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Ballew, Sr. et al.

[11] **3,881,332**

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[54] **ELECTRIC LOCK ASSEMBLY**

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[52] **U.S. Cl.** **70/282;** 292/150; 292/164; 292/171; 403/62; 403/119; 403/161

[51] **Int. Cl.**..... **E05b 47/04;** E05b 65/14

[58] **Field of Search** 70/282; 292/144, 150, 164, 292/171; 403/62, 119, 161, 163, 406

[56] **References Cited**

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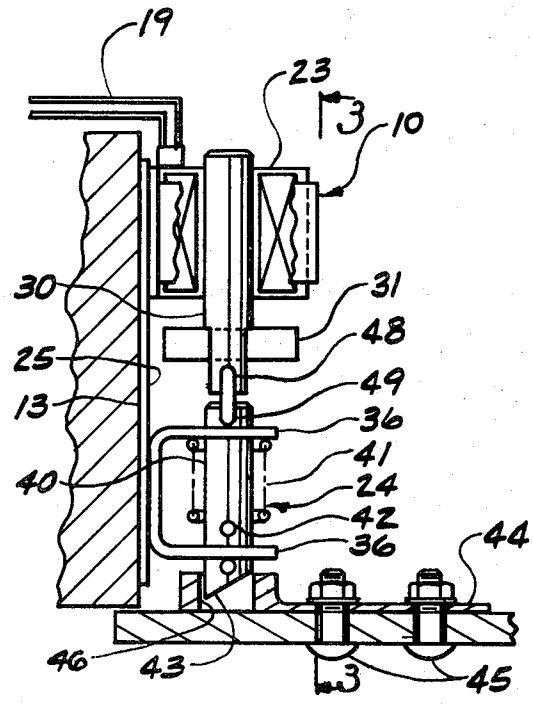
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Primary Examiner—Albert G. Craig, Jr.

[57] **ABSTRACT**

This electric lock assembly is inaccessibly mounted inside a carrier vehicle and is actuated from the outside by utilizing a conventional power source. The lock assembly includes a solenoid having a movable core connected by a link member to a bolt which engages the door of the vehicle. The link member isolates the solenoid core from transverse forces applied to the bolt by the door.

