

Door lock

The invention relates to a door lock which can be operated by a key located at one operating axis and by a handle, knob or the like located at a second operating axis.

In door locks, which include two operating axes, 5 of which one can be provided with a key-operated lock mechanism and the other with a manually-operated operating device such as a turning knob or handle, the dead bolt or the latch bolt can usually be dead locked so, that the lock can be opened from one side (e.g. the outside) 10 of the door only with a key, but not with a turning knob or a handle. This can be accomplished for instance by moving, with a key or by means of a turning knob inside of the door, some member in the lock body into a position preventing movement of the dead bolt or the latch bolt 15 into its retracted position in the lock body from a handle outside of the door. Further solutions are known, in which a follower connected to a turning knob or a handle can, by means of special measures, be moved into a position, in which its force transmission connection 20 to the dead bolt or the latch bolt is disconnected. All these known solutions presume that the lock is subjected to adjustment measures directly from a device at one or other of the two operating axes. A further presumption is that the measures in question are carried out by the 25 person attempting to use the door, so by means of these kinds of door lock arrangements it is impossible to carry out for instance access control from a remote location. As a consequence, electrically operated motor locks have been developed, whereby the movements of the dead bolt 30 or the latch bolt and consequently opening of the lock can be carried out remotely. These arrangements for their part include the drawback that the provision of a lock with a motor considerably increases the costs of manufacture and increases the volume required to 35 accommodate the lock.

Further solutions are known, in which the dead bolt, or a member acting on the dead bolt, is under the influence of a solenoid located outside the lock body for locking or opening the lock. If then provision is made for the door lock to be able to provide all the conventional functions of a door lock, such as key operation, operation with a turning knob or exclusion of the operation with a turning knob and dead locking, the result is a complicated and impractical construction. In addition also, in this case the need for space is greater than conventionally, which causes problems especially in operating locations where there is a desire to change the conventional locking of doors for a new locking arrangement using electrical remote control.

The present invention seeks to eliminate the drawbacks apparent in known door lock arrangements by creating an uncomplicated and operationally secure door lock construction, which fulfils the conventional requirements set for a door lock and additionally is adaptable for a remote controlled use under surveillance. One aim is to make use of electric control either for connecting or disconnecting the possibility of operating the door through a handle or a turning knob for instance so that when electrical control is used, the lock can be opened by a handle or turning knob, whereas the consequence of a disconnection of the electrical control is that the lock can only be opened by means of a key through a separate locking mechanism, for instance a cylinder lock. A still further aim is to provide a lock having a lock body which corresponds, as to the outer dimensions thereof, with the bodies of conventional door locks and, thus, does not, in this respect, require any noticeable special arrangements for installation on or in a door.

What constitutes the invention is defined in the following claim 1. In one arrangement according to the

invention the lock body includes coupling means, which, under control of the solenoid means, on one hand connect and on the other hand disconnect the force transmission connection from a handle or a turning knob attached to the door lock to the latch bolt. By effecting the force transmission connection in this way in an arrangement according to the invention, the additional elements to be provided for remote control can be minimized and, thus, they all can be located in a conventional lock body. Only the electric switch itself, with which the solenoid means is activated and deactivated, is located outside of the lock body in any desired position that may required for controlling the door.

The solenoid means can equally well comprise a drawing or a pulling solenoid, which is provided with an actuating member for moving the coupling means into a position, in which the force transmission connection between the follower means and the latch bolt is either connected or disconnected depending on the mode of operation. The returning of the coupling means for its part can with advantage be arranged by means of a spring. Then for instance in the event of a possible interruption of electrical power supply it can be arranged so that the coupling means disconnects the force transmission connection from a handle or a turning knob to the latch bolt. Thus, the door lock can be opened only with a key, whereby security over door control is not compromised. In other modes of operation on the other hand the provisions set for the security of persons can expressly require that when a power loss occurs the coupling means must be in a position enabling access via the door without a key.

In one embodiment of the invention, favourable especially in view of space requirements, the follower means is divided to include first and second members so that

the first follower member is connected to a handle, a turning knob or the like operating device and is directly turnable therewith. The second follower member is a turnable element independent of the first follower member and said operating device and is arranged in force transmission connection with the latch bolt, whereby the force transmission from the first follower member to the second follower member is arranged by means of said coupling means. The force transmission connection can with advantage be carried out so that the second follower member is longer than the first follower member and arranged to act on the latch bolt by making use of a force transmission element turnably journaled to the lock body. Said coupling means can with advantage include a swingable stub shaft arranged to be moved by the solenoid means between the connecting and disconnecting positions of the coupling means, and a cam member supported to said stub shaft so as to be movable in the longitudinal direction thereof. The follower members, respectively, can be provided with protrusions, which are arranged, at the connecting position of the coupling means, in cooperation with said cam member.

