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Kambic

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[54] **ELECTRIC LOCK**

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[52] **U.S. Cl.** **292/173**, 292/144, 292/153

[51] **Int. Cl.** **E05c 1/12**

[58] **Field of Search** 292/173, 144, 153, 201, 292/DIG. 62

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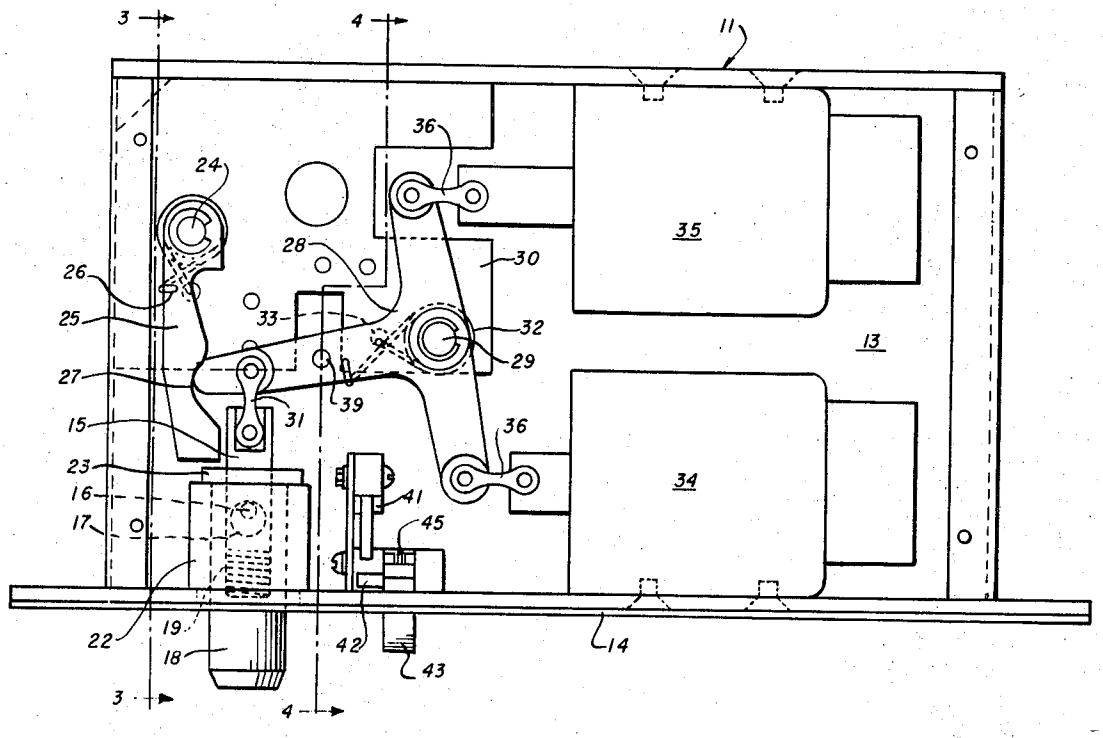
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[57] **ABSTRACT**

An electric lock having two-part bolt with interposed bolt spring and pin and slot connections, a bell crank pivotally connected to bolt, solenoid means for swinging bell crank, a spring for swinging bell crank in one direction when power to solenoid means is shut off, a dead lock lever movable from active to inactive position by the bell crank as latter moves bolt to retracted position, and spring means automatically operable to move dead lock lever to active position into the path of retracting movement of the bolt, when bolt is in extended position, to prevent movement of bolt to retracted position by means other than bell crank, the bolt spring protecting the bell crank and solenoid means against damage by exterior forces applied to the bolt.

