LOCK ARRANGEMENT FOR VEHICLES ESPECIALLY VEHICLES EQUIPPED WITH SLIDING DOORS

Inventor: Horst Klebba, Weyhausen, Germany
Assignee: Volkswagenwerk AKG, Wolfsburg, Germany

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A locking mechanism for the sliding door of a vehicle in which a swingable lock bolt projecting through an opening in the sliding door has associated therewith a safety element slidable along the bolt into said opening to positively prevent release movement of the bolt. Retraction of the safety element from the opening is transmitted by linkages from independently swingable inside and outside door handles, the arrangement being such that the common blocking slide may be selectively positioned to obstruct and prevent the actuation of one or both of said linkages, or of neither of them. Suitable arrangements are made for controlling the position of the blocking slide either from the inside or from the outside of the automobile, the external arrangement comprising a key-controlled cylinder lock. Also there is provided a child proof safety latch operable to prevent opening of the door from within the vehicle, and to permit its opening from the vehicle exterior in the event of an accident. Additional control means also are provided.

15 Claims, 1 Drawing Figure
LOCK ARRANGEMENT FOR VEHICLES ESPECIALLY VEHICLES EQUIPPED WITH SLIDING DOORS

This invention relates to a lock arrangement, especially adapted for vehicles equipped with sliding doors, with pivoted outside and inside operating handles and locking mechanism to prevent undesirable opening of the door. Such lock arrangements are adapted for use in the doors of minibuses, to prevent unintentional opening of the door during travel or by playing children. However, the invention is by no means limited to this specific use but is adapted for general use. For instance, one advantage of the principle of construction according to the invention is to be seen in the fact that the lock arrangement can also be used in the case of hinged or swinging doors.

At first glance the solution of the task sketched does not seem to cause any difficulties. But one must take into consideration that it is not sufficient for the safety of the passengers to create simply any kind of closure against the opening of the doors, but that the arrangement must offer the possibility on the one hand of preventing the unintentional opening of the doors from the inside, while on the other hand permit the opening of the doors from the outside in the event of an accident. It is desirable that the construction, both for reasons of space and in view of an easy operation, must be designed as simple as possible. Therefore it will be recognized that the known lock arrangements frequently do not suffice for the above requirements.

The lock arrangement of this invention is characterized by the fact that the inside and outside operating handles have been pivotally mounted independently of one another and are provided respectively with swingable levers movable into operation engagement with a rocker lever through movement of which the lock is released. A blocking means is selectively positioned to arrest the movement of one, both or neither of said swingable levers to prevent the motion of said lever or levers from being transmitted to the rocker lever. In a first position the slide projects into the paths of and blocks both swingable levers; in a second position it blocks only the lever actuated by the inside handle; and in a third position it permits operation movement of both swingable levers to permit unlocking by either handle.

The principle of construction according to the invention just stated, therefore, offers the possibility of a choice among three different defined positions for the locking mechanism:

In the first position the door is secured against opening from both the inside and the outside. In the second position, the door is secured only against opening from the inside, to avoid opening by children within the vehicle, while permitting opening from the outside in the event the vehicle is involved in an accident. In the third position, the door can be opened without trouble both from inside and outside of the vehicle.

A particularly simple and therefore preferred embodiment of the lock arrangement according to the invention is distinguished by the fact that the levers have stops or portions which in their rest position are located adjacent one another, and the blocking slider of a lever is provided with markings for the three definite positions and in its first predetermined position is interposed in the path of operative movement of both levers. In this embodiment of the invention, the locking means essentially comprises only a single sidable lever or blocking slide which can be moved into the three defined positions. This can be accomplished manually. In accordance with still further developments of the invention an automatic transition from one defined position into the other is aimed at. For example, the sliding lever or blocking slide may be shifted by means of an eccentrically located crank pin on a closing cylinder that can be operated from the outside by means of a key, the eccentricity of said crank pin being such that it will move the sliding lever or slide from the first defined position (closure against operation both from the outside and inside) into the third defined position (lock can be opened), and vice versa.

In further accordance with this invention, the swingable levers above mentioned, when not blocked by the blocking slide, can transmit release movement to a safety slide or element which is associated with the lock bolt to prevent release of the latter. In the case of this further development of the invention therefore, the additional locking of the lock bolt will be suspended automatically by operation of one of the handles as soon as the inside and/or outside operating handle is released.

