

Oct. 12, 1965

E. F. TOEPFER

3,211,850

COMBINED LOCK AND SWITCH

Filed Sept. 28, 1964

4 Sheets-Sheet 2

Fig. 3.

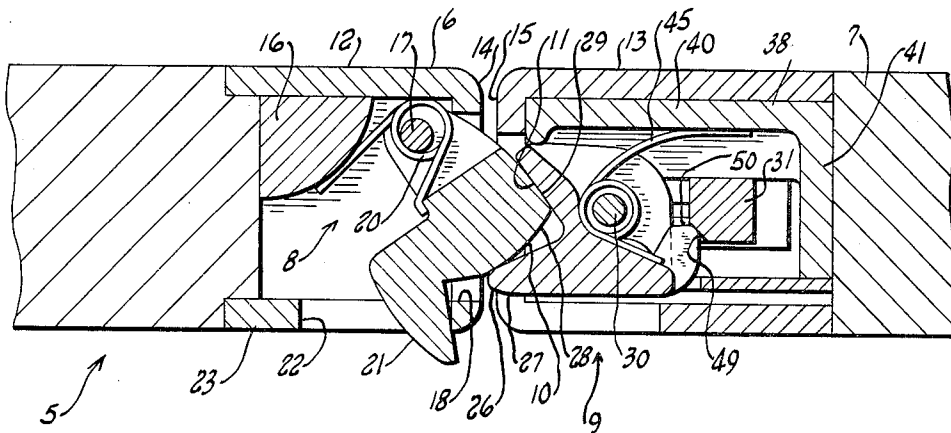
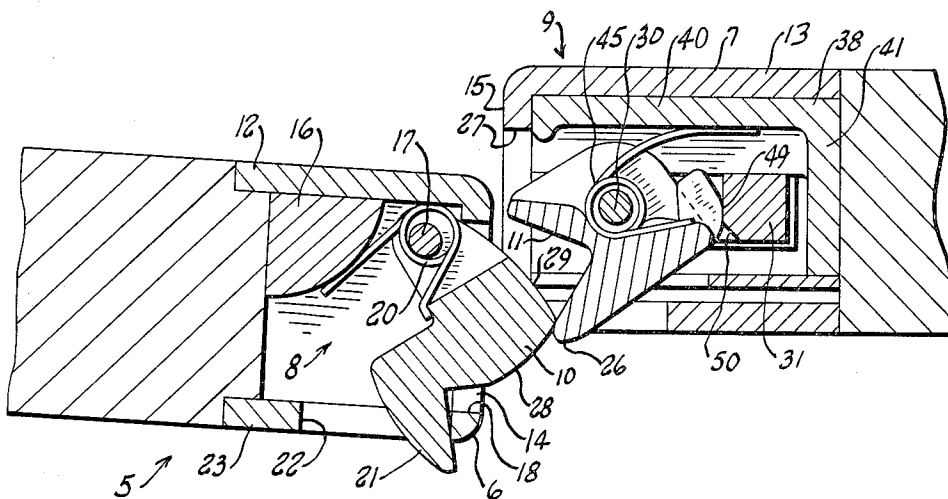


Fig. 4.