1 Claim, 5 Drawing Figures



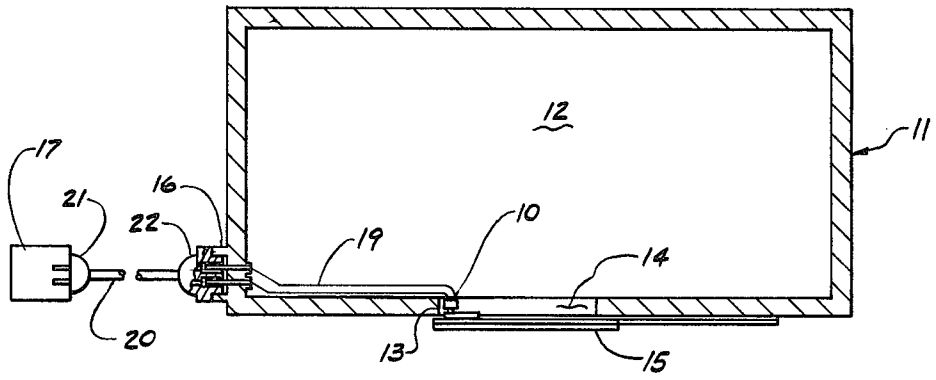


FIGURE 1

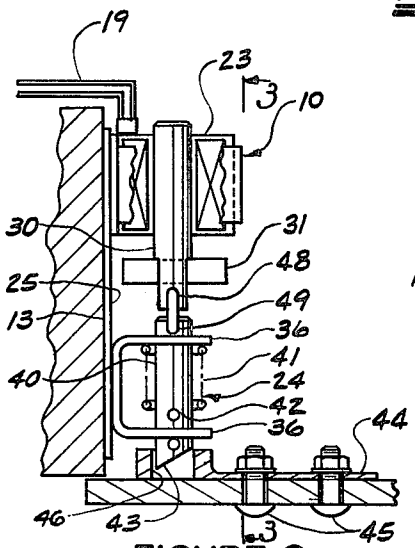


FIGURE 2

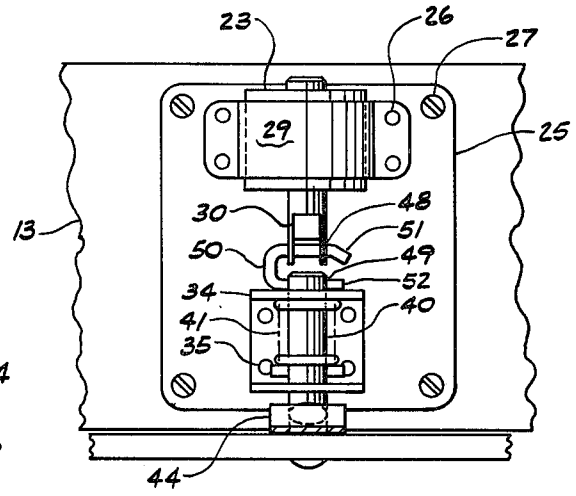


FIGURE 3

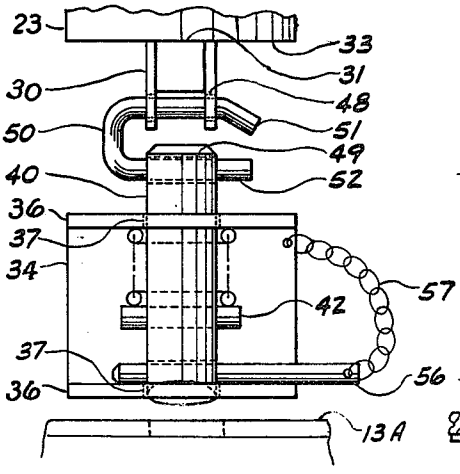


FIGURE 5

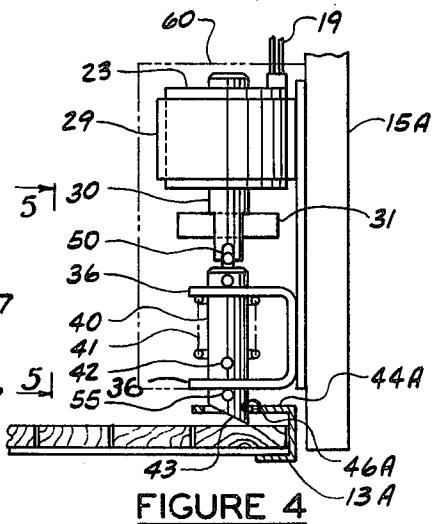


FIGURE 4

ELECTRIC LOCK ASSEMBLY

BACKGROUND OF THE INVENTION

This invention relates generally to an improved lock for preventing theft from common carriers and particularly to an inaccessible electric lock actuated from the outside of the carrier.

The theft of goods from common carriers, particularly railroad cars and trucks, amounts to many millions of dollars each year. Much of this theft is carried out by individuals or small groups rather than by criminal organizations and could be prevented by providing adequate locking safeguards. However, in spite of the fact that locks are known which are installed inside cars for outside actuation such locks have not been successful. That this is so is clearly evident from the fact that conventional padlocks remain the most frequently used locks available, notwithstanding that such locks are relatively easily broken even by individuals. Railroad cars, for example are particularly susceptible to being broken into while they are standing in railroad yards between loading and unloading stations.

The primary reasons why more sophisticated locks are not used are that they are either too complex, and therefore expensive, or that they are difficult to mount and operate, and are therefore impractical. Moreover, even though solenoid operated locks have been used in attempts to cut down the incidence of theft they have not met with acceptance. The reason for this is that they suffer from a common disadvantage in that the bolt element is either provided by the movable core directly, or else by an extension rigidly attached to the core in such a fashion that any strain on the bolt is taken by the solenoid core, and this applies particularly to the strain resulting from the vibration of the carrier door against the bolt while the vehicle is in transit. This common structural arrangement of parts precludes effective operation of the solenoid and is probably the greatest factor contributing to the failure of this type of lock.

The present lock overcomes these and other deficiencies in a manner not disclosed by the known prior art.

SUMMARY OF THE INVENTION

This electric lock assembly provides a solenoid operated bolt which is inaccessibly mounted interiorly of a vehicle, such as a common carrier, and is actuated exteriorly of said vehicle.

The bolt is connected to and movable with the solenoid by means of a connecting link, which substantially precludes the transfer of transverse forces from the bolt to the solenoid core by permitting relative transverse movement between said bolt and core members.

The lock is actuated by a conventional electrical energy source available at loading and unloading points but not between such points. This electric lock assembly is inexpensive to manufacture, easy to install and use and is highly efficient in operation.

It is an important object of this invention to provide an interiorly mounted electric lock, which is attached to the door frame of a carrier vehicle for engagement with the door or, alternatively, is attached to the door itself for engagement with the frame, the lock being actuated exteriorly of the vehicle.