If the safety lever is developed as a two-armed rocker lever, one can easily achieve in a simple manner the cooperation between lock arrangement and a further lock usually designated as central lock, by articulating an element for the long range transmission of forces to one arm of the rocker lever. In this case the central lock can also be a spring tension lock whose springs are cocked via the element for the long range transmission of forces. Vice versa, this transfer of force can also be developed in such a way that, upon bolting the central lock, the rocker lever automatically will be swiveled to the position assuring the locking of the lock bolt via the safety element.

As already mentioned, that position of the blocking slide, in which the opening of the door is prevented only from the inside, is particularly important. A variation of the invention which permits one to reach this operable state automatically is distinguished by the fact that the blocking slide and the rocker lever are operatively interconnected so that the rocker lever will move the blocking slide into the second defined position.

In the following paragraphs the invention will be explained on the basis of the embodiment shown in the accompanying FIGURE of drawing by way of example.

The locking arrangement shown has an inside pivotable operating element or handle 1 in the customary manner, and a conventional outside operating pivoted element or handle 2. In this embodiment the assumption has been made that the lock arrangement is being housed in the sliding door 3 of a minibus; only the leading edge portion of the door 3 is shown; the door frame 4 has a lock plate 5 for reception of its upper edge in the recess 6a. A safety element 7 sidably carried by bolt 6, protrudes into opening 8, to secure the lock bolt 6 against release. On the other hand, in the retracted position of the safety element 7 from the opening 8 the lock bolt 6 has been released, and is free to swing upwardly and become disengaged from the lock plate 5.

An important characteristic of the lock arrangement according to the invention consists in the separation of the swivelling axes defined by shafts 9 and 10 of the two operating handles 1 and 2. The two swivelling axes do not necessarily have to be arranged differently locally from one another, rather a concentric arrangement is also possible in principle; in any case, the swivelling axes, and thus operating handles 1 and 2, must be operable independently of one another. The shafts 9 and 10 respectively have levers 11 and 12 affixed thereto and these levers are swingable together with their respective handles 1 and 2. Portions of these levers, such as the projections or stops 13 and 14 normally are disposed adjacent each other in a common vertical plane for swinging movement in substantially tangential arcs into operative engagement with the lower lever arm of rocker lever 23. A blocking lever or slide 15 has a stop portion 16 proportioned so that in the fully raised position of the slide 15 it transacts the paths of movement of both stop portions 13 and 14 to prevent actuation of lever 23 from either handle 1 or 2. In the highest position of sliding lever 15 as shown, which has been designated in the FIG. by 1, the lock arrangement therefore has been secured against an opening from the outside or from the inside. In position II on the other hand, counter stop 16 projects only into the path of stop 13, so that an opening of the door from the inside is possible as usual. The lowest position III of the sliding lever 15 permits an opening from the outside as well as from the inside.
The mounting of blocking slide or lever 15 making these three definite positions possible consists in a properlyprofiled support surface 17, which cooperates with bearing bolts 18 and 19. Support surface 17 is maintained in engagement with bolts 18 and 19 by way of spring 20.

Tension springs 21 and 22 cooperate with the respective levers 11 and 12 to return such levers and the operating handles 1 and 2 to retracted positions.

The rocker lever 23, which in this embodiment is journaled on the shaft 10 for free swinging movement has an upper arm pivotally connected with safety element 7, while its lower arm projects into the paths of the two stops 13 and 14. Therefore, as soon as stopper 16 of the blocking slide or lever 15 releases at least one of the two stops 13 and 14, the swiveling of the inner or outer operating handle 1 or 2 in the direction of the arrow A automatically causes the withdrawal of the safety element into its retracted position as shown, so that the lock bolt 6 can be lifted off the lock plate 5. The retaining spring 24 therefore has been designed weak enough that it will only assure a safe guidance through support of the safety element 7 on the lock bolts 6, without however preventing the lifting off of said bolt after the release.

To the lower end of the rocker lever 23, there is pivotally connected a pull rod 25. It will be understood that pull rod 25 may be connected to a central lock developed as a tension lock. Upon opening the lock shown, the spring tension lock is unbolts and cocked via the pull rod 25, so that the rod 25 thus coordinates the operation of the two locks. Vice versa, the closure of the central lock causes a pivoting movement of the rocker lever 23 via the pull rod 25 in a counterclockwise direction, as a result of which the safety element 7 is made to engage.

