April 9, 1968 C. L. ROHMAN 3,377,092

ELECTRICALLY CONTROLLED LOCK

Filed April 27, 1967

FIG. 1.

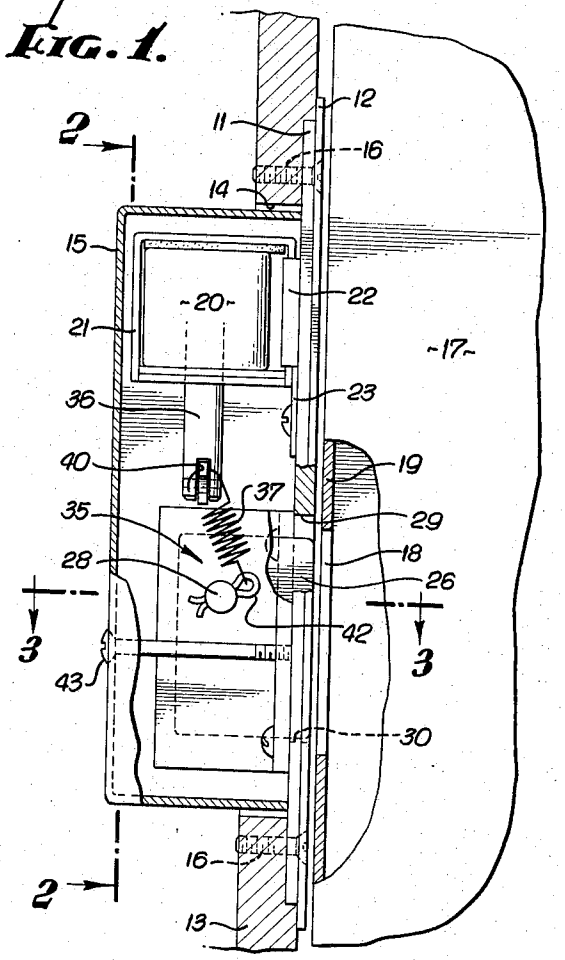


FIG. 2.

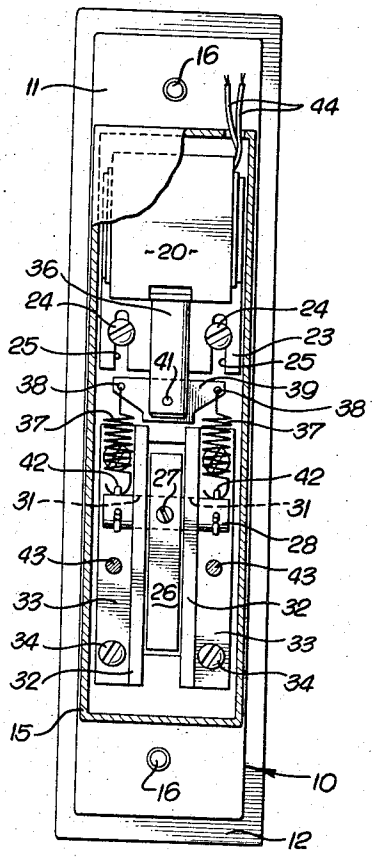


FIG. 4.

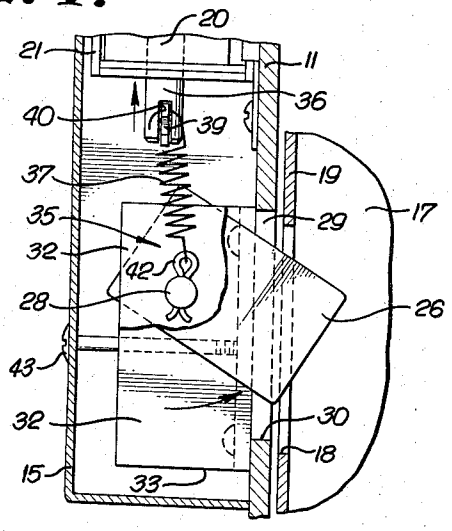
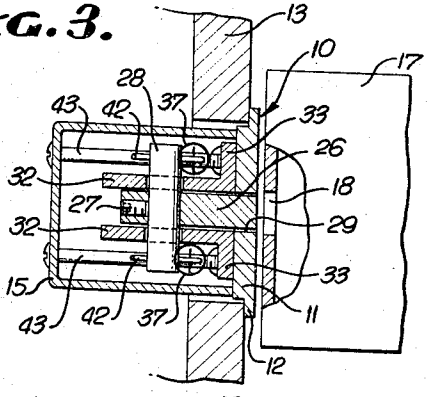


FIG. 3.