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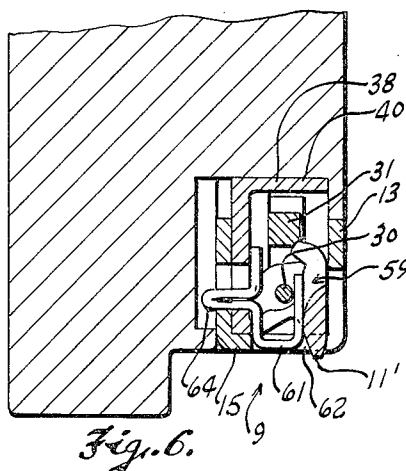
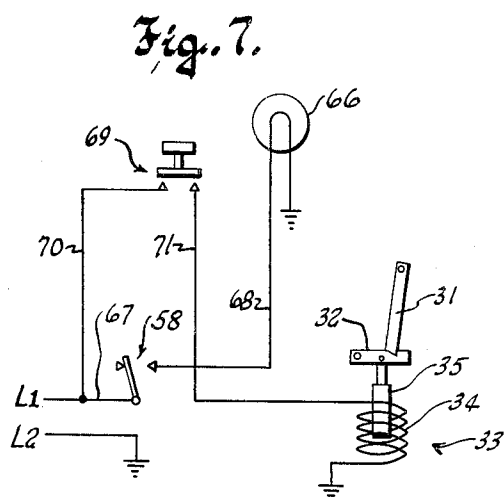
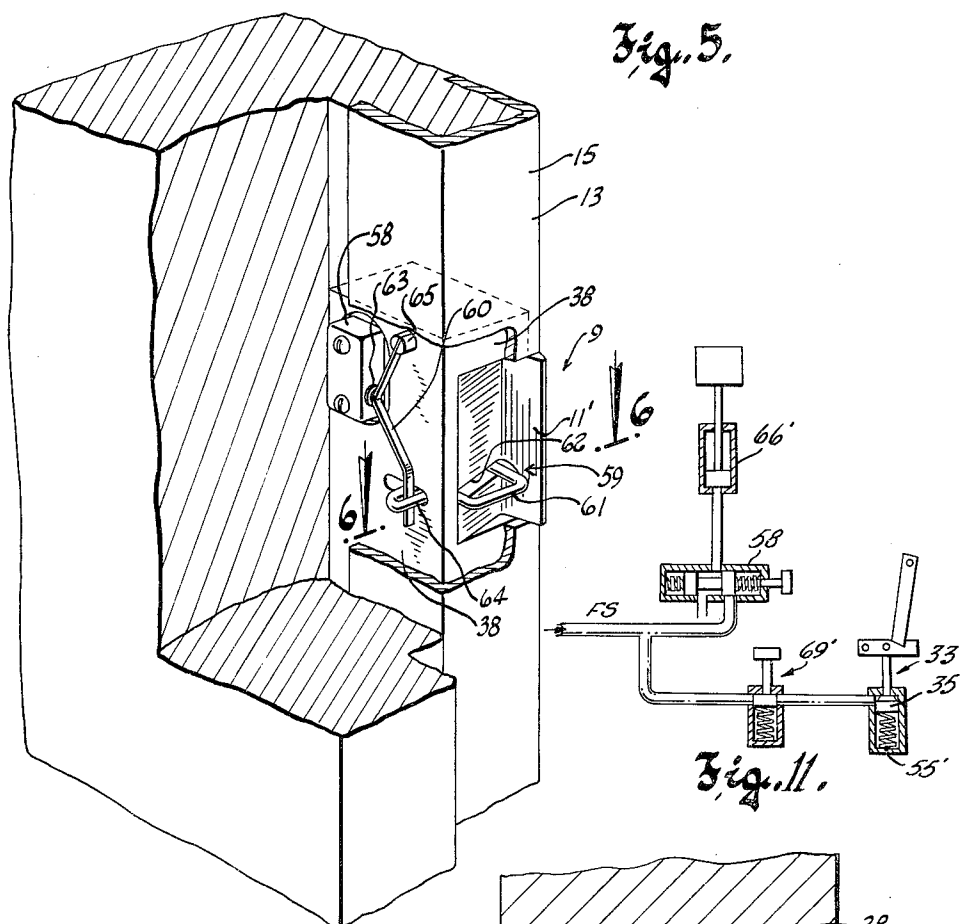
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4 Sheets-Sheet 3



