Sept. 15, 1964 S. I. DURANT 3,148,525

ELECTRICALLY OPERATED DOOR LOCK

Filed April 15, 1963

FIG. 3

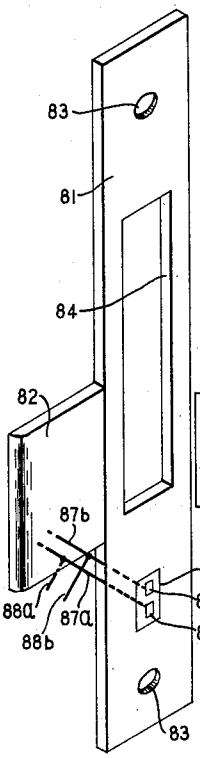


FIG. 1

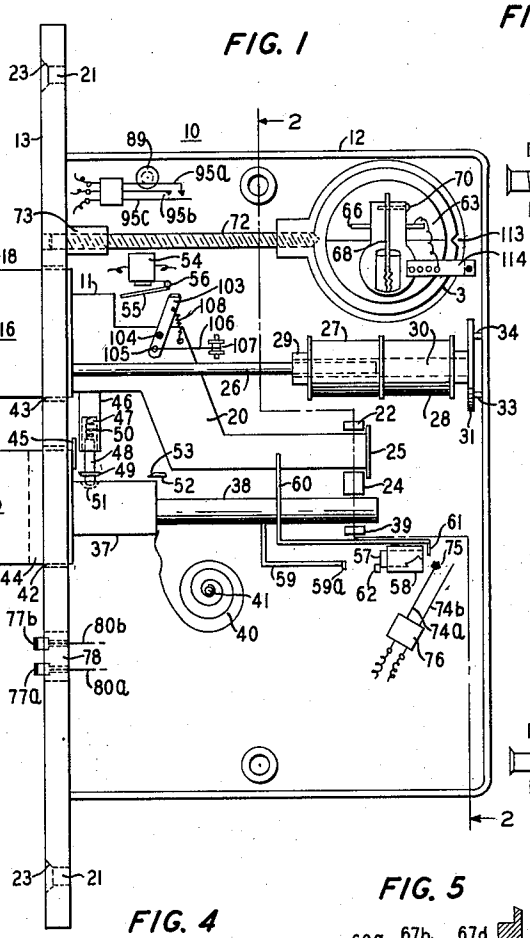


FIG. 2

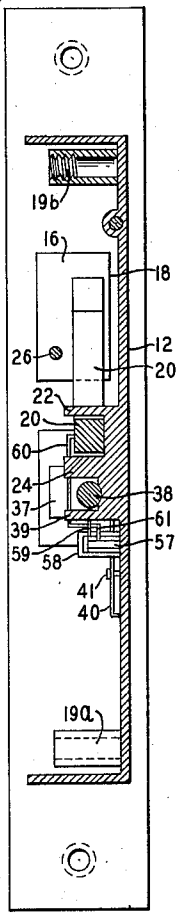


FIG. 7

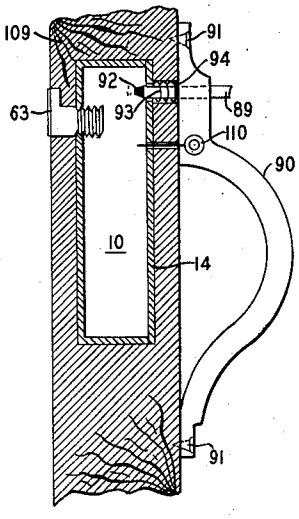


FIG. 4

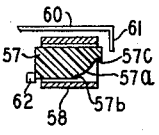


FIG. 5

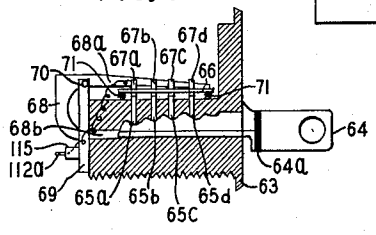
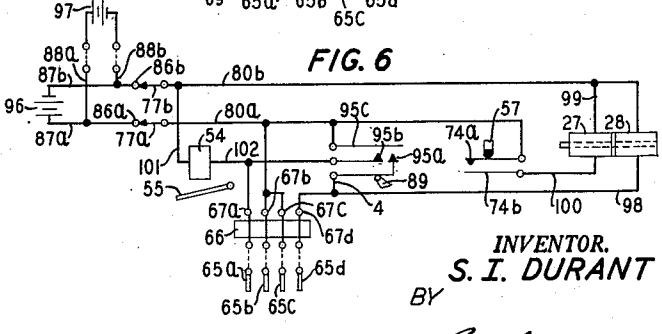