8 Claims, 5 Drawing Figures



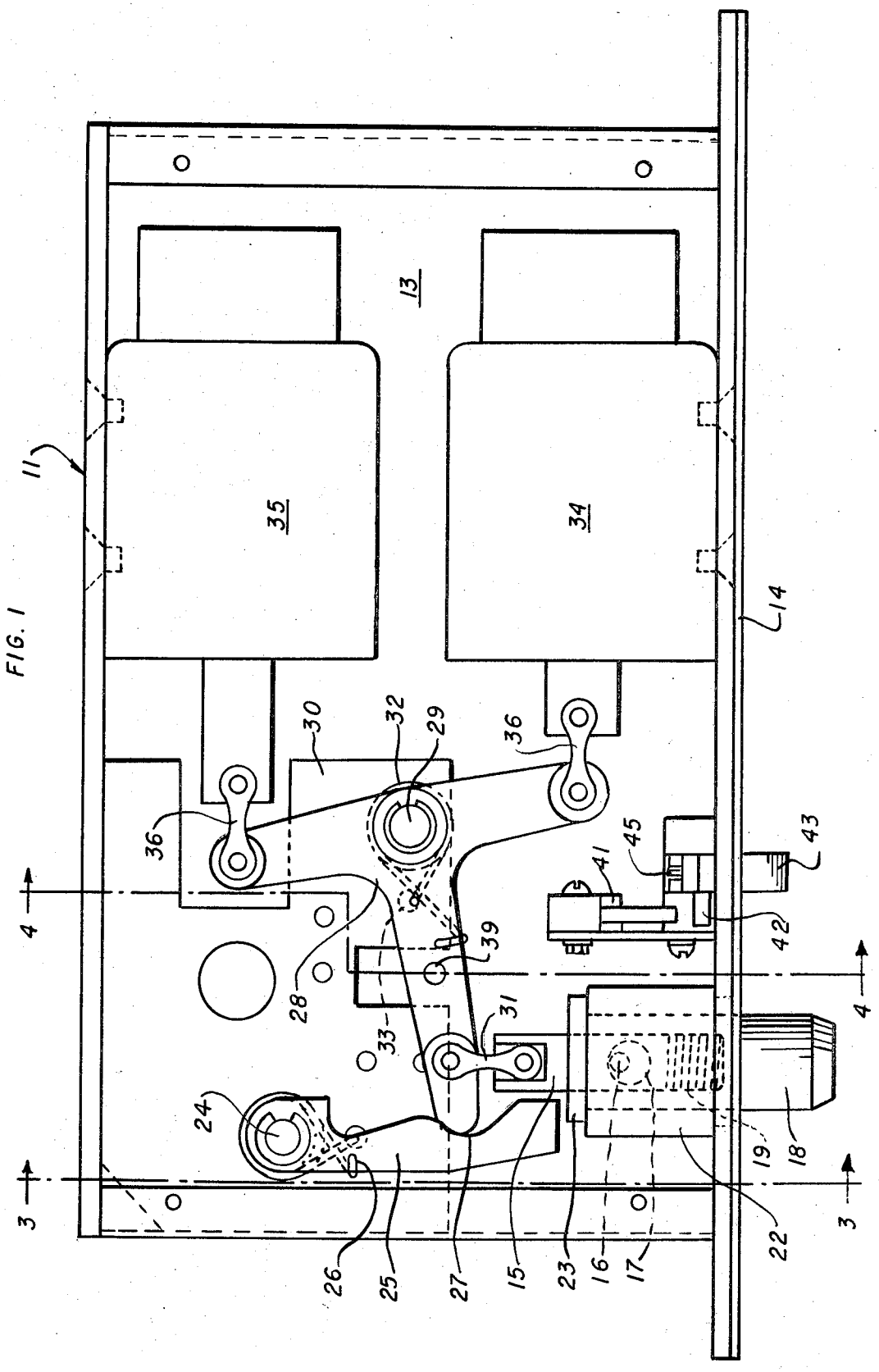