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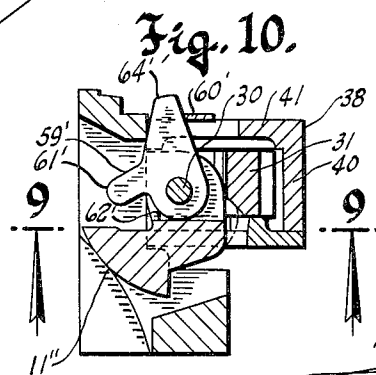
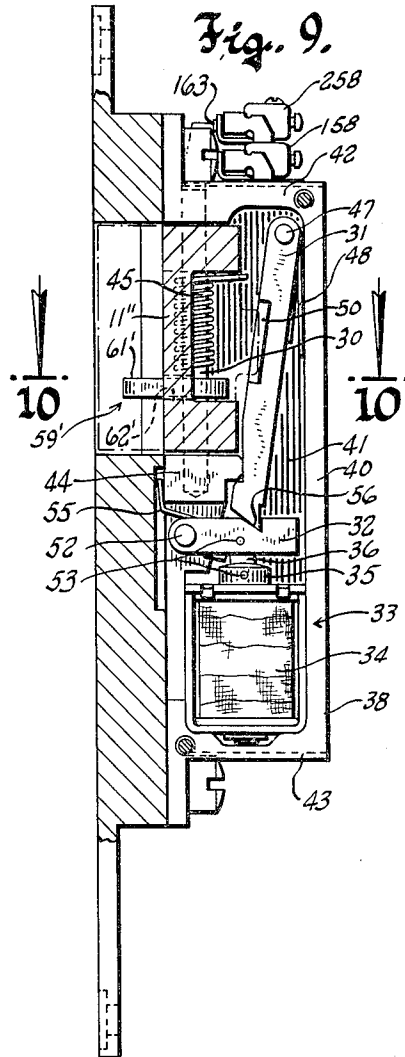
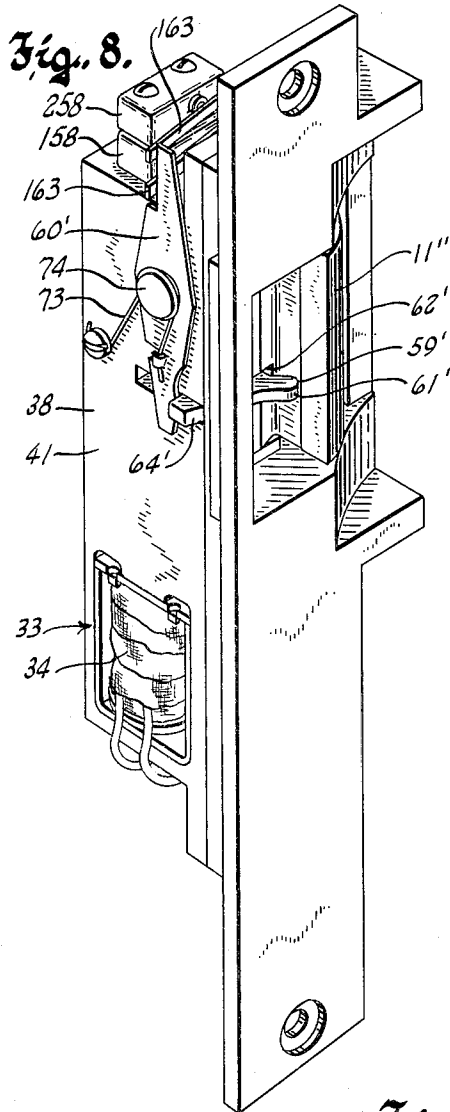
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4 Sheets-Sheet 4



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3,211,850

COMBINED LOCK AND SWITCH

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Filed Sept. 28, 1964, Ser. No. 402,688

4 Claims. (Cl. 200—61.64)

This application is a continuation-in-part of my co-pending application Ser. No. 204,221, filed June 21, 1962, now abandoned.

This invention relates to remotely releasable door locks, and more specifically refers to lock devices of the type comprising interengageable locking assemblies, one of which is securable to a door or the like, and the other of which is securable to fixed structure adjacent to the door, wherein one of said locking assemblies comprises a power actuator that can be energized from a location remote from the door to effect release of the lock device so that the door can be opened.

Remotely releasable locking devices of this type are commonly used in various public buildings, banks and other institutions. In banking houses and the like, doors may be provided with electromagnetically operated locks that have their electromagnetic actuators connected with a time switch whereby the doors are unlocked only during predetermined periods of each day. Such locks may also be installed in prisons, for example, to enable all cells to be unlocked simultaneously from a single location in the event of an emergency.