This pivoting of the rocker lever 23, causing a renewed closure, in the embodiment shown by way of example of this invention, furthermore, the automatic movement of the sliding lever 15 from position III in which the door is not secured against opening from the outside as well as from the inside, into the specially important position II, results in preventing the opening of the door only from the inside. For this purpose, lever 23 and sliding lever 15 have been provided with cooperating cam means in the form of a peg 25 and a cam 26.

The blocking slide 15 can be provided with an operating lever 27. For the purpose of a further automation of the operation of the lock, the sliding lever 15 in the embodiment shown by way of example has a fork-shaped area 15a, which receives the eccentric crank pin 28 of the closing rotary lock cylinder 29, visible in the upper part of the figure. The closing cylinder 29 is the shaft 10 in the known manner by means of a key 30. The eccentricity of the pin 28 and the width of the fork-shaped area 15a have been selected in such a way that, through operation of key 30, the sliding lever 15 can be moved between positions I and III. Therefore, it is possible by turning key 30 to position the blocking slide 15 as desired.

The levers 11 and 12 of the operating handles 1 and 2, have still other functions. It should be noted that lever 11 has another stop 31 which cooperates with a latch 32. This latch is shiftable only from the direction of the front side and in the direction of the arrows designated by B. Such a latch prevents the unintentional opening of the door from the inside and, therefore, is called a child safety latch.

Furthermore, the lock arrangement shown has been provided with an arrangement for the cancellation of the fixing of the door. This arrangement contains the slide 32a mounted slidably at 33, to the right-hand end of which both an operating bar 34 and a spiral spring 35 have been articulated. In its left-hand start in the figure, the slide 32a cooperates with two stop pins 36 and 37, with which it engages the two levers 11 and 12. Upon closure of the door, and the ensuing movement of one of the operating handles 1 and 2 in the direction of arrow E, slide 32a therefore is forced toward the right in this figure; this movement will be transferred via bar 34 to the shift lock of the door of a known construction (not shown) in such a way that the shift lock of the door will be suspended.

As a result of the fact that the swiveling axes of the inner and outer operating handles have been arranged with reference to one another with the levers 11 and 12 directed toward each other, a specially compact construction of the lock arrangement according to the invention will result.

**MODE OF OPERATION**

The mode of operation of the invention which is believed to be apparent from the foregoing detailed description, is briefly summarized as follows:

For securing the sliding door 3 in its closed position against the side 4 of the door frame, the freely vertically swingable lock bolt or hook 6 is normally urged by gravity about the horizontal axis defined by pivot 10 and receives the upwardly projecting edge of lock plate 5 within its downwardly directed locking recess. It will be appreciated that when the sliding door 3 is opened, with the lock bolt 6 disengaged from the lock plate 5, the lock bolt 6 will rest on the lower edge of the opening 8 of the door through which it projects, at 11 for operative engagement with the lock plate 5 upon closing of the door. It will be manifest that as the door is closed, the sloping cam edge at the free end of the lock bolt will engage the upper end of the lock plate 5 and cam the bolt 6 over the lock plate to then swing back downwardly and receive the lock plate within its locking recess.

The sidewall of the locking recess toward the free end of the bolt preferably is arranged with a sloping or diagonal disposition to cam the bolt upwardly and disengage it automatically as the door is moved toward open position, unless the lock bolt is secured in its operative locking position by means of the safety element or slide bolt 7. This last mentioned slide bolt 7 supported for sliding movement on the upper edge of the lock bolt 6 is movable into operative position within the opening 8 with its upper edge abutting against the upper edge of the opening 8, thereby firmly to block any upward displacement of the lock bolt 6 from operative engagement with the lock plate 5.

Movement of the safety bolt or element 7 to insert it into operative position in the opening 8, and to retract therefrom, is transmitted through the mediately fulcrumed rocker lever 23, the upper lever arm of which is pivotally connected to the safety bolt 7 and the depending lower lever arm of which is positioned in the paths of operative movement of both the operating levers 11 and 12, which may be manually swung independently of each other through operation of the respective inside and outside door handles 1 and 2, respectively.

Operative engagement of the levers 11 and 12 with the rocker lever 23 for the purpose of retracting the safety bolt 7, is selectively controlled by means of the blocking slide 15 which may be selectively positioned to block the path of movement of either, both or neither of the levers 11 and 12 into operative engagement with the lever 23.