FIG. 6



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3,148,525

Patented Sept. 15, 1964

3,148,525

ELECTRICALLY OPERATED DOOR LOCK

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Filed Apr. 15, 1963, Ser. No. 273,100
10 Claims. (Cl. 70—107)

This invention relates to a door lock in general and more particularly to a door lock which is operated electronically.

The conventional door lock is usually affixed to a hinge mounted door. The lock ordinarily comprises three essential elements: a dead bolt; a tongue; and a tumbler mechanism. These elements are mechanically linked to interact in response to a rotation of the tumbler mechanism cylinder. In the "locked" state the dead bolt and the tongue are extended to engage an aperture in a so-called striker plate on a stationary member to thereby restrain movement of the door about the hinges.

In the prior art the tongue is usually biased to the extended position by a spring. When the door is closing a portion of the striker plate strikes an arcuate section of the tongue to thereby automatically depress the tongue. When the door is completely closed the spring again extends the tongue to engage the aperture in the striker plate. A rotation of either the tumbler cylinder, the inner door knob or, under certain circumstances, the outer door knob will cause the tongue to be withdrawn from engagement with the aperture in the striker plate. The dead bolt, on the other hand, may only be extended or retracted by a rotation of either the tumbler cylinder or a separate knob on the inside of the door.

In operation, the tumbler mechanism cylinder is not free to rotate, however, when the correct key is inserted into the tumbler mechanism the tumblers are adjusted, in the well known manner, to allow the cylinder to freely rotate. If the lock is in the locked state, a rotation of the cylinder will cause the dead bolt to be withdrawn from engagement with the stationary member (i.e., the striker plate). A further rotation of the cylinder will disengage the tongue; this operation frees the door from the restraining action of the lock thereby allowing the door to be opened.

There are several disadvantages associated with the above described type of arrangement. The primary drawback is that further manual operations are required to operate the dead bolt to securely lock the door after the door has been shut. That is, simply closing a door will cause the tongue to engage the striker plate. However, this operation alone is insufficient to securely lock a door because it has been found that the tongue may be forced out of engagement with the striker plate by means external to the lock. In a great many situations a person may not have the time or the inclination to stop, insert the key in the tumbler mechanism, and rotate the cylinder to thereby extend the dead bolt. Similarly, a great majority of people, upon entering through a door, allow the door to close behind them without ever giving a second thought to operating the dead bolt portion of the lock. The common fallacy that the tongue portion of the lock in itself is adequate to afford sufficient protection in locking a door has led to many a burglarized home or apartment. A second disadvantage to the conventional lock is the requirement of rotating the tumbler mechanism cylinder to effect retraction of the dead bolt and tongue. This is an extremely inconvenient operation to perform when a person's hands are otherwise occupied as, for example, when one is carrying packages.

Accordingly, it is a general object of the present invention to improve the operation of door locks. More specific objects of this invention are to minimize or eliminate the above-described difficulties with a lock of a single straightforward design.

Another object of the present invention is to provide a door lock which requires a minimum of manual operations to perform its functions.

Accordingly, a preferred embodiment of the present invention comprises a dead bolt and a tongue slidably mounted within a lock body wherein each is operable between an extended and a retracted position. The tongue is biased toward the extended position. A pin on the dead bolt engages the tongue when these elements are in their extended position to insure that the tongue will retract in unison with the dead bolt. A magnetic rod is connected to the dead bolt and two coils concentrically surround the rod. A source of power is connected to the lock through contacts on the striker plate.

