Feb. 15, 1966 E. O'BRIEN 3,234,766

TIME OPERATED AND/OR REMOTE CONTROL-OPERATED ELECTRO-MECHANICAL LOCK

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Fig. 1

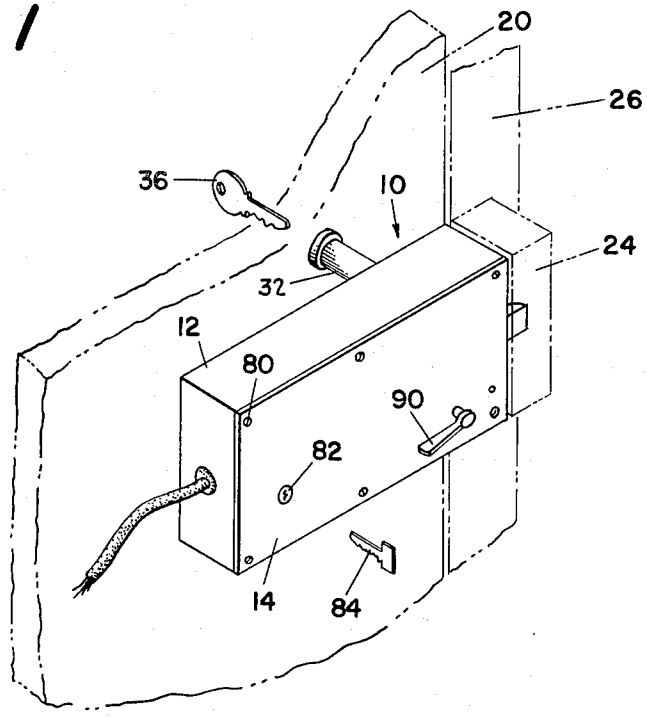
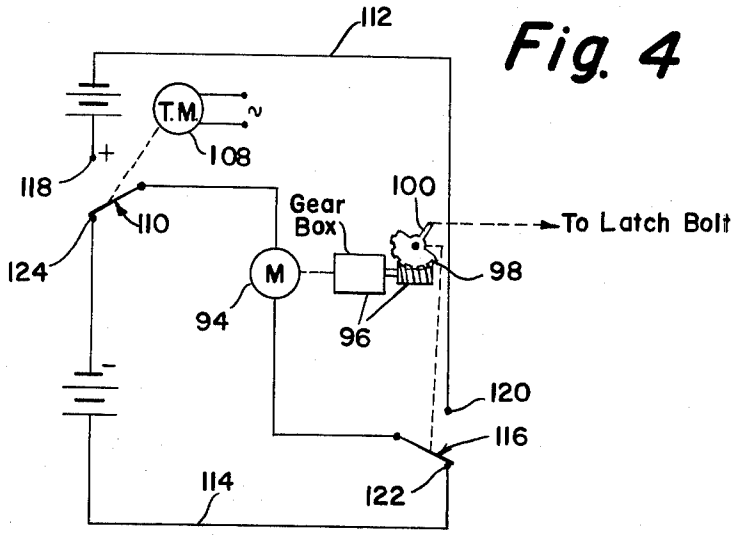