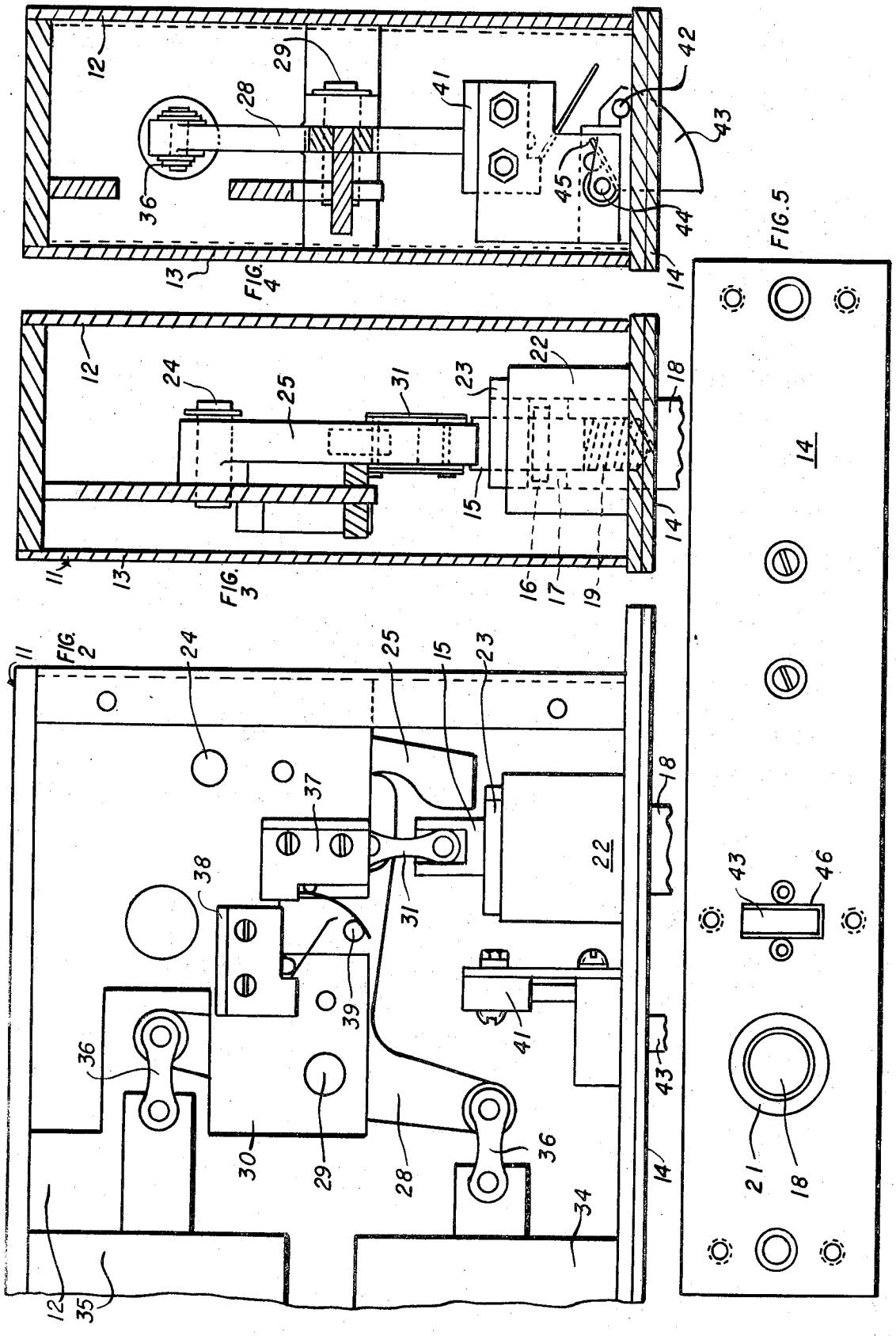