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ELECTRICALLY CONTROLLED LOCK

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ABSTRACT OF THE DISCLOSURE

The invention is directed to solenoid-actuated door locks of a projectable bolt type adaptable for sequentially controlling locked and unlocked conditions of a pair of doors leading to a room area to be protected from outside exposure, and aims to provide a locking mechanism that will assure such protection.

Fail-safe performance of the locking mechanism is assured by precluding malfunctioning of either or both the locking bolt or its solenoid actuator by utilizing a gravity projectable bolt and a lost motion spring-interposed connection between the bolt and solenoid core vertically reciprocable above the bolt sothat the spring means transmits bolt projecting movement upon energization of the solenoid and assures downward withdrawal of the core from the solenoid body upon its de-energization. In this manner a combination of such electrically connected locking mechanisms positively assures proper locked and unlocked conditions in the door sequence.

Background of the invention

The invention has been occasioned by observations of faulty performance in the operation of lock mechanisms employed in the control of dual door arrangements used in association with so-called clean rooms which require their atmospheres to be kept free from contamination by outside air. In such arrangements both of the doors normally are openable, but upon opening of one door the other becomes locked closed until the opened door closes, thus preventing access of outside open atmosphere communication with the room protected by the dual doors. Should the second door be openable, because of its lock failure in advance of assured closure of the first door, then the room contamination could result.

In the past, lock failures have resulted from malfunctioning of either or both the solenoid actuator or the lock bolt. The present invention aims to preclude such possibilities by "must" functioning of the bolt and in so mechanically relating it to the actuator as to assure sustained performance of the solenoid.

Summary of the invention

The invention contemplates the combination of a solenoid actuator having a vertically reciprocable core responsive to energization of the solenoid, and a bolt which is gravity response to remain normally in retracted or open door position. By use of a spring interposed, lost motion connection between the bolt and solenoid core, upward movement of the latter thrusts the bolt to projected or door locking position, and upon de-energization of the solenoid (as occasioned by closing of a first in progression door) the spring means acts to lower the core and free the bolt for assumption of its retracted position.

More specifically, and in a preferred form, the invention employs a pivoted bolt having its center of gravity so offset from the axis of rotation as to respond normally in retracted position. By the interposition of a balanced coil spring interconnection between the bolt and solenoid core, the spring means accumulates tension in projecting

the bolt, that is utilized for core retraction when the solenoid is de-energized.

The invention has various features and objects such as the solenoid and bolt mountings for relative vertical adjustment, and employment of a balanced coil spring interconnection, all of which will be more fully understood from the following detailed description of an illustrative embodiment of the invention shown by the accompanying drawing, in which:

Brief description of the drawings

FIG. 1 is a view showing the lock mechanism in vertical section and within a door opposite a keeper-containing jamb;

FIG. 2 is a section as viewed from line 2—2 of FIG. 1 and showing the inside of the lock assembly as removed from the door;

FIG. 3 is a cross section on line 3—3 of FIG. 1; and

FIG. 4 is a fragmentary section showing the bolt swung to projected or locking position.

Description of the preferred embodiments

The lock structure comprises a mounting base **10** in the form of a plate **11** peripherally thinned at **12** for engagement against a door **13** about a rectangular opening **14** which receives the lock housing **15**, plate **11** being secured to the door by screws **16**. The door and lock are shown in association with a stationary jamb **17** which may contain any suitable form of keeper, typified by slot **18** within plate **19**, for receptoion of the later described bolt.

The lock mechanism is shown to comprise a solenoid **20** mounted within bracket **21** insulated at **22** from the plate **11** and having a lower extension **23** secured to the plate by screws **24**. The solenoid is rendered vertically adjustable relative to the bolt and its connections below, by accommodating the screw **24** within the bracket slots **25**.