The present invention relates to a lock device of the character described which is particularly well adapted for installation in doors having very narrow or slender frame members, such as doors that mainly comprise a glass plate with channel shaped metal frames at its edges, and which have jambs that are likewise narrow and slender.

Another object of this invention is to provide a remotely operable locking device of the character described which incorporates very simple but very reliable means for signalling whether or not the locking members of the device are in their door locking positions so that constant surveillance can be maintained, from a remote location, upon the condition of a door or the like which is equipped with the device. Heretofore such signalling devices have only provided indications of whether the door monitored by them is open or closed; but the present invention has as one of its objects to provide means for producing a signal that indicates whether or not the monitored door is actually locked.

In most installations wherein the security of a door or other closure must be remotely indicated it is feasible to use electricity as a signalling medium, and it is therefore an object of this invention to provide security surveillance means incorporating a microswitch which is arranged in such a manner as not to interfere with other portions of the mechanism and to be secure against tampering.

There are installations, such as certain chemical plants, where the presence of electrical conductors is undesirable, and with this in mind it is also an object of this invention to provide remote signalling means for indicating the security of a door, adapted to utilize a hydraulic or pneumatic signalling medium.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate several complete examples of the physical embodiments of the invention

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constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

FIGURE 1 is an elevational view, with portions broken away, of a part of a door and its jamb in which a lock device of this invention is installed, the device being shown in its locked condition;

FIGURE 2 is a view similar to FIGURE 1, but showing the device in its released or unlocked condition;

FIGURE 3 is a cross sectional view taken on the plane of the line 3—3 in FIGURE 1;

FIGURE 4 is a view similar to FIGURE 3, but showing the lock device in its unlocked condition;

FIGURE 5 is a perspective view of part of a door jamb, with portions broken away to show a modified form of the electromagnetically operated locking element of this invention, incorporating signalling means for indicating the condition of the lock at a location remote therefrom;

FIGURE 6 is a cross-sectional view taken on the plane of the line 6—6 in FIGURE 5;

FIGURE 7 is a circuit diagram showing one manner of connecting the electromagnetically operated lock device and signalling means of this invention;

FIGURE 8 is a perspective view of a further modified embodiment of an electromagnetically operated keeper assembly in a lock of this invention;

FIGURE 9 is a vertical sectional view of the keeper assembly shown in FIGURE 8, taken on the plane of the line 9—9 in FIGURE 10;

FIGURE 10 is a cross-sectional view taken on the plane of the line 10—10 in FIGURE 9; and

FIGURE 11 is a diagram similar to FIGURE 7 but illustrating apparatus which utilizes a pneumatic or hydraulic signalling medium.

Referring now more particularly to the accompanying drawings, the numeral 5 designates generally a door, gate or the like, which is swingable rearwardly toward and forwardly away from a locked position in which an edge portion 6 of the door is adjacent to a jamb 7 or other fixed structure. Mounted in the door and the jamb, in positions where they are opposite one another when the door is closed, are a pair of locking assemblies 8 and 9, one of which includes a bolt-like male latching member 10, and the other of which comprises a co-operating female latching member or keeper 11. Usually the assembly 9 that incorporates the keeper member 11 is installed on the jamb, as shown, while the other assembly 8 is installed on the door, but this arrangement could of course be reversed.

The locking assemblies 8 and 9 are adapted to be mounted in relatively narrow and slender channel shaped frame members 12 and 13 that comprise parts of a door and its jamb and which are so disposed that their respective bight or web portions 14 and 15 are adjacent to one another when the door is closed, and their legs or flanges extend away from one another.

The bolt-like male latching member 10 on the door is mounted in a base member 16 that is secured between the flanges of the channel 12, and is pivoted on a pin 17, which has its opposite ends fastened in said base member and which extends lengthwise of said channel, so that the bolt-like member can swing to and from a locking position in which it projects outwardly through an aperture 18 in the bight 14 of the channel 12. A coiled torsion spring 20, embracing the pin 17 and reacting between the bolt-like member and the base member 16, biases the bolt-like member to its projected locking position. To permit the door to be readily opened from the front side thereof, the bolt-like member can have a manual actuating lever 21 that projects through an aperture 22 in the front flange 23 of the channel member 12,

and by which said member can be swung to a retracted position, disengaged from the keeper 11 of the locking assembly 9 on the jamb.