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FIG. 1


FIG. 2
FIG. 3
FIG. 4
FIG. 5
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ELECTRIC LOCK

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to electric locks and more specifically to solenoid actuated locks incorporating a dead lock lever.

2. Description of the Prior Art

It is known to employ solenoid means to actuate a locking bolt, and use has been made of a dead lock lever to prevent unauthorized movement of a bolt to retracted position, but such mechanisms have been separate, with the application of one force required to move the dead lock lever to inactive position and another force thereafter applied to retract the bolt.

SUMMARY OF THE INVENTION

This invention employs a single force application, first to move a dead lock lever to inactive position, and then to retract the bolt in an electric lock. More specifically, it employs a dead lock lever spring-urged into active position into the path of retracting movement of a bolt in extended position, and a bell crank pivotally connected to the bolt for moving it between retracted and extended positions and having an end engaging the dead lock lever to move it to inactive position. The bell crank also is pivotally connected to solenoid means for actuation thereby, and the latter optionally may comprise one or two solenoids. In either case, spring means is included for swinging the bell crank in one direction, and such bell crank spring means preferably is arranged to move the bolt to retracted position so as to function as a fail-safe feature in the event of failure of the power supply to the solenoid means.

This invention also provides for the protection of the operating mechanism in such an electric lock by making the bolt in two parts and interposing a spring therebetween to initially absorb any retracting force applied exteriorly when the bolt is extended in order to cushion the bolt-stopping action of the dead lock lever, and which prevents damage to the bell crank from exterior forces applied to the bolt when it is retracted and possible rendering of the bell crank inoperative by the solenoid means. The simplified construction employed further facilitates inclusion in this electric lock of switch means for controlling door and bolt position signals.

In The Drawings:

FIG. 1 which is a front elevational view of a lock embodying the features of this invention, with the forward cover plate of the casing removed;

FIG. 2 is a rear elevation of a portion of the lock of FIG. 1, with the rear cover plate removed;

FIGS. 3 and 4 are vertical sectional views taken substantially on the lines 3—3 and 4—4, respectively, of FIG. 1; and

FIG. 5 is a bottom plan view as seen from the under side of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, reference numeral 11 indicates in general an electric lock embodying the features of this invention which is enclosed in a case assembly or casing means including front and rear cover plates 12 and 13, respectively, and a face plate 14 secured together in any suitable manner. As will be understood by those skilled in the art, this case assembly is adapted to be mounted in well known manner in position to cooperate with either a swinging or sliding door having means (not shown) for lockingly receiving the bolt of the lock.

This comprises a two-part bolt made up, as best seen in FIGS. 1 and 3, of a bolt pin or inner 15 having a cross pin 16 extending into slots or apertures 17 in the walls of an inner bored portion of a deadbolt or outer part 18. Such pin and slot connections 16, 17 permit but limit longitudinal movements of the inner and outer parts 15 and 18, and a compression spring 19 is disposed in the inner bored portion of the deadbolt 18 between the latter and the lower end of the bolt pin 15 disposed therein. The face plate 14 is provided with an aperture 21 accommodating the deadbolt 18, and a bolt guide or collar 22 is secured in any suitable manner to, and extends upwardly from, the casing means in vertical alignment with the aperture 21. The upper end of that bolt guide 22 cooperates with a flange 23 on the upper or inner end of the deadbolt 18 to limit downward or extended movement of the bolt, as best seen in FIG. 1, wherein the bolt is illustrated in its extended position.

Pivotally mounted at its upper end on a cross stud 24 is a dead lock lever 25, the lower end of which is urged in a counterclockwise direction (viewing FIG. 1) to active position into the path of retracting movement of the deadbolt 18, 23 by a spring 26. The inner vertical edge of this dead lock lever 25 is shaped to provide a cam surface 27 with which the outer end of the central arm of a bell crank 28 cooperates in a manner to be later described.