As heretofore described, selective positioning of the blocking slide 15 may be achieved in several alternative manners. Such selective positioning of the blocking slide 15 from the interior of the vehicle may be achieved through appropriate manual actuation of the interior control handle 27 which is rigidly connected to the slide as shown.

Selective positioning of the blocking slide 15 from the exterior of the vehicle is controlled through rotation of the key 13 together with the lock cylinder 29 engaged by it, so that the eccentric crank pin 28, operating within the notch or recess 15a of the slide may raise or lower the slide as desired to place the slide in any of its three operative positions.

Thus, even though the blocking slide 15 may be positioned by the inside operating handle 27 to intercept the swinging movement of the lever 12 before it engages the lever 23 of the outside door handle 2 to retract the safety bolt 7, the blocking slide 15 may readily be moved to a non-blocking position from the outside through engagement of key 13 with any of the lock cylinders 29 and their associated linkage with the blocking slide 15.
It will further be apparent that the child safety latch 32 is operable to secure the inside handle 1 against actuation from the car interior without preventing opening of the door from the exterior of the car by way of the outside handle 2. By virtue of this latter relationship, access to the interior of the car is facilitated in the event of an accident, even though the child safety latch has been applied, the safety latch nevertheless functioning to prevent small children within the vehicle from opening the door 3.

Having thus described my invention, I claim:

1. A lock arrangement for vehicles with sliding doors, with outside and inside pivoted operating handles, as well as means preventing undesirable operations of the lock, characterized in that the two operating handles are mounted for operative swinging movement independently of one another, levers connected with the respective operating handles for movement therewith, a blocking slide mounted for selective movement to any of three positions, said slide obstructing the paths of movement of both levers in its first position, and in a second position obstructing the path of movement of only the lever connected with the inside operating handle and in a third of the said positions said slide is removed from the path of movement of both said levers.

2. A lock arrangement according to claim 1, characterized in that the free ends of the levers normally are located adjacent one another, and said blocking slide is provided with markings for the three said positions.

3. A lock arrangement according to claim 2, characterized in that the blocking slide is disposed for operative movement in a direction which is approximately transverse to the paths pursued by the free ends of said levers for the purpose of selecting the said positions.

4. A lock arrangement according to claim 2, characterized in that the blocking slide is guided for operative movement by bearing bolts and has a supporting surface provided with recesses corresponding to the three definite positions, and spring means urging said surface against the bearing bolts.

5. A lock arrangement according to claim 4, characterized in the inclusion of a rocker lever, a safety element connected to and moved by said rocker lever, an arm of said rocker lever projecting continuously into the paths of the said levers connected with the respective operating handles.

6. A lock arrangement according to claim 5, characterized in that the rocker lever is a two-armed rocking lever, one arm of which projects into the paths of said levers and the other arm of which is connected with a safety slide movable on the lock bolt.

7. A lock arrangement according to claim 6, characterized in that an element for the remote control of forces has been articulated to one arm of the rocking lever.

8. A lock arrangement according to claim 7, characterized in that the said element for the remote control of forces has been developed as a tension transmission, which is connected with a central lock, likewise unlocking said lock upon movements of the rocking lever, cancelling the closure of the lock bolt.

9. A lock arrangement according to claim 8, characterized in that the said element is developed as a tension transmission, which is connected with a central lock in such a way that, upon closure of the central lock, it will swivel the rocking lever into the position assuring the closure of the lock bolt via the safety element.

10. A lock arrangement according to claim 2, characterized in that the blocking slide and the rocker lever have areas cooperating in the manner of cams and of such arrangement and development that the rocker lever will move the blocking slide into the second definite position upon transition from its position, responsive to the closure of the lock bolt via the rocker lever.

11. A lock arrangement according to claim 1, characterized by a stop connected to the inside operating handle there being a closing latch operable only from the front side of the lock for cooperation with said stop.

12. A lock arrangement according to claim 1, characterized in the inclusion of stops supported by said two levers.

13. A lock arrangement according to claim 12, characterized in that an operating element for the release of a shift lock for the door opposes the two levers.

14. A lock arrangement according to claim 2, characterized in that the sliding lever has a fork-like area which receives an eccentric crank pin on a closing cylinder operable from the outside, the eccentricity of said crank pin being selected to permit the movement of said sliding lever from the first said position to the third said position, and vice versa.

15. A lock arrangement according to claim 14, characterized in that the pivotal axes of the inside and outside operating handles are so disposed and the said levers are so arranged that said levers are directed toward each other.

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