The locking assembly 9 comprises the electromagnetically releasable female latching member or keeper 11 which is normally confined in a locking position, illustrated in FIGURES 1 and 3, wherein a strike portion 26 on the keeper projects through an aperture 27 in the web or bight portion 15 of the channel shaped frame member 13 to be engageable with the bolt-like male latching member 10 on the door mounted locking assembly.

The bolt-like member has front and rear cam faces 28 and 29 which are obliquely inclined to the plane of the web 14 of the channel member 12, and as the door is swung rearwardly toward its closed position the rear cam face 29 on the bolt-like member is engaged by the front face of the strike portion 26 of the keeper to be cammed by the latter to its retracted position, against the bias of its spring 20, thus allowing the bolt-like member to pass the strike. When the door arrives at its fully closed position, the bolt-like member is spring propelled back to its projected locking position in which it is engaged behind the strike 26, preventing forward movement of the door until either the strike or the latching member is retracted. Thus mere closure of the door insures locking thereof.

When the keeper 11 is released, to unlock the door, its strike portion 26 can be swung forwardly by the front cam face 28 on the bolt-like member 10 as the door is opened, as shown in FIGURES 2 and 4. The mechanism for normally confining the keeper in its strike projected locking position, and by which it can be released upon actuation of a switch or the like located remotely from the door, comprises, in general, a stop lever 31 that engages the keeper to normally prevent it from swinging out of its locking position, a tumbler arm 32 which controls the stop lever 31, a power actuator 33 which is illustrated as an electromagnet of the type comprising an annular winding 34 and coaxially slidable plunger 35, and a link 36 that connects the solenoid plunger with the tumbler arm 32.

The several members comprising the remotely controllable locking assembly are mounted on an elongated base or support 38 which is generally L-shaped in cross section to provide a rear wall 40 and an inner longitudinal side wall 41, and which is mounted between the flanges of the channel member 13 with its side wall 41 remote from the bight 15 of the channel. The base 38 also has end walls 42 and 43 that cooperate with its side wall 41 and the flanges of the channel in which the base is mounted to provide an enclosure or housing for the movable parts of the locking assembly.

The keeper 11 is pivotally supported on a trunnion pin 30 that has its ends secured in one end wall 42 of the base and in a boss 44 that projects from the rear wall 40, about midway between the end walls adjacent to the web 15 of the channel 13, so that the pivot axis of the keeper extends parallel to the rear wall 40 and side wall 41 of the base. Hence the keeper is mounted near one end of the base and in such a position that its strike portion can swing in and out through the aperture 27, which opens through the front flange 24 of the channel 13 as well as through its bight portion 15. A coiled torsion spring 45, embracing the trunnion pin 30 and reacting between the base and the keeper, yieldingly biases the keeper to its strike projected locking position.

The power actuator 33 is located near the other end of the base, in the corner defined by the rear wall 40, the side wall 41 and the end wall 43, and its axis extends lengthwise of the base, substantially parallel to the pivot axis of the keeper.

The stop lever 31 is pivoted on a fulcrum pin 47 which projects forwardly from the rear base wall 40, near the side wall 41 and the end wall 42, and the stop lever ex-

tends generally lengthwise of the base, between the side wall 41 and the keeper 11. The pivoted end of the stop lever can be bifurcated to accommodate a torsion spring 48 which embraces the pin 47 and reacts between the stop lever and the side wall 41 of the base to bias the stop lever toward the keeper and thus normally maintain it in a locking position. The keeper and the stop lever are provided with cooperating cam or wedging surfaces 49 and 50 by which pivotal motion of the keeper is translated into swinging of the stop lever away from the keeper, against the bias of spring 48, but by which pivoting of the keeper to its strike retracted position is blocked when swinging of the stop lever is prevented.

The stop lever is normally held in its locking position by the tumbler arm 32, which is actuatable by the power actuator 33 to effect release of the locking mechanism.