The opening cycle of the lock is initiated when the correct key is inserted into the tumbler mechanism. This action completes a circuit thereby disabling a latch which prevents movement of the dead bolt and energizing the first of the two coils. The magnetic field produced by the coil exerts a force on the rod in a direction which causes the dead bolt, and concomitantly the tongue, to retract thus allowing the door to be opened. When the tongue and dead bolt reach their retracted position a device within the lock disables the interconnecting pin and the tongue is again biased toward its extended position.

The closing cycle of the door is initiated when the door is shut. Thus, closing the door causes the tongue to be depressed by the striker plate in the conventional manner. The retracted tongue causes a set of contacts to close, thereby connecting the source of power to the second of the two coils. The magnetic field produced by this coil exerts a force on the rod in a direction which causes the dead bolt to move to its extended position.

Accordingly, a feature of this invention is to provide a door lock which automatically dead bolts when the door is closed.

Another feature of the present invention is to provide a door lock wherein the tongue and dead bolt will disengage from the striker plate simply by inserting the key into the tumbler mechanism.

A further feature of the present invention is to provide a door lock in which movement of the elements is initiated by electromagnetic devices.

Still another feature of the present invention resides in the use of a stop latch to prevent movement of the dead bolt by external means when it is in the extended position.

Many types of electrically operated locks can only be operated by energizing the various elements. This type of arrangement can lead to disastrous consequences, i.e., if a fire breaks out and causes a power failure before the tenants operate the lock they will not be able to open the door.

Accordingly, a still further feature of the present invention is to provide an electrically operated door lock which incorporates a mechanical over-ride to manually open the lock in case of power failure.

The above and other objects and features of the present invention will become more apparent from a consideration of the following detailed description when taken in conjunction with the drawings in which:

FIG. 1 is a front elevation of the lock of the present invention with the cover removed and the elements in their extended positions;

FIG. 2 is a sectional view of the lock of the present invention taken along the lines 2—2 of FIG. 1 showing a portion of the elements of the lock;

FIG. 3 is a perspective view of a striker plate for the lock shown in FIG. 1;

FIG. 4 is an enlarged sectional view of the pawl shown in FIG. 1;

FIG. 5 is a sectional view of the tumbler mechanism of the present invention with the key inserted;

FIG. 6 is a schematic circuit wiring diagram showing how the electrical elements of FIG. 1 are connected; and

FIG. 7 is a side elevational portion of a door with the external elements of the lock of the present invention affixed thereto.

It is to be understood that like numbers in the different figures indicate the same elements.

The preferred embodiment of the present invention is shown in FIG. 1 in the "locked" state and comprises a lock 10 having a body portion 12 and a face plate 13. A cover portion 14 (FIG. 2) fits over body 12 and contains two apertures, 15*a* and 15*b* therein. A pair of screws 17*a* and 17*b* are adapted to pass through apertures 15*a* and 15*b*, respectively and engage the threaded bores 19*a* and 19*b*, respectively, in body 12 thereby securing the cover to the body. The apertures 21, having countersunk portions 23, are at each end of face plate 13. Screws (not shown) are adapted to pass through these apertures to mount body 12 to a door. The countersunk portions 23 receive the heads of the screws so the heads do not project beyond face plate 13.

A dead bolt 16, which has a head portion 18 and a shank portion 20, is slidably mounted within body 12 between the posts 22 and 24. A suitable aperture 43 in face plate 13 allows head portion 18 to extend therethrough. A stop 25 at the end of shank 20 engages posts 22 and 24 to limit the distance which head 18 extends beyond face plate 13. In the "unlocked" state stop 25 will abut the rear wall of body 12 to limit the distance dead bolt 16 will retract within body 12.

A magnetic rod 26 is connected to the rear face of head portion 18 and lies in a plane which is parallel to the axis of travel of dead bolt 16. A bushing 29, which has a bore 30 therein to receive rod 26, concentrically surrounds rod 26 and is mounted on a pedestal 31. Pedestal 31 is rigidly connected to the rear wall of body 12 by the supports 33 and 34. The two coils 27 and 28, are wound about bushing 29 in a manner such that the force one coil will cause to be exerted on rod 26 will be opposite to the force the other coil will cause to be exerted on rod 26 when the coils are individually energized.