Fig. 4



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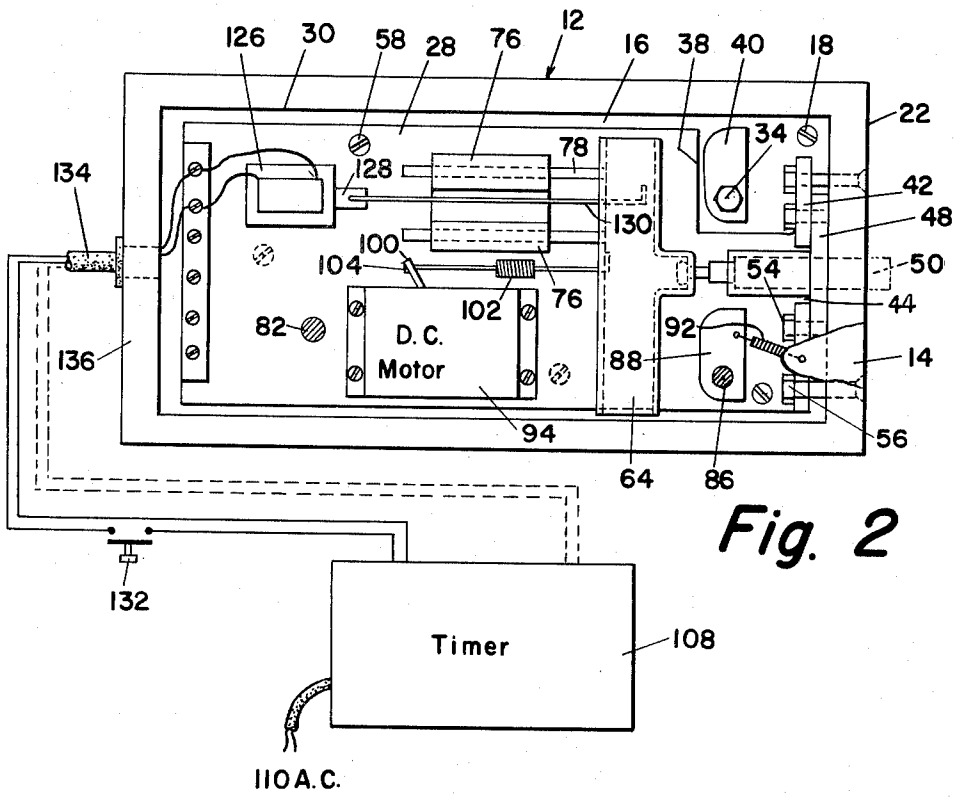
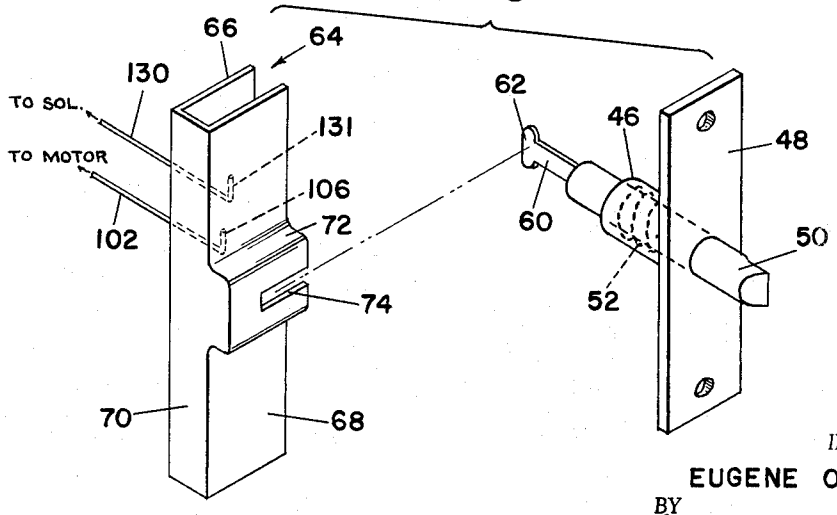


Fig. 2

Fig. 3



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TIME OPERATED AND/OR REMOTE CONTROL-OPERATED ELECTRO-MECHANICAL LOCK

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14 Claims. (Cl. 70—271)

This invention relates to a time controlled lock, the primary object of which is to provide a construction in which the lock is automatically closed at a pre-set time and automatically re-opened after a pre-set interval thereafter, the lock being key or manually operable only by authorized personnel in said interim. It also relates to a remote control-operated lock in which the opening and closing thereof is automatically effected by a means other than a timer, such as manual, pressure or temperature operation.

Another object of the invention is to provide a time controlled lock of the character described in which the latch bolt of the lock is extended into the closed or retracted into the open position by a timer actuated motor in such a manner that the motor shuts off at end of travel of the latch bolt thereby utilizing electrical energy only for the short time required to extend or retract the bolt.

Another object of the invention is to provide a time controlled lock of the character described in which the timer actuated motor is operatively connected to the latch bolt by a means which permits the retraction cycle to complete itself and which cuts off the motor even though the latch bolt may be temporarily restrained from movement, as by jamming in the keeper, said means storing the retraction energy and acting to move the bolt to the retracted position when the restraining force in the keeper is eventually released.

Another object of the invention is to provide a time controlled electromechanical lock which does not rely upon batteries as a source of current and which employs instead circuits of opposite polarity and switches therein in which are operatively connected an electrical source, a reversible motor and the lock bolt in such a manner that at the end of each stroke of the latch bolt a switch is actuated to break one of the circuits and cut off the motor but move to such a position that when the timer re-activates the motor at the pre-set time the opposite circuit is automatically closed.