The tumbler arm is swingable about a pin 52 which projects forwardly from the rear wall of the base near the boss 44, at the side of said boss remote from the keeper, and the tumbler arm extends generally crosswise of the base, between the keeper and the power actuator. Like the stop lever, the tumbler arm is bifurcated at its pivoted end to accommodate a torsion spring 55 which reacts between the tumbler arm and the boss 44 on the base to urge the tumbler arm away from the power actuator 33 and toward the stop lever, to a normal holding position in which the tumbler arm holds the stop lever against swinging out of its locking position. Such locking cooperation between the stop lever and the tumbler arm is afforded by a notch 56 in the side of the tumbler arm that faces the free end of the stop lever, defining an abutment behind which the free end of the stop lever is engaged when said lever is in its locking position and the tumbler arm is in its normal holding position.

The link 36 provides a motion transmitting connection between the solenoid plunger 35 and the tumbler arm, whereby movement of the plunger axially into the winding 34, to its attracted position, draws the tumbler arm away from the stop lever, releasing the latter for swinging motion. Pins 53 at opposite ends of the link, secured in the tumbler arm and plunger and extending parallel to the pin 52 upon which the tumbler arm is fulcrumed, allow the tumbler arm to swing in an arc without interfering with true axial motion of the plunger.

As indicated by FIGURE 7, the control circuit for the device is quite conventional. The winding 34 of the electromagnet 33 is connectable with a source of current L_1 , L_2 , by means of a push-button switch 69. Conductors 70 and 71 connect the switch and solenoid in series with one another and the current source.

If desired, the mechanism can be arranged to be normally unlocked and to effect locking only when the electromagnet is energized. Since the slight changes necessary for this purpose will be obvious to those skilled in the art, that arrangement is not illustrated, and suffice it to say that it could be done, for example, by having the tumbler arm biased away from its holding position, rather than towards it, and the plunger arranged for attracted motion into the winding from the end thereof remote from the tumbler arm, the link 36 of course being lengthened accordingly.

In the modified embodiment of the invention illustrated in FIGURES 5 and 6, means are provided for signalling the condition of the lock mechanism at a location remote from the door secured thereby. To this end the jamb-mounted locking assembly is provided with a sensitive switch 58 or other control member which is biased to one of its positions, a driver 59, and a lever 60 which provides a motion transmitting connection between the driver and the control member.

The driver 59 preferably comprises a length of stiff wire bent to a substantially U-shape, with the bight portion 61 of the U projecting through a slot 62 in the keeper 11' to provide an abutment engageable by the bolt-like male latching element when the door is locked. The con-

control member 58 is mounted on the rear face of the base member 38, and has a push button actuator 63 that faces outwardly and is engaged by the medial portion of the lever 60. The rear leg of the driver has a narrow U-shaped projection 64 bent laterally outwardly therefrom, extending rearwardly through a slot in the base and snugly embracing the free end of the lever 60. The opposite end of the lever 60 is fixed in a boss 65 that projects rearwardly from the base, and the lever is made of spring stock so that it biases the driver to a normal outwardly projected position illustrated in FIGURES 5 and 6. When the door moves to its locked position, the male latching element engages the abutment 61 and moves the driver inwardly, and the driver in turn swings the lever 60 inwardly to throw the actuator of the control member 58 from one of its positions to the other.

It will be noted that the driver 59 straddles the trunnion pin 29 upon which the keeper 11' is carried and is guided for in and out sliding movement by the slots in the keeper and base in which it is received. The signalling means just described is very inexpensive and simple, as well as dependable, rugged and virtually impossible to defeat. It not only indicates that the door is shut, but affords a definite indication that it is in locked condition, since manual movement of the bolt-like male latching member to its retracted position allows the driver to move outwardly to the position in which it causes a signal to be produced that indicates the door is not secure.

As shown in FIGURE 7, the control member 58 comprises an electric switch that can be connected in series with a source of electric current L_1 , L_2 and with a signal light 66 (or an annunciator or the like) by means of conductors 67 and 68. If the switch is of the normally open type, as shown, the signal light 66 will be lit only at such times as the door is closed and secured, with the latching elements engaged to effect depression of the driver 59 and closure of the switch 58.