This bell crank 28 is pivotally mounted on a cross shaft 29 supported by a suitable vertical bracket 30, and its central arm is pivotally connected near its outer end by means of a link 31 to the bolt pin or inner part 15 of the two-part bolt. A bell crank spring 32 has one end engaging in an aperture 33 in bracket 30 and its other end terminating in a bent portion adapted to engage either the lower or upper edge of the central arm of the bell crank 28. As illustrated in FIG. 1, this bent end of the spring 32 engages the lower edge of the central arm to urge the bell crank 28 in a clockwise direction. If for reasons which will hereinafter be better appreciated it is desired to employ this spring 32 to urge the bell crank 28 in a counterclockwise direction, it is necessary only to remove the ends of the spring from their engagement with the bell crank and the bracket and reverse the spring so that the longer bent end engages the opposite edge of the central portion while the other end extends into the aperture 33 from the opposite side.

Solenoid means are provided for swinging the bell crank 28 which are illustrated in FIG. 1 as comprising a first or lower solenoid 34 and a second or upper solenoid 35 secured in any suitable manner to the case assembly interiorly thereof. The plungers of these solenoids 34, 35 are pivotally connected, respectively, to the lower and upper ends of the bell crank 28 by means of links 36 which are similar to the link 31. Thus, energization of the lower solenoid 34 will pull its plunger inwardly or to the right in FIG. 1 to swing the bell crank 28 counterclockwise and move the bolt to its extended position. Such movement of the bell crank 28 also results in the plunger of the upper solenoid 35 being pulled to its extended position. Conversely, when the

upper solenoid **35** is energized and solenoid **34** is deenergized, the bell crank **28** will be swung clockwise from its position of FIG. **1**. The initial portion of such movement of the bell crank **28** results in the outer end of its central arm moving upwardly along the cam surface **27** to swing the dead lock lever **25** clockwise against the action of its spring **26**. This clears the lower end of the dead lock lever **25** from the bolt, moving it outwardly beyond the path of upward movement of the flange **23** on the deadbolt **18**. Continued such clockwise movement of the bell crank **28** moves the bolt upwardly or inwardly to its retracted position in which the lower end of the deadbolt **18** is within the aperture **21** and substantially flush with the outer surface of the face plate **14**. At the same time, this clockwise movement of the bell crank **28** pulls the plunger of the lower solenoid **34** outwardly to its extended position.

Signal switch means are provided for controlling signal means indicating the locked or unlocked position of the bolt or its extended or retracted position which comprises a lower microswitch **37** and an upper microswitch **38** suitably mounted interiorly of the casing assembly, as shown in FIG. **2**, for alternate actuation by a switch tripper in the form of a stud **39** mounted in, and extending rearwardly from, the central arm of the bell crank **28**. This signal switch means also includes a door position signal switch **41** suitably mounted interiorly of the case assembly, as shown in FIGS. **1, 2** and **4**. A switch tripper in the form of a stud **42** (FIG. **4**) is mounted in a switch cam **43** which is pivoted interiorly of the casing means at **44**. A spring **45** urges the lower end of the switch cam **43** downwardly or outwardly of the case assembly through an aperture **46** (FIG. **5**) provided in the face plate **14**. As will readily be appreciated, when the door associated with this electric lock is in closed position, whether it be a swinging or sliding door, the cam **43** will have been swung inwardly or upwardly about its pivot **44** and against the action of its spring **45** by the door to move the stud **42** into switch tripping relationship with the microswitch **41**. The latter is connected in the circuit of a suitable signal means (not shown) so that a signal will be given thereby to indicate whether the door is in open or closed position. In similar manner, the microswitches **37** and **38** are connected in the circuit of suitable signal means (not shown) to indicate, respectively, whether the deadbolt **18** is in extended position, as illustrated in the instant drawings, or in retracted or unlocked position.