Another object of the invention is to provide a timer actuated electromechanical lock which can be opened mechanically from the inside and by key operation from the outside only by authorized personnel during the interval when the lock has been pre-set to remain closed.

Another object of the invention is to provide a timer actuated electromechanical lock which can be temporarily actuated from the inside by a remote control push button operating during the interval when the lock has been pre-set to remain closed.

These and other objects of the invention will become more apparent as the following description proceeds in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of the lock shown installed;

FIG. 2 is a side elevational view of the instant lock, the cover having been removed to disclose the working parts;

FIG. 3 is an exploded perspective view of the latch bolt and slide actuating bar therefore; and

FIG. 4 is a diagrammatic view of the timer, motor, latch bolt actuator and circuit therefor.

Specific reference is now made to the drawings in which similar reference characters are used for corresponding elements throughout.

The lock is generally indicated at **10** and comprises a housing **12**, preferably rectangular, and a cover **14** therefor which encloses the lock mechanism. The rear plate **16** of the housing is itself secured as by screws **18** to a

door **20** in any desired position so that one of its side walls **22** is adjacent the vertical edge of the door and proximate to a suitable keeper **24** which has been mounted on the door jamb **26**.

The lock mechanism is itself secured upon a substantially rectangular mounting plate **28** which is smaller than the opening **30** closed by the cover **14** so that the mounting plate can be readily slipped into the housing and there secured. Thus, where the door structure makes it difficult to install the entire lock as a unit, by the present arrangement, first the housing **12** can be readily secured and then the mounting plate. Mounted on and extending perpendicular to the rear housing plate **16** and through a hole in the door is a continuous wafer type lock **32** having a rotatable plug **34** which is operable by a key **36** that is removable in two positions 90° apart. The plug extends into the housing and through a cut-out **38** in the mounting plate **28** and secures a cam **40** on its inner end.

The mounting plate **28** has an upstanding wall **42** with a central opening **44** through which extends a conventional tubular-type spring latch. The latch includes a tube **46** secured to a plate **48**, the latch bolt **50** being slidable in the tube and normally urged by a spring **52** in the tube towards the extended or closed position through a hole provided in the plate **48** and an opening in the side wall **22** of the housing thence into the keeper. The wall **42** of the mounting plate **28** is secured by screws **54** to the latch plate **48** and then further recessed screws **56** are made to extend through the side wall **22** of the housing, the plate **48**, and the wall **42**. Additional screws **58** are used to fix the mounting plate **28** in its final position in the housing.

The inner end of the latch bolt **50** inclules a flattened reduced shank **60** and a laterally enlarged head **62**. A latch bolt actuator **64** is provided which extends vertically across the mounting plate **28** and consists of a member which is substantially U-shaped in cross section having a pair of spaced plates **66** and **68** connected by a web **70**, the plate **68** having a laterally extending enlarged portion **72** provided with an open-ended slot **74** for receiving the shank **60** and head **62** of the latch bolt **50** and effect coupling of the actuator **64** to the bolt. The plates **66** and **68** are spaced apart a distance greater than the total movement of the latch bolt **50**. The mounting plate **28** secures a pair of upstanding spaced bars **76** through which extend, slidably, rods **78** secured to the actuator **64** to guide the latter in its sliding movement longitudinally of the mounting plate.

The cover **14** is secured by screws **80** to the housing and by a threaded member **82** which engages the mounting plate **28** and rear housing plate **16**, the latter being locked in place by a key **84**. To one side thereof a shaft **86** is rotatably mounted on the cover and extends into the housing, the inner end thereof securing a cam **88** and the outer end an operating handle **90**. A spring **92** connects the cam with the cover and urges it away from the actuator. Thus, it will be seen that rotation of the handle **90** in a counter-clockwise direction will cause the cam **88** to engage the actuator **64** and retract the latch bolt. Similarly, key operation of the barrel **34** will cause the cam **40** to engage the actuator **64** and retract the latch bolt.

Mounted on the plate **28** is a reversible D.C. motor **94** whose shaft drives gearing **96**, see FIG. 4, one of which is a sector gear **98** having an upstanding arm **100** which extends through the motor casing, as seen in FIG. 2. Such a motor and associated gearing is commercially available as a Duramite-Multi Servo unit supplied by Bonner Specialties of Los Angeles, California. A spring **102** is terminally hooked as at **104** to the arm **100** and behind the plate **66** as at **106** through which it is freely

slidable. The spring rating of spring 102 is such that it is stronger than the latch spring 52 but weaker than the motor and gears for a purpose later to appear.