In another embodiment of the invention said coupling means comprises a turnably journaled lever arranged in cooperation on one hand with a drawing member located adjacent to the first operating axis of the lock and effecting the retracting movement of the latch bolt into the lock body and on the other hand with the follower turning around the second operating axis of the lock so that in its connecting position the coupling lever is arranged to be within the reach of the follower means whereby turning of the follower means causes turning of the coupling lever for moving the drawing member and retracting the latch bolt. On the other hand in its open position the coupling lever is turned to be out of reach relative to the follower means so that force

transmission from the follower means to the latch bolt is disconnected.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which

Figures 1 and 2 show a side view of one embodiment of a door lock according to the invention, the lock body being opened and the coupling means being shown in two different operating positions, and

Figure 3 shows a side view of another embodiment of a door lock according to the invention, the lock body also being opened.

In the drawings reference numeral 1 refers to a lock body, into which a bevelled latch bolt 2 is arranged to be movable back and forth between its protruding or locking position, as shown in the Figures and its retracted or releasing position. The lock body 1 includes two operating axes, of which to the first operating axis 4a a key-operable lock mechanism (not shown in the Figures) is connectable, from which force transmission to the latch bolt 2 takes place via a linearly movable drawing member 5, associated with the axis 4a, and a force-transmission element 7 turnably connected thereto by means of a pivot pin 6. Force transmission from the lock mechanism to the drawing member 5 takes place through a torsion cylinder 26, which is provided with cams cooperating with a conventional force-transmission element attached to the lock mechanism and a recess, in which the drawing member 5 is located. The recess includes guiding edges 27, which act on the drawing member 5 for accomplishing the linear movement thereof when the torsion cylinder 26 is turned by means of the lock mechanism.

The force-transmission element 7 is turnably journaled in the lock body 1 by a pivot pin 22. The latch bolt 2 for its part includes a pin 8, which is arranged in cooperation with a guiding groove 9 in the force-transmission element 7 for moving the latch bolt 2 into its retracted position. Movement of the latch bolt 2 back into its locking position takes place by means of a spring 3, again via the force-transmission element 7. The other operating axis 4b is provided with a follower 10b, which can be turned with a handle, a turning knob or the like (not shown in the Figures) to be installed in alignment with the operating axis 4b. A spring 11 serves as a returning member for the follower 10b and, hence, also for the handle, knob or the like. Additionally the lock body 1 includes a buffer 10c for the follower 10b.

The door lock further comprises solenoid means 12, which is arranged to be a part of an electrical circuit 13, which is shown only schematically in the Figures. The circuit 13 is opened and closed with a switch 14, which can be positioned in any desired location outside the lock body 1. The solenoid means 12 comprises a drawing solenoid in the embodiment of Figures 1 and 2 and a pushing solenoid in the embodiment of Figure 3. In either case, the solenoid is provided with an actuating member 15, which, when the solenoid is energised, moves coupling means 16 in the lock body from an open position to a connected position, in which the coupling means 16 provides a force transmission connection from a handle or the like (not shown) via the follower 10b to the latch bolt 2. Return of the coupling means 16 to its open position takes place by means of a spring 17. When the switch 14 is open, the actuating member 15 is pressed back into its initial position also by means of the spring 17. When the coupling means 16 is not activated electrically the above-mentioned force transmission connection

is disconnected and it is not possible to act on the latch bolt 2 by turning the handle or the like located at the operating axis 4b so that the door lock can then only be opened with a key working in the vicinity of the operating axis 4a.

In the embodiment of Figures 1 and 2, the follower is divided into two separate members 10a and 10b of different lengths. The shorter follower member 10a is connected so that it can directly be turned from a handle or a turning knob acting at the operating axis 4b. In addition the follower member 10a includes a protrusion 19. The longer follower member 10b, which is provided with a protrusion 20, is for its part independent of the turning of the handle and of the follower member 10a when the coupling means 16 is in its open position, as will be apparent from a study of Figure 1.