A relay 54, which is attached to body 12 by a screw (not shown), includes an armature 55 pivotally mounted to body 12 by screw 56. When the dead bolt is extended armature 55 falls below the step 11 in shank 20, as shown in FIG. 1, to prevent retraction of head bolt 16. When the winding of relay 54 is energized, as noted hereinbelow, armature 55 moves toward the winding about screw 56 so dead bolt 16 may retract uninhibited.

A tongue 35, having a head portion 44, an enlarged shank portion 37 and a small shank portion 38 is slidably mounted within body 12 between post 24 and a post 39. Head 44 comprises, in part, an arcuate portion on the rear face thereof. A coiled spring 40, which is affixed to body 12 by pin 41, abuts the rear wall of shank 37 and forces tongue 35 toward the extended position through a suitable aperture 42 in face plate 13. A stop 45 which is affixed to the rear of head 44, abuts the back of face plate 13 and limits the maximum extension of tongue 35 beyong the face plate.

An extension 46 is rigidly affixed to shank 20 and contains a bore 47 therein. A pin 48, having a beveled washer 49 at one end thereof, is contained within and free to move in bore 47 and is biased in a downward direction by a spring 50. A detention 51 in enlarged shank 37 receives that portion of pin 48 which lies below washer 49. An abutment 52, which is affixed to body 12, has a beveled face 53 which coacts with washer 49, in the manner described hereinbelow, to lift pin 48 out of engagement with shank 37. Stop 45 serves to limit rearward travel of tongue 35 by abutting extension 46 when dead bolt 16 is in its retracted position.

A pawl 57, composed of a suitable dielectric material, is slidably mounted within a channel 58. A right angled rod 59, which is connected to shank 38 of tongue 35, is positioned so the end 59*a* engages the front face of pawl 57 and moves the pawl toward a rearward position (to the right in FIG. 1) when tongue 35 moves toward the retracted position. A multiply angled rod 60 is connected to shank 20 of dead bolt 16 and has a hook 61 at the end thereof. The hooked end 61 is operatively positioned to engage the rear face of pawl 57 and move the pawl toward the foreward position (to the left in FIG. 1) when dead bolt 16 moves toward its extended position. A stop 62 on body 12 limits the foreward travel of pawl 57.

FIG. 4 shows an enlarged view of pawl 57. The rear face of the pawl has an arcuate portion 57*a*, with notches 57*b* and 57*c* at the ends thereof. Operatively positioned to the right of channel 58 (as shown in FIG. 1) and in the path of travel of pawl 57, is a set of spring contacts comprising contact 74*a* (having a raised portion 75 at the end thereof) and contact 74*b* affixed to body 12 by the dielectric block 76. Thus, on the rearward travel of pawl 57 notch 57*c* impinges upon 75 thereby forcing contacts 74*a* and 74*b* together. The pressure of 74*a* maintains the pawl in place until rod 61 moves the pawl to the right as taken in FIG. 1, whereupon contacts 74*a* and 74*b* separate.

The tumbler mechanism of the present invention is illustrated in section in FIG. 5 and comprises a partially threaded body 63, of a suitable dielectric material, with a keyshaft therein to slidably receive a metal key 64. An insulated portion 64*a* on key 64 insulates the handle portion of 64 from the keyed portion. A set of metal tumblers 65*a*, 65*b*, 65*c* and 65*d* are slidably mounted in longitudinal bores in body 63 in the conventional manner. A dielectric plate 66, having a set of contacts 67*a*, 67*b*, 67*c* and 67*d* therein, is affixed to the leg 68*a* of a U shaped member 68. A pin 70, which engages an aperture in 68, pivotally mounts member 68 to a post 69 which is affixed to body 63. When the key 64 is inserted in body 63, the top edge of tumblers 65*a*–65*d* fall into the same plane. Contacts 67*a*–67*d* are forced into engagement with the respective tumbler when the front end of key 64 abuts the leg 68*b* of member 68. If an incorrect key is inserted into body 63 (i.e., a key which is not designed to operate the lock) the top edge of the tumblers will not lie in the same plane. Thus, contacts 67*a*–67*d* will be prevented from engaging all the respective tumblers since the top edge of the highest tumbler will prevent the lowering of plate 66. Each of the contacts 67*a*–67*d* is connected to a different prong of a four-prong male socket 115 mounted to the rear of body 63; 67*a* being shown connected to prong 112*a*. A pair of springs 71 normally bias plate 66 above the tumblers.