A conventional timer 108 is provided in the form of an electrically operated clock having trippers on its clock face which can be set at desired time intervals to open and close the instant lock, the trippers actuating a single pull, double throw toggle switch 110. Such a timer is available from Tork Time Controls, Inc., of Mt. Vernon, New York, as Tork Time Switch, model 7120. The switch 110 is interposed in two circuits of opposing polarity, 112 and 114, each including the motor 94 and a shunt switch 116 energized at the end of each stroke of the sector gear 98 to break the circuit to the motor and prepare the opposing circuit for closure by mere actuation of the toggle switch 110 at the next time interval.

In use, suppose one wished to arrange for the lock to automatically close at 5 p.m. and automatically reopen at 9 a.m. the next morning. One of the trippers of the timer 108 is set at 5 p.m. and the other at 9 a.m. and the clock is set at the correct actual time. When the first tripper arrives at 5 p.m. it throws the pole of the toggle switch 110 to the position to engage the terminal 118 and close the circuit 112 driving the motor in one direction and through the gearing 96, 98 the arm 100 from left to right on FIG. 2 or from a remote to a close position with reference to the keeper. In so doing, the tension on spring 102 is released allowing the compression latch bolt spring 52 to take over and urge the latch into the extended or closed position, the latch pulling the actuator 64 along. At the end of its travel, the sector arm 100 actuates the shunt switch 116 to break the circuit 112 by causing its pole to move away from terminal 120 which it had previously contacted, thus cutting off the current to the motor. At the same time, the pole of switch 116 moves to engage the terminal 122 of the shunt switch which would normally close the circuit of opposite polarity 114 but for the fact that the pole of the toggle switch 110 has not yet engaged the second terminal 124. When the second tripper arrives at 9 a.m., it actuates the pole of the toggle switch 110 to engage the terminal 124 thereby automatically completing the circuit to the motor and reversing its rotation. In so doing, the sector arm 100 moves away from the keeper or from right to left of FIG. 2 extending the spring 102 somewhat which in turn pulls the actuator 64 to the left or away from the keeper and retracts the latch bolt 50 against action of its compression spring 52. At the same time, the pole of shunt switch 116 moves off terminal 122 and engages terminal 120 to prepare the other circuit 112 to be closed only by the action of the timer tripper when it arrives at the next pre-set interval.

In the event that the latch bolt is jammed in the keeper for some reason, the arm 100 will complete its stroke to the left and shut off the motor while the spring 102 is fully extended. The spring therefore acts to store the retraction energy and when the jamming is mechanically released, the spring 102 will itself retract the actuator 64 and latch bolt 50, thus preventing overload on the motor.

In the further event that an authorized person inside the enclosure wants to release the lock from the inside, a solenoid 126 may be provided in the housing whose core 128 is operatively connected by a wire 130 to the plate 66 behind which it is hooked as at 131 and through which it is freely slidable, there being a push-button switch 132 at any desired location to close the circuit to the solenoid and thereby retract the actuator 64 and latch bolt 50. If desired, the solenoid can be located outside of the housing and operatively connected to the actuator 64 by other means.

When the bolt 50 is in its extended position and engages the keeper, the actuator 64 is at its furthest position towards the keeper or to the left of FIG. 2. If the timer has acted to cause the latch bolt to lock and has not yet arrived at the time to open it, those in the enclosure can let themselves out by rotating the handle 90 so that cam 88 abuts the plate 68 of actuator 64 to retract it and the latch bolt. From the outside this can be effected only by an authorized person having key 36 which when used to rotate barrel 34 in one direction will cause its cam 40 to abut the plate 68 of actuator 64 to retract it and the latch bolt 50. The conduit 134 from the timer 108 enters the housing through a grommeted opening in the side wall 136 of the housing opposite wall 22. Also, because the solenoid wire 130 and retractor spring 102 are freely slidable through plate 66, the latch bolt can be manually retracted without any resistance from either the wire or spring and the latch bolt can be retracted by the solenoid without any resistance from the retractor spring 102.

While a preferred embodiment has here been shown and described, skilled artisans may make minor variations in the construction and arrangement of parts without departing from the spirit of the invention and the scope of the appended claims. Thus, it should be understood that the switch 110 can be operated by manual, pressure or temperature means, instead of a timer, in which case the mechanism becomes a remote control-operated electro-mechanical lock.