The coupling means 16 comprises, in the embodiment of Figures 1 and 2, a swingable stub shaft 16a, to which a cam member 16b is journaled to be movable in the axial direction of the shaft 16a. The cam member 16b is provided with a guiding edge 16b' and a nose 16b". Additionally the coupling means 16 comprises an arm member 16c, to which the actuating member 15 of the solenoid 12 is connected so as to turn the coupling means 16 around an axis 16d. In the situation shown in Figure 1, the switch 14 is open, whereby the circuit 13 is disconnected and the shaft 16a and the cam member 16b are in their open positions, in which the cam member 16b and more clearly the nose 16b" is out of contact with the protrusions 19 and 20 of the follower members 10a and 10b. As a consequence of this it is possible to turn, by means of a handle or a turning knob, only the shorter follower member 10a, which does not extend to the force-transmission element 7 and from which force is not transmitted to the longer follower member 10b either, so that force

transmission from the handle to the latch bolt 2 is not possible. The drawing solenoid 12 is provided with a guiding member 18 having a surface 18a, which acts on the guiding edge 16b' and thereby ensures that the cam member 16b descends into its lower position as shown in Figure 1 when the spring 17 presses the coupling means 16 into this non-connected position. The lock body 1 includes a buffer 19a for the protrusion 19 and thus, for the shorter follower member 10a. In this embodiment the buffer 10c acts only on the longer follower member 10b.

In Figure 2, the switch 14 is shown in its closed position completing the circuit 13, the drawing solenoid 12 thus being activated and the actuation member 15 being shown moved to a position which causes the nose 16b" of the cam member 16b to be located in a channel formed by the protrusions 19 and 20 of the follower members 10a and 10b. Thus, when the handle or the like is turned the protrusion 19 in the follower member 10a presses the nose 16b" against the protrusion 20 in the follower member 10b, as a result of which force transmission between the follower members 10a and 10b is possible. Now the longer follower member 10b acts on a pin 21 carried by the force-transmission element 7, whereby the force-transmission element 7 first turns through a range allowed by the shorter branch of the guiding groove 9 releasing the latch bolt 2 from a dead-locked position, in which an edge 9a in the guiding groove 9 together with the pin 8 prevent turning of the force-transmission element 7 and movement of the latch bolt 2. Thereafter the follower member 10b acts directly on the pin 8 for moving the latch bolt 2, whereby a force-transmission connection is provided between the handle or the like and the latch bolt 2. The movement of the latch bolt 2 is guided by means of the pin 8, the longer branch of the guiding groove 9 in the force transmission element

7 and a guiding groove 28 in the lock body 1.

The embodiment of Figure 3 differs from the construction described above in that one follower 10 and a pushing solenoid 12 are used. In this embodiment the coupling means 16 comprises a lever turnably journaled to the lock body 1 and includes a guiding pin 23 which is arranged in cooperation with a guiding edge 24 provided on the drawing member 5. When the switch 14 is open, the pushing solenoid 12 is de-activated. Due to the action of a spring 17', the actuating member 15 and a coupling lever 160 are then in a position (in Figure 3 the upper position of the coupling lever 160), in which the follower 10 cannot contact the coupling lever. In this condition, force transmission from a handle (not shown in the Figure) acting at the operating axis 4b cannot move the latch bolt 2.

When the switch 14 is closed, the circuit 13 is completed and the pushing solenoid 12 is activated, the actuating member 15 pressing the coupling lever 160 into a position (in Figure 3 the lower position), in which its one end is within reach of the follower 10. When the handle acting at the operating axis 4b is turned, the follower 10 can turn the coupling lever 160 around its pivot 25, causing the guiding pin 23 to be pressed against the guiding edge 24 to simultaneously move the drawing member 5, which turns the force-transmission element 7 in a corresponding way to that described above for the embodiment of Figures 1 and 2 thereby releasing the latch bolt 2 from its dead-locked position. Thereafter when turning the handle further, the follower 10 and the coupling lever 160 act directly on the pin 8 and move the latch bolt 2 into the retracted position in the lock body 1.

The principles according to the invention are also

adaptable to a case where, unlike the embodiments disclosed in the Figures, a coupling means 16 is arranged in its connecting position when the solenoid 12 is deactivated and, thus, the circuit 13 is disconnected either
5 by means of the switch 14 or when the circuit is currentless, for example due to an interruption of electrical power. Naturally this presumes certain modifications of the force transmission arrangement as well as the coupling mechanisms used. However, in principle it is
10 sufficient that the return spring 17 for the coupling lever 160 is changed for a new one, the operating direction or the actuating direction of which is reversed.

