member, a door, engaging means on each movable hinge member and cooperating engaging means on the registering edge of said door, each of said movable hinge members having a bolt socket, bolts located on opposite side edges of the door, each bolt adapted to engage one of the said bolt sockets and lock said engaging means of the respective movable hinge member and door edge in inter-engaged position, means for bolt actuation on each door edge, and means for locking a bolt on either door edge when a bolt of the other door edge is actuated for release.

3. A door structure for a vehicle body

comprising posts in said body, hinges each comprising a stationary member fastened on one of said posts and a movable member pivoted on said stationary member, means resiliently holding each movable member against its cooperating stationary member, a door, engaging means on each movable hinge member and cooperating engaging means on the registering edge of said door, each of said movable hinge members having a bolt socket, bolts located on opposite side edges of the door each adapted to engage one of the said bolt sockets, means for bolt actuation on each door edge, and means for locking a bolt on either door edge when a bolt at the other door edge is actuated for release.

4. A door structure for a vehicle body comprising posts in said body, hinges each comprising a stationary member fastened on one of said posts and a movable member pivoted on said stationary member, a door, engaging means on each movable hinge member and cooperating engaging means on the registering edge of said door, each of said movable hinge members having bolt sockets, a plurality of bolts located on each opposite side edge of the door and each adapted to engage one of the said bolt sockets, means interconnecting said bolts of each door edge, means for actuating one of said bolts on each door edge, and means for locking at least one of said bolts of either door edge when a bolt at the other door edge is actuated for release.

5. A door structure for a vehicle body comprising stationary members in said body, movable hinge members each pivoted on one of said stationary members, a door, engaging means on each movable hinge member and cooperating engaging means on the registering edge of said door, each of said movable hinge members having a bolt socket, bolts located on opposite side edges of the door each adapted to engage one of the said bolt sockets, means for bolt actuation on each door edge, a locking member on each door edge for a bolt located on the opposite door edge, a spring moving said locking member into bolt locking position, and an extension on said locking member abutting on the adjacent stationary member to hold said locking member released when said door is closed.

6. A door structure for a vehicle body comprising posts in said body, hinges each comprising a stationary member fastened on one of said posts and a movable member pivoted on said stationary member, a door, two sets of engaging means on each movable hinge member and two cooperating sets of engaging means on the registering edge of said door, each of said movable hinge members having two bolt sockets, two bolts located on opposite side edges of the door and

each adapted to engage one of the said bolt sockets, means for joint actuation of the bolt on each door edge, and means for locking a bolt on either door edge when a bolt at the other door edge is actuated for release.

7. A door structure for a vehicle body comprising posts in said body, hinges each comprising a stationary member fastened on one of said posts and a movable member pivoted on said stationary member, a door, each of said movable hinge members having a plurality of bolt sockets, bolts located on each opposite side edge of the door and each adapted to engage one of the said bolt sockets, engaging means on each movable hinge member, and means on the registering edge of said door cooperating with said first-named engaging means on a line transverse to the line of engagement of said bolts and sockets, means for bolt actuation on each door edge, and means for locking the bolt on either door edge when a bolt at the other door edge is actuated for release.

8. The combination with a door and door frame, of permanently pivoted double-leaf hinges at opposite side edges of the door frame; one leaf of each hinge being fixed to the door frame and the other leaf being free of the door; locking mechanism on the door edges for engaging the leaves of the hinges free of said door; and means for actuating the mechanism to simultaneously release the door from the hinge leaves at one edge of said door and locking said mechanism with the hinge leaves at the other edge of the door therewith.

9. The combination with a door and door frame, of permanently pivoted double-leaf hinges at opposite side edges of the door frame; one leaf of each hinge being fixed to the door frame and the other leaf being free of the door; locking mechanism on the door edges for engaging the leaves of the hinges free of said door; means for actuating the mechanism to simultaneously release the door from the hinge leaves at one edge of said door and locking said mechanism with the hinge leaves at the other edge of the door therewith; and means tensioning the leaves of the hinges.

10. The combination with a door and door frame, of permanently pivoted double-leaf hinges at opposite side edges of the door frame; one leaf of each hinge being fixed to the door frame and the other leaf being free of the door; locking mechanism on the door edges for engaging the leaves of the hinges free of said door; means for actuating the mechanism to simultaneously release the door from the hinge leaves at one edge of said door and locking said mechanism with the hinge leaves at the other edge of the door therewith; means tensioning the leaves of the hinges; and means for sustaining the

locking mechanism engaged with the hinge leaves when the door is closed.

In testimony whereof we affix our signatures.

GIOACCHINO CAVICCHIOLI.
EUGENIO CESCHI.

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