I claim:

1. A time controlled electro-mechanical lock mechanism comprising a housing having an opening at one end thereof, a latch bolt mounted to move laterally of said housing through said opening, a spring urging said bolt in its extended position through said opening, a reversible motor, means operatively connecting said motor to said bolt to retract said bolt against action of said spring, a timer mechanism and a circuit including switch means operatively connecting said timer to said motor whereby at one pre-set position of the timer, the motor will rotate in one direction to retract said bolt and then cut off at the position of full retraction and at another pre-set position of the timer, the motor will again rotate but in an opposite direction to allow said spring to extend said bolt into a locking position at which point the motor again cuts off.

2. The combination of claim 1 wherein said means operatively connecting said motor to said bolt includes a bar slidable laterally in said housing and connected to said bolt, an arm operatively connected to said motor and movable laterally in said housing and resilient means operatively connecting said arm to said slide bar.

3. The combination of claim 2 wherein said resilient means includes a second spring which is in tension when said first-named bolt spring is in compression, said second spring having a rating greater than that of said bolt spring but less than the retractive power of said motor and means connecting the same to said bolt.

4. The combination of claim 2 and means in said housing guiding the lateral movement of said slide bar.

5. The combination of claim 1 and a plug mounted for rotation on one wall of said housing extending outwardly thereof and through a support, said plug having an end disposed on the inside of said housing and a cam thereon, the other end of a plug being adapted to receive a key whereby said plug and cam can be rotated to act upon said means operatively connecting said motor to said bolt to retract said bolt.

6. The combination of claim 1 and a cover on said housing adapted to face into an enclosure, a handle mounted on said cover having a shaft extending throughout and into said housing, and a cam on said shaft in said housing whereby rotation of said handle will cause said cam to act on said means operatively connecting said motor to said bolt to retract said bolt.

7. The combination of claim 2 and a solenoid operatively connected to said slide bar and to a source of electric current and a push-button switch interposed between

said source and said solenoid to actuate said solenoid and retract said bolt independently of the timer cycle.

8. The combination of claim 2 wherein said slide bar is a member which is substantially U-shaped in cross-section having laterally spaced plates connected by a web, said resilient means being a spring one end of which is secured to the plate remote from said bolt.

9. The combination of claim 8 wherein one end of said bolt includes a reduced shank terminating in an enlarged head and the plate of said slide bar adjacent said bolt includes a slot approximating in width that of said reduced shank, said slot receiving said shank with the enlarged head thereof disposed between the plates of said slide bar.

10. The combination of claim 2 wherein said circuit and switch means includes two circuits of opposite polarity electrically connected to said motor, a single pole double throw toggle switch actuated by said timer to move between a first pair of spaced terminals in said circuits and a single pole double throw shunt switch actuated by said arm at the ends of its stroke to move between a second pair of spaced terminals in said circuits so that when the timer actuates the pole of said toggle switch to engage one of said first pair of terminals, the motor will rotate in one direction and when said arm reaches the end of its stroke the pole of said shunt switch moves from one to the other terminal of said second pair of terminals cutting off the motor and said operation is reversed when said timer actuates the pole of said toggle switch to move it to the other pole of said first pair of terminals.

11. The combination of claim 1 wherein said means operatively connecting said motor to said bolt includes a bar slidable laterally in said housing and connected to said bolt, an arm geared to said motor and movable on an arc laterally of said housing and a link connecting said arm to said slide bar.

12. The combination of claim 2 wherein said housing is substantially rectangular and includes a first plate adapted to be secured to a support and an open face opposite said plate, a second plate mounting said motor, slide bar, bolt and connecting means, said second plate being dimensioned to pass through said open face with said members thereon, and means to secure said second plate in place in said housing against said first plate.

13. The combination of claim 12 and a closure for said open face and key-operated means to lock said closure.

14. A remote control-operated electro-mechanical lock mechanism comprising a housing having an opening at one end thereof, a latch bolt mounted to move laterally of said housing through said opening, a spring urging said bolt in its extended position through said opening, a reversible motor, means operatively connecting said motor to said bolt to retract said bolt against action of said spring, a circuit including a single pole double throw switch and other switch means operatively connected to said motor and means operative selectively upon said single pole double throw switch first to move it to one position whereby the motor will rotate in one direction to retract said bolt and then cut off at the position of full retraction, and then move said single pole double throw switch to its other position whereby the motor will rotate in a reverse direction to allow said spring to extend said bolt into a locking position at which point the motor again cuts off.

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