The switch 14, which activates and de-activates the solenoid means 12, can be placed, if desired, even
15 quite a long way away from the door, on which the door lock including the solenoid means, has been installed. By means of the invention access via the door can be controlled in a simple and effective way. Only those, who have the correct key for the lock mechanisms attached
20 to the door lock, can by themselves open the door. Access by others can be made optional according to whether force transmission from the handle or turning knob at the operating axis 4b to the latch bolt 2 of the door lock is or is not available depending on the condition of the
25 switch 14.

Further, depending on the mode of operation, the invention can be used so that the closing and opening of the circuit 13 takes place under control of a timer. Then for instance during daylight hours the circuit 13
30 can be connected, but at a certain pre-selected time, the timer is programmed to disconnect the current, whereby access via the door can take place only by use of a key.

It should further be observed that adaptation of the invention does not presume that the operating axis

4a is provided with a key-operated lock mechanism on both sides of the lock body. Depending on location it is possible to provide a turning knob or the like on one side (say on the inner side) of the door. As will be apparent from the Figures, force transmission at the operating axis 4a to the latch bolt 2 always takes place in the same way irrespective of what kind of operating device is used for turning the torsion cylinder 26.

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CLAIMS

1. A door lock, comprising a lock body, a spring-loaded latch bolt which is movable between a protruding or locking position and a retracted or releasing position, and, for accomplishing the movement of the latch bolt, operating means located at two spaced-apart operating axes of which the means at the first operating axis is adapted to be connectable with a key-operated lock mechanism and is arranged in force transmission connection with the latch bolt and the means at the second operating axis includes a follower means and is adapted to be associated with a handle, a turning knob or the like operating device which can be turnably linked to the follower means, wherein the lock body includes coupling means arranged on the one hand to connect and on the other hand to disconnect a force transmission connection extending from an operating device associated with the means at said second operating axis via said follower means to the latch bolt but leaving unaffected the force transmission connection operable via the means at the first operating axis, and wherein the lock body further includes solenoid means for controlling the operation of said coupling means.

2. A door lock according to claim 1, in which the two operating axes are located on opposite sides of the movement axis of the latch bolt.

3. A door lock according to claim 1 or claim 2, in which the solenoid means is included in an electrical circuit, the closing and opening of which is arranged to be effected from outside the lock body and in which closing of the circuit activates the solenoid means which is then arranged to move the coupling means into a position in which force transmission connection between the follower means and the latch bolt is either connected or disconnected.



4. A door lock according to claim 3, in which the solenoid means comprises a drawing or a pulling solenoid, which is provided with an actuating member for accomplishing said movement of the coupling means, and in which
5 return of the coupling means is effected by means of a spring.

5. A door lock according to any one of the preceding claims, in which the follower means comprises first and second follower members so that the first follower member
10 is connected to an operating device associated with the means at the second operating axis and is directly turnable therewith and in which the second follower member is an element turnable independently of the first follower member and arranged in force transmission connection with the
15 latch bolt, force transmission from the first follower member to the second follower member being occasioned by means of said coupling means.

6. A door lock according to claim 5, in which said second follower member is longer than the first follower member and is arranged to act on the latch bolt by making
20 use of a force-transmission element turnably journalled in the lock body.

7. A door lock according to claim 5 or 6, in which said coupling means includes a swingable stub shaft, arranged to be moved by the solenoid means between connect-
25 ing and disconnecting positions of the coupling means, and a cam member carried by said stub shaft so as to be movable in the longitudinal direction thereof, the follower members being provided with protrusions which are arranged to coact with said cam member for accomplishing the re-
30 quired force transmission to move the latch bolt.

8. A door lock according to any one of claims 1 to 4, in which the coupling means comprises a turnably journalled coupling lever arranged to cooperate on one

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hand with a drawing member located adjacent to the first operating axis and providing a retracting movement of the latch bolt into the lock body and on the other hand with the follower means mounted to turn about said second
5 operating axis so that in its connecting position the coupling lever is arranged to be within reach of the follower means, whereby turning of the follower means causes turning of the coupling lever for moving the drawing member and retracting the latch bolt, and in which in
10 its open position, the coupling lever is turned to be out of reach of the follower means so that force transmission from the follower means to the latch bolt is disconnected.

9. A door lock substantially as hereinbefore described with reference to, and as illustrated in Figures
15 1 and 2 or Figure 3 of the accompanying drawings.