A bore 3 in body 12 (FIG. 1) slidably receives body 63 with projection 113 on body 12 engaging a suitable channel therein. A set screw 72, threadably mounted to body 12 through a threaded aperture 73, is turned until the rear end thereof abuts body 63 thereby holding the lock mechanism in place. A female socket 114, mounted to body 12, receives the prongs of 115 in slidable engagement. The various electrical connections are omitted in FIG. 1 for clarity but are shown in detail in FIG. 6.

A pair of wiper contacts 77*a* and 77*b* are set in a suitable dielectric 78 in the front of face plate 13. Leads 80*a* and 80*b* respectively connect contacts 77*a* and 77*b* to the electrical elements in body 12, as noted hereinbelow.

The striker plate of the present invention is illustrated in FIG. 3 and comprises the rectangular body 81 having a laterally extending protrusion 82. The striker plate is affixed to a door frame by a pair of screws (not shown) passing through the apertures 83. A rectangular aperture 84 slidably receives tongue 35 and dead bolt 16 in the conventional manner to thereby restrain movement of the door. Moreover, protrusion 82 causes tongue 35 to depress in the well known manner, when the tongue impinges upon the protrusion as the door is shut. A di-

electric block 85 is mounted within body 81 and contains contacts 86*a* and 86*b* therein. These contacts are connected to a source of power (not shown in FIG. 3) by the leads 87*a* and 87*b*, respectively. Leads 88*a* and 88*b* designate a means of providing auxiliary power by connecting, for example, a battery thereto if the main source of power fails. These leads may be connected to the outside of the door frame or any other suitable place. When the door is shut (i.e., when face plate 13 is opposite body 81) wiper contacts 77*a* and 77*b* will respectively engage contacts 86*a* and 86*b* to thereby energize the electrical portions of the lock as described hereinbelow.

A rod 89, having a reduced diameter portion 92 at the end thereof, projects through a suitable aperture in cover 14 and may be supported by a handle 90, as shown in FIG. 7. (The lock in indicated generally by the numeral 10 in FIG. 7.) Handle 90 is affixed to the rear of a door 109 by fasteners 91 and slidably supports rod 89, which passes through a bore in door 109. A spring 93, compressed between cover 14 and a stop 94 on rod 89, forces rod 89 toward the right as taken in FIG. 7. In the normal position reduced diameter portion 92 rests against contact 95*a* of a set of contacts which include contacts 95*b* and 95*c* (FIG. 1). Thus, when rod 89 is pushed inward toward body 12 the enlarged diameter of rod 89 forces contacts 95*a* and 95*b* to engage contact 95*c*. What the pressure is removed, spring 93 forces rod 89 back to its original position thereby allowing contacts 95*a*, 95*b* and 95*c* to separate.

The electrical elements described above are connected as shown in FIG. 6. A source of potential 96 is connected to contacts 86*a* and 86*b* by leads 87*a* and 87*b*, respectively. (A noted hereinabove, leads 88*a* and 88*b* may be connected to a secondary source of power 97 if primary source 96 fails.) If the door is assumed shut wiper contacts 77*a* and 77*b* will respectively engage contacts 86*a* and 86*b* thereby connecting source 96 across leads 80*a* and 80*b*. Lead 80*b* is connected to one terminal of coil 28; the other terminal of coil 28 is connected to contact 67*d* on plate 66 by a lead 98. Contact 95*a* is connected to lead 98 by a lead 4. Lead 80*a* is connected to contacts 67*b* and 67*c* on plate 66 and to contacts 95*c* and 74*a*. One terminal of coil 27 is connected to lead 80*b* by a lead 99; the other terminal of coil 27 is connected to contact 74*b* by a lead 100. Coil 54 is connected between lead 80*b* and contact 95*b* by the respective leads 101 and 102. Contact 67*a* on plate 66 is likewise connected to lead 102.