The signal light can be placed at a location near the pushbutton switch 69 by which unlocking of the door is controlled, although many other signalling arrangements can be used, depending upon security requirements for the location in which the device is installed.

In the embodiment of the invention illustrated in FIGURE 11, which is intended for installations where current carrying conductors are undesirable, the control member 58 comprises a small valve which is connected with a fluid source FS, such as a source of air or hydraulic fluid under pressure or a vacuum source. Instead of a signal light, the signalling means 66' comprises a small piston type fluid motor which raises or lowers a flag or actuates some other suitable signalling device, depending upon the position of the control member 58 and the manner in which it and the signalling device are connected in the hydraulic or pneumatic circuit, as will be readily apparent to those skilled in the art. In the arrangement shown in FIGURE 11 the power actuator 33 comprises a small pneumatic or hydraulic cylinder actuator, the piston or ram 35' of which corresponds to the slidable plunger of the solenoid in the electrically energized version of the apparatus. In this case the piston 35' can be biased to its extended position by means of a small compression spring 55' in the cylinder behind it. A push-button valve 69', connected between the fluid source FS and the power actuator cylinder, provides for control of locking and unlocking of the mechanism in which the cylinder power actuator is incorporated.

In the embodiment of the invention illustrated in FIGURES 8-10 the driver 59', which can control the position of two control members 158 and 258, comprises a flat stamping in the nature of a bell crank which is medially pivoted on the keeper trunnion pin 30, coaxially with the keeper 11'', and which is received in an outwardly and rearwardly opening slot 62' in the keeper to be thus held against axial displacement along the trunnion pin. The driver has one arm 61' that projects outwardly of the

keeper when the driver is in an inoperative position, to be engaged by the male latching element. The other arm 64' of the driver projects through a slot in the rear wall 41 of the base member 38, to cooperate with a medially pivoted rigid lever 60' that overlies and swings across the rear face of the base member and by which motion of the driver is transmitted to the control members 158 and 258.

The two control members are mounted on the upper end of the base member, one above the other. One of them can be used to control a lamp or other signalling device, as in the previously described embodiments of the invention, and the other is available for interlock control and can be used, for example, to coordinate locking and unlocking of another remotely operatable latch device with locking and unlocking of the device on which it is mounted. Each of the control members has a rearwardly extending actuator arm 163 which projects beyond the rear face of the base member to be engaged by the upper end portion of the lever 60'. A torsion spring 73, carried on the screw or pinion 74 on which the lever 60' is fulcrumed, has opposite arms which are respectively secured to the base member and to said lever to bias the latter into engagement with the driver and at the same time urge the driver toward its inoperative position. The spring 73 has sufficient force to normally hold the control member actuators depressed against outward bias upon them.

It will be evident that when the male latching element engages the driver the latter is swung about the trunnion pin 29, and the driver in turn swings the lever 60' sufficiently to allow the control member actuators 163 to swing outwardly in response to their bias. Some degree of overtravel of the driver and lever is permitted, relative to the control member actuators, by reason of the fact that the upper end portion of the lever can swing outwardly away from engagement with the actuators.

From the foregoing description taken together with the accompanying drawings it will be apparent that this invention provides a remotely releasable locking device having an unusually compact arrangement of its parts, so that it can be installed in very slender and narrow frame members of a door and its jamb, and it will also be apparent that the invention provides such a lock device having signalling means for affording a positive indication as to whether or not a door on which the device is installed is in securely locked condition.

What is claimed as my invention is:

1. In a lock device of the type comprising a pair of cooperating locking assemblies, one of which can be mounted in a door, at one edge thereof, and the other of which can be mounted in fixed structure that is adjacent to said edge of the door when the latter is closed, one of said assemblies comprising a bolt-like member and the other of said assemblies comprising a base and a keeper member on the base engageable by the bolt-like member to hold the door locked, and one of said members being releasable for movement out of engagement with the other to unlock the door, means for signalling whether or not said members are engaged to lock the door, said means comprising:

- A. a control member fixed on said base and having an actuator movable to off and on positions;
- B. a driver having an abutment portion thereon, said driver being mounted on the base for motion in opposite directions between a projected position in which the abutment portion protrudes through a lateral slot in the keeper member for engagement by the bolt-like member and a retracted position to which the driver can be propelled by the bolt-like member when the latter is lockingly engaged with the keeper;
- C. means biasing the driver toward its projected position; and
- D. means providing a motion transmitting connection

between the driver and the actuator of the control member whereby motion of the driver from one of its positions to the other effects corresponding movement of the actuator from one to the other of its positions, said motion transmitting means comprising a spring arm

- (1) having one end secured to the base,
- (2) having a portion spaced from its securement to the base connected with the actuator of the control member, and
- (3) having another portion spaced from said first named portion and from its securement to the base engaged with the driver,

said spring arm being flexible to accommodate over-travel of the driver relative to the actuator of the control member.

2. In a lock device of the type comprising a pair of cooperating locking assemblies, one of which can be mounted in a door, at one edge thereof, and the other of which can be mounted in fixed structure that is adjacent to said edge of the door when the latter is closed, one of said assemblies comprising a bolt-like member and the other of said assemblies comprising an elongated body which extends lengthwise parallel to an edge of the door and a keeper member mounted on said body and engageable by the bolt-like member to hold the door locked, and one of said members being releasable for movement out of engagement with the other to unlock the door, means for signalling whether or not said members are engaged to lock the door, said means comprising:

- A. a control member fixed on said elongated body and having an actuator movable to off and on positions;
- B. a driver having an abutment portion thereon, said driver being mounted on said elongated body, spaced lengthwise of the body from said actuator, for motion in opposite directions transverse to the length of the body between a projected position in which the abutment portion protrudes through a lateral slot in the keeper member for engagement by the bolt-like member and a retracted position to which the driver can be propelled by the bolt-like member when the latter is lockingly engaged with the keeper;
- C. a lever;
- D. means fulcruming the lever on one elongated side of the body for swinging motion, said fulcruming means disposing the lever generally lengthwise of the body;
- E. means connected with the lever serving to bias the same in one direction of its swinging motion; and
- F. said lever having connections with the driver and with said actuator which connections are spaced from one another and from the fulcrum axis of the lever whereby the lever provides a motion transmitting connection between the driver and said actuator and whereby said biasing means also serves to bias the driver to its projected position.

3. In a lock device of the type comprising a pair of cooperating locking assemblies, one of which can be mounted in a door, at one edge thereof, and the other of which can be mounted in fixed structure that is adjacent to said edge of the door when the latter is closed, one of said assemblies comprising a bolt-like member, and the other of said assemblies comprising an elongated body which extends lengthwise parallel to an edge of the door and a keeper member mounted on said body and engageable by the bolt-like member to hold the door locked, and one of said members being releasable for movement out of engagement with the other to unlock the door, means for signalling whether or not said members are engaged to lock the door, said means comprising:

- A. a control member fixed on one end of said elongated body and having an actuator projecting laterally relative to the body movable to off and on positions;
 - B. a driver having an abutment portion thereon, said driver being mounted on said body for motion in opposite directions transverse to the length of the body between a projected position in which the abutment portion protrudes through a lateral slot in the keeper member for engagement by the bolt-like member and a retracted position to which the driver can be propelled by the bolt-like member when the latter is lockingly engaged with the keeper;
 - C. an elongated motion transmitting element;
 - D. means mounting said motion transmitting element on the body, at one elongated side thereof, and extending generally lengthwise therealong and with spaced apart portions of said element engaged with portions of the driver and of the control member actuator, said means providing for movement of said element in opposite directions, whereby said element provides a motion transmitting connection between the driver and said actuator; and
 - E. means biasing said motion transmitting element in one direction of its motion and thereby biasing the driver to its projected position.
4. The combination of claim 3, further characterized by the following:
- A. said elongated element is a lever;
 - B. the mounting means comprises a pivot fixed with respect to the body which mounts the elongated element for swinging motion in the plane of said one side of the body; and
 - C. the biasing means comprises a torsion spring coiled about the pivot and having one end portion connected to the body and its opposite end portion connected to a portion of the elongated element that is spaced from the pivot axis.

No references cited.

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