From the foregoing description, it will be apparent that energization of the first or lower solenoid **34** will swing the bell crank **28** counter-clockwise in FIG. **1** to move the deadbolt **18** to locked or extended position. This results in the dead lock lever **25** being swung by its spring **26** into active or locking relationship with respect to the flange **23** on the deadbolt **18**. With the parts in such locked position of FIG. **1**, deenergization of the lower solenoid **34** and energization of the upper solenoid **35** will swing the bell crank **28** clockwise about its pivot **29**. This first will cause the outer end of the central arm of bell crank **28** to move upwardly along the cam surface **27** of the dead lock lever **25** to swing the latter clockwise to inactive position, thereby clearing its lower end from the path of upward movement of the dead-bolt flange **23**. Continued clockwise swinging of bell crank **28** will retract the deadbolt **18** to its unlocked position. If desired, the upper solenoid **35** may be dispensed with, since the bell crank spring **32** is sufficiently strong, when the lower solenoid **34** is deenergized, to swing the bell crank **28** clockwise from its position of FIG. **1** to automatically effect the above-described unlocking operation. This constitutes a fail-safe arrangement which assures automatic unlocking or retraction of the deadbolt **18** in the event of power failure. Likewise, as noted hereinbefore, the position of the bell crank spring **32** may be reversed to impose a counterclockwise rotating force upon the bell crank **28** to automatically move the deadbolt **18** to extended or locked position. In such arrangement, the lower solenoid **34** may be dispensed with, the upper solenoid **35** being employed to move the deadbolt **18** to retracted or unlocked position.

During all such operations of this electric lock, it will be appreciated that the bolt spring **19** and the pin and slot connections **16, 17** between the bolt pin **15** and the deadbolt **18** effectively protect the bell crank **28** and the solenoids **34, 35** against damage by any exterior forces applied to the deadbolt **18**. When the latter is in its locked or extended position of the drawings, this spring **19** cushions the bolt-stopping action of the dead lock lever **25** when upward force is applied to the deadbolt **18**. This two-part construction of the bolt likewise prevents damage to the bell crank **28** in response to any exterior forces applied to the deadbolt **18** when the latter is in its retracted position, thus assuring that the operating mechanism cannot be damaged or rendered inoperative to effect a locking operation.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction, and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the forms hereinbefore described being merely preferred embodiments thereof.

I claim:

1. An electric lock, comprising casing means, a bolt having an inner part and an outer part, means for guiding movement of said bolt between retracted position and extended position with said outer part protruding from said casing means, a bell crank pivotally mounted in said casing pivotal connections between said bell crank and said bolt, solenoid means pivotally connected to said bell crank for swinging the same to move said bolt, a dead lock lever movable from active to inactive position by said bell crank as said bolt is being retracted, and spring means automatically operable to move said dead lock lever to active position into the path of retracting movement of said bolt, when the latter is in extended position, to prevent movement of said bolt to retracted position by means other than said bell crank.

2. An electric lock according to claim **1**, wherein said solenoid means comprises a first solenoid operable to swing said bell crank to move said bolt to extended position and a second solenoid operable to swing said bell crank to move said bolt to retracted position.

3. In an electric lock according to claim **1**, bell crank spring means operable to swing said bell crank to move said bolt upon deenergization of said solenoid means.

4. In an electric lock according to claim **1**, means interposed between said inner and outer parts of said bolt to initially absorb any retracting force applied exteriorly to said bolt when the same is in extended position

to cushion bolt-stopping reaction of said dead lock lever.

5. An electric lock according to claim **4,** wherein said last means comprises a pin and slot connection and a compression spring between said inner and outer parts of said bolt, whereby damage to said bell crank from forces applied to said outer part when said bolt is retracted and possible rendering of said bell crank inoperative by said solenoid means are prevented.

6. In an electric lock according to claim **1,** signal switch means operable by said bell crank in accordance with the positioning of said bolt by said bell crank.

7. An electric lock according to claim **6,** wherein said signal switch means comprises two microswitches and a switch tripper for alternately actuating the same mounted on said bell crank.

8. In an electric lock according to claim **1** for cooperation with a door movable between closed and open positions relative thereto, door position signal switch means, comprising a switch mounted interiorly of said casing means, a cam mounted in said casing means having an outer portion protruding through an aperture therein for movement by said door, and means mounted on said cam interiorly of said casing means for actuating said switch.

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