In operation, assume that a door utilizing the device of the present invention is shut with dead bolt 16 and tongue 35 extended to engage aperture 84 and contacts 86*a* and 86*b* respectively connected to wiper contacts 77*a* and 77*b*. When key 64 is inserted in the keyshaft in tumbler mechanism body 63, tumblers 65*a* through 65*d* will respectively engage contacts 67*a* through 67*d*, in the manner noted above. Thus, as can be seen from FIG. 6, the winding of relay 54 will be energized through the circuit comprising source 96, lead 87*b*, contacts 86*b* and 77*b*, leads 80*b* and 101, the winding of relay 54, lead 102, contact 67*a*, tumbler 65*a*, key 64, tumbler 65*b*, contact 67*b*, lead 80*a*, contacts 77*a* and 86*a* and lead 87*a*. The energizing of relay 54 will cause armature 55 to rise thereby allowing dead bolt 16 to retract unimpeded, as noted above. Coil 28 will be energized through the circuit comprising source 96, lead 87*a*, contacts 86*a*, and 77*a*, lead 80*a*, contact 67*c*, tumbler 65*c*, key 64, tumbler 65*d*, contact 67*d*, lead 98, coil 28, lead 80*b*, contacts 77*b* and 86*b* and lead 87*b*. Coil 28 is wound in such a direction as to attract magnetic rod 26, according to the well known principles of electromagnetic theory. Thus, dead bolt 16 (the head 18 of which is rigidly connected to rod 26) will be drawn back towards its retracted position thereby causing tongue 35 to move towards its retracted position by virtue of the interconnecting pin 48 engaged in detention 51. Pressure applied to the door will cause the door to open once tongue 35 and dead bolt 16 have retracted a distance sufficient to cause them to be disengaged from aperture 84. Once the door has begun to open contacts 77*a* and 77*b* will become disengaged from contacts 86*a* and 86*b* thereby de-energizing coil 28. However, the momentum of dead bolt 16 will carry it to its fully retracted position causing beveled washer 49 to engage face 53 of abutment 52 thereby raising pin 48 and freeing tongue 35 as explained hereinabove. Spring 40 forces tongue 35 to its extended position. Key 64 may then be removed from body 63.

The closing cycle is initiated when the door is shut. The arcuate portion of tongue 35 will impinge upon extension 32 forcing the tongue toward its retracted position. Right angle rod 59 will engage the front face of pawl 57 and move pawl 57 to impinge upon extension 75 thereby forcing contacts 74*a* and 74*b* into engagement, as described above. Although tongue 35 is again extended, by spring 40, through aperture 84, the contacts 74*a* and 74*b* will remain in engagement since their force on pawl 57 will keep the pawl in place. Since the door is closed leads 80*a* and 80*b* will be energized because contacts 77*a* and 77*b* will respectively engage contacts 86*a* and 86*b* (which are connected to source 96 by leads 87*a* and 87*b*, respectively). Thus, coil 27 will be energized through the circuit comprising lead 80*a*, contacts 74*a* and 74*b*, lead 100, coil 27, lead 99 and lead 80*b*. Coil 27 is wound in such a direction as to cause magnetic rod 26 to move to the left as taken in FIG. 1. This action will force dead bolt 16 to its extended position thereby causing head 18 to be engaged in aperture 84. As dead bolt 16 moves to its extended position the hooked end 61 of rod 60 will engage the rear face of pawl 57 and move the pawl to the left as taken in FIG. 1. As pawl 57 moves toward the left it releases the force exerted on contacts 74*a* and 74*b* and these contacts separate thereby de-energizing coil 27. Armature 55, which lies on surface 11 of shank 20 while dead bolt 16 is in its retracted position, will fall into position when the dead bolt is extended to prevent movement of the bolt as explained above. Hence, it is to be noted, in accordance with the present invention, that the lock automatically dead bolts upon closure of the door.

It is to be noted that although rod 59 on tongue 35 engages pawl 57 and moves the pawl to the right as taken in FIG. 1 when the tongue retracts on the opening cycle, the forces involved may not be sufficient to force the pawl to maintain contact with raised portion 75 on contact 74*a*. However, even if contacts 74*a* and 74*b* are forced together, coil 27 will not be energized since no source of power will be connected to wiper contacts 77*a* and 77*b* when the door is open.