Although capable of different specific forms, the bolt **26** may take the simple form of a metallic rectangular of uniform thickness secured by key screw **27** to shaft **28**. In reference to FIGS. 1 and 2 it will be observed that shaft **28** which is the axis of rotation of the bolt, is offset from the center of the bolt mass so that in the absence of restraint, the bolt assumes by gravity the open or unlocking position of FIG. 1. The bolt is projectable to the locking position of FIG 4 by outward swinging within the mounting plate slot **29**. Upon release of the later described spring force, the bolt restores to open position limited by bolt engagement with the bottom edge **30** of the slot **29**.

The shaft **28** is journaled for rotation by passage at **31** through openings in spaced parallel flanges **32** of angular brackets **33** secured to the base plate by screws **34**. The lock mechanism is characterized by the provision of a spring interposed lost motion connection generally indicated at **35** between the extended core **36** of the solenoid and shaft **28**. This lost motion connection comprises in its preferred form a pair of coil springs **37** the upper terminals of which are looped through openings **38** in a cross pieces **39** received within slot **40** in the solenoid core extension and somewhat loosely pivoted therein by a pin or cotter key **41**. Some looseness in the cross piece accommodation may be desirable in its tendency to equalize the transmission of spring forces to or from the solenoid core. The lower terminals of the springs **37** are connected to shaft **28** by reception within the loops of cotter pins **42** inserted through openings in the shaft beyond the supports **32**.

The described mechanism is shown to be enclosed within housing **15** detachably secured to the base plate **11** by screws **43**. Lead conductors **44** are shown in FIG. 2

to extend from the solenoid outwardly through the housing to a suitable multiple door control of known type and with which the present invention is not concerned. As known to those familiar with clean room door controls, multiple electrically energizable door locks are governed by such controlls so that in the sequence of passage through a pair of normally unlocked closed doors, the one first opened will cause the second door to lock until the first door closes, whereupon both doors restore to unlocked condition.

In considering the operation of the present lock, assume first the parts to be positioned in FIG. 1 with the bolt **26** retracted to allow opening of the door. Upon door closure a remote control energizes the solenoid **20** elevate its core **36** and in so doing to transmit through the springs **37** yielding force which swings the bolt to its door locking position of FIG. 4. Thereafter, upon de-energization of the solenoid, its core drops both by gravity and the pull of springs **37** to restore the parts as is FIG. 1. The force transmission through the springs has an important advantage in assurance against binding of the core **36** within the solenoid during any continued current feed to the solenoid that otherwise might cause its impairment. By reason of its off center unbalance mounting, the bolt is assured of gravity restoration to open position upon release or lessening of the spring tension as the solenoid opens.

I claim:

1. Locking mechanism comprising a supporting base mountable on a door or the like, an electrically energizable solenoid including a body carried by said base and containing a vertically reciprocable core, a bolt carried by the base below the solenoid and movable from a normal retracted open position to a projected locking position, and a lost motion connection between said core and bolt including spring means by which upward movement of the core upon energization of the solenoid moves the bolt from retracted too projected position, said spring means acting to lower the core upon de-energization of the solenoid.

2. Locking mechanism according to claim **1**, including means mounting said solenoid for vertical adjustment relative to the bolt.

3. Locking mechanism according to claim **1**, in which said bolt is movable by gravity from propected to retracted position.

4. Locking mechanism according to claim **2**, in which said bolt is pivoted to swing between said positions and has its center of gravity offset from the pivot axis.

5. Locking mechanism according to claim **4**, including a shaft fixed to the bolt for pivoting thereof, and bracket means at opposite sides of the bolt mounting the shaft to said base.

6. Locking mechanism according to claim **5**, in which said spring means is attached to said shaft.

7. Locking mechanism according to claim **6**, in which said spring means comprises a pair of coil springs at opposite sides of said bracket means.

8. Locking mechanism according to claim **7**, including a cross T-arm movably carried by said core and to which said springs are connected.

9. Locking mechanism according to claim **8**, including cotter keys connecting the springs to said shaft and a cotter key centrally connecting said T-arm to the core.

10. Locking mechanism according to claim **8**, in which said base is a plate containing an aperture through which the bolt extends, and comprising means mounting said solenoid for vertical adjustment on said plate.

References Cited

UNITED STATES PATENTS

2,219,132	10/1940	Hohmann et al.	292—201 X
1,319,187	10/1919	Summers	292—238
2,325,225	7/1943	Burke	292—201 X
2,647,789	8/1953	Chayne	292—144 X

FOREIGN PATENTS

293,675	8/1916	Germany.
1,184	12/1911	Great Britain.

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