If it is desired to unlock the door from the inside, rod 89 is pushed toward the left as taken in FIG. 7. The enlarged diameter of rod 89 forces contacts 95*a* and 95*b* into engagement with contact 95*c* (FIG. 6). Thus, relay 54 will be energized through the circuit comprising source 96, lead 87*a*, contacts 86*a* and 77*a*, lead 80*a*, contacts 95*c* and 95*b*, lead 102, the winding of relay 54, lead 101, lead 80*b*, contacts 77*b* and 86*b* and lead 87*b*. Coil 28 will be energized through the circuit comprising source 96, lead 87*b*, contacts 86*b* and 77*b*, lead 80*b*, coil 28, lead 98, contacts 95*a* and 95*c*, lead 80*a*, contacts 77*a* and 86*a* and lead 87*a*. With relay 54 and coil 28 energized, dead bolt 16 and tongue 35 will retract in the manner noted hereinabove. Thus, the door may be opened by pulling on handle 90.

On many occasions it may be desirable to operate the lock of the present invention by mechanical means such as when the primary source of power fails and an emergency does not leave time to connect a secondary source of power to the lock. This mechanical "over-ride" may comprise a lever 103 pivotally mounted to shank 20 of dead bolt 16 by means of pin 104, which is affixed to shank 20, passing through an aperture in 103. The

top edge of level 103 is biased to the right, as taken in FIG. 1, by a spring 108 which is connected between the top portion of lever 103 and shank 20. The lower portion of lever 103 contains an aperture 105 which receives a lead 106 therein. Lead 106 is wound about a pulley 107 and passes through an aperture in cover plate 14 and through a bore in door 109 to terminate in a pull ring 110 (FIG. 7).

If the lock is in its locked state and the source of power fails, ring 110 is pulled thereby tensing lead 106. Lead 106 will exert a force on lever 103 in a direction which will force the top edge of lever 103 to the left as taken in FIG. 1, against the action of spring 108. The top edge of lever 103 will impinge upon armature 55 thereby forcing the armature up and out of the path of travel of dead bolt 16. Continued force on lead 106 will be transmitted to shank 20 by virtue of pin 104 connecting the lever 103 and dead bolt 16 thereby forcing the dead bolt toward its retracted position. The dead bolt 16 will cause tongue 35 to retract, in the manner noted hereinabove, to thereby unlock the door. A pull on handle 90 will cause the door to open.

What is claimed is:

1. A door lock comprising, in combination, a lock body, a dead bolt moveable in said lock body between an extended and a retracted position, a tongue moveable in said lock body between a retracted and an extended position, means for biasing said tongue toward its extended position, first means responsive to an electric current for moving said dead bolt from the extended to the retracted position, second means responsive to an electric current for moving said dead bolt from the retracted to the extended position, energizing means for providing a source of current, means responsive to the insertion of a key for connecting said energizing means to said first means, means actuated by said tongue for connecting said energizing means to said second means, latching means for connecting the tongue and dead bolt together when said tongue and dead bolt are in the extended position, and means for disabling said latching means when said dead bolt reaches a predetermined position in its travel from the extended to the retracted position.

2. A door lock comprising, in combination, a lock body, a dead bolt moveable in said lock body between an extended and a retracted position, stop means for preventing movement of said bead bolt when it is in the extended position, a tongue moveable in said lock body between an extended and a retracted position, means for biasing said tongue toward its extended position, latching means for connecting said tongue and dead bolt together when they are in the extended position, first means responsive to an electric current for removing said stop means, second means responsive to an electric current for moving said dead bolt from the extended to the retracted position, third means responsive to an electric current for moving said dead bolt from the retracted to the extended position, energizing means for providing a source of electric current, means responsive to the insertion of a key for connecting said energizing means to said first and second means, means actuated by said tongue for connecting said energizing means to said third means, and means for disabling said latching means when said dead bolt reaches a predetermined position in its travel from the extended to the retracted position.

3. A door lock as defined in claim 2 including, a rod protruding from said lock body and moveable therein, biasing means for biasing said rod away from said lock body, and means actuated by said rod when said rod is moved in toward said lock body for connecting said energizing means to the first and second means.

4. A door lock as defined in claim 2 and means responsive to the pulling of a lead for removing said stop means and for moving said dead bolt from the extended to the retracted position.

5. In a locking mechanism for a door, the combination comprising, a casing structure, a dead bolt having a head and a shank portion and moveable in said casing structure between an extended and a retracted position, a magnetic rod projecting from the rear of said head with the major axis of said rod lying in a plane parallel to the plane of travel of said dead bolt, a first coil wound in one direction and a second coil wound in the opposite direction, means for mounting said coils to concentrically surround a portion of said rod, a tongue moveable in said casing structure between an extended and a retracted position, means for biasing said tongue toward the extended position, energizing means for providing a source of electric current, means responsive to the insertion of a key for connecting said energizing means to said first coil whereby the magnetic field produced by said first coil attracts said magnetic rod to move said dead bolt from the extended to the retracted position, means actuated by said tongue when said tongue moves toward the retracted position for connecting said energizing means to the second coil whereby the magnetic field produced by the second coil repels said magnetic rod to move said dead bolt from the retracted to the extended position, latching means for connecting said dead bolt and tongue together when said tongue and dead bolt are in the extended position, and means for disabling said latching means when said dead bolt reaches a predetermined position in its travel from the extended position to the retracted position.

6. In a locking mechanism for a door, the combination comprising, a casing structure adapted to be affixed to a door, a dead bolt having a head and a shank portion and moveable in said casing structure between an extended and a retracted position, a tongue moveable in said casing structure between an extended and a retracted position, biasing means for biasing said tongue toward the extended position, a striker plate adapted to be affixed to a stationary member and having a aperture therein for slidably receiving said dead bolt and said tongue, a magnetic rod projecting from the rear face of said head with the major axis of the rod parallel to the plane of travel of said dead bolt, a first coil means concentrically surrounding at least a portion of said rod for producing a magnetic field which attracts said rod to move the dead bolt to the retracted position, a second coil means concentrically surrounding at least a portion of said rod for producing a magnetic field which repels said magnetic rod to move said dead bolt to the extended position, a first set of contacts affixed to said striker plate, a source of power connected across said first set of contacts, contact means affixed to said casing structure for engaging said first set of contacts when the casing structure is in a predetermined position relative to said striker plate, means responsive to the insertion of a key for connecting said contact means to said first coil means to thereby energize said first coil means when said casing structure is in said predetermined position, first means actuated by said tongue when said tongue moves toward the retracted position for connecting said contact means to said second coil means to thereby energize said second coil means when said casing structure is in said predetermined position, latching means for connecting said tongue and dead bolt together when said tongue and dead bolt are in the extended position, and means for disabling said latching means when said dead bolt reaches a predetermined position in its travel from the extended position to the retracted position.

7. An arrangement as defined in claim 6 wherein said first means includes a pawl having a notched face and moveable by said tongue from a first to a second position, said first means further including a second set of contacts connected in series with said second coil means and said contact means and operatively positioned in the path of travel of said pawl whereby the notched face of said pawl impinges upon at least one of said second set of contacts to force said second set of contacts into engagement when said tongue moves said pawl to the second position,

and means connected to said dead bolt for moving said pawl to the first position when said dead bolt moves toward the extended position.

8. An arrangement as defined in claim 7 and a rod having a large and a small diameter projecting from said casing structure and slidable therein, second means for connecting said contact means to said first coil means when the large diameter of said rod abuts said second means, and means for biasing said rod so the small diameter abuts said second means.

9. An arrangement as defined in claim 7 and a relay means operable between a first and a second position for preventing movement of said dead bolt when said dead bolt is in the extended position and said relay means is in the first position and for allowing movement of said dead bolt when said relay means is in the second position, said means responsive to the insertion of a key further connecting said contact means to said relay means whereby said relay means moves to said second position when said casing structure is in said predetermined position.

10. An arrangement as defined in claim 9 and a lever pivotally mounted to said dead bolt and operable between a first and a second position to move said relay means to the second position when said lever is moved to said second position, means for biasing said lever to the first position, a lead connected to said lever whereby tension on said lead moves said lever to the second position and moves said dead bolt to the retracted position.

No references cited.