It is another important object to provide an electric lock which includes solenoid means, having a movable core member; bolt means having a bolt member, and link means operatively interconnecting said members for movement of said bolt member by said core member from an engaged lock position to a disengaged withdrawal position.

It is an object to provide that the solenoid can be energized by an external, conventional energy source such as a **110** volt power supply.

It is another object to provide a bolt member, which is substantially longitudinally aligned with the movable core member and which has considerably greater resistance to transverse locking forces than said movable core member.

An important object is to provide link means which includes a link element pivotally connected to both the bolt member and the core member to permit relative transverse movement of said members in at least one direction.

Another object is to provide a link member having a pair of arms, each pivotally and slidably connected to at least one of the bolt and core members for relative transverse movement of said members in at least two directions.

It is an object to provide a bolt means having a bracket member in which the bolt member is slidingly mounted and supported independently of the solenoid core member and to provide spring means between said bracket member and said bolt member to bias the bolt member into a locked position.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a cross sectional plan view through a railroad car showing a typical lock assembly location;

FIG. **2** is an enlarged view of the lock assembly;

FIG. **3** is a cross sectional view taken on line **3—3** of FIG. **2**;

FIG. **4** is a similar view to FIG. **2** showing the assembly mounted in conjunction with the swinging door of a truck; and

FIG. **5** is an enlarged, fragmentary view taken on line **5—5** of FIG. **4**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now by characters of reference to the drawing and first to FIGS. **1** through **3**, it will be understood that the electric lock, generally indicated by numeral **10** is shown, by way of example, as mounted within the interior of a railroad car **11**. The same lock **10** may also be used in conjunction with a truck as will be described.

As shown in FIG. **1** the lock **10** is mounted within the interior **12** of the car **11** by attachment to the door frame **13**. The door frame **13** defines the opening **14** to the interior **12**, and constitutes a framing means. A sliding door **15** provides a door means operatively closing said opening **14**.

In the preferred embodiment, the electric lock **10** is electrically connected to a male electrical outlet **16**, provided on the side of the railroad car **11**, by means of a cable **19**. In order to actuate the lock **10** the outlet **16** is connected to a 110 volt electrical energy source, generally indicated by numeral **17**, by means of an extension cord **20**, having appropriate male and female plugs **21** and **22** respectively at each end. It will be un-

derstood that this arrangement permits the use of a conventional 110 volt outlet for actuating the electric lock, such outlets being commonly available at loading docks.

Referring now to FIGS. 2 and 3 it will be seen that the lock **10** includes a solenoid **23**, constituting a solenoid means, and a bolt assembly **24**, constituting a bolt means. The solenoid **23** is mounted to a base plate **25**, as by screws **26**, and the base plate **25** is mounted in turn to the frame **13**, as by mounting screws **27**.

The solenoid **23** includes a body **29** and a movable core member **30**, having a T-shaped head **31**, engageable with the face **33** of the body **29** when the solenoid **23** is energized to withdraw the movable core member **30**.

The bolt assembly **24** includes a U-shaped bracket **34** attached to the base plate **25** as by screws **35**. The legs **36** of the U-shaped bracket **34** are provided with apertures **37** which receive a bolt member **40** in sliding relation and provide spaced points of support for the bolt member **40** independently of the core member **30**. In the preferred embodiment, the bolt assembly **24** also includes a compression spring **41**, which is retained on the bolt member **40** by means of a retaining pin **42**. The spring **41** provides a bias means urging the beveled end **43** of the bolt member **40** into engagement with an engagement means on the sliding door **15**. In the embodiment illustrated the engagement means is provided by an apertured catch member **44**, which is attached to the sliding door **15** as by fasteners **45**, and presents a face **46** for engagement with said bolt member **40**, it being understood that the catch member **44**, in effect, constitutes part of the door means.

Importantly, the bolt member **40** is connected to the solenoid core member **30** by means of a link element generally indicated by numeral **50** and constituting a link means. In the preferred embodiment, the link element **50** is substantially U-shaped and includes arm portions **51** and **52** received within apertures **48** and **49** provided respectively in the core member **30** and the bolt member **40**, the apertured ends of said members providing connection means for the link element. As shown in FIG. **3** the arm **51** is bent at its remote end to prevent inadvertent withdrawal of the link element **50**. The lower arm **52** of the link element **50** is engageable with the upper leg **36** of the bracket **34** and acts to limit downward movement of the bolt member **40**.

The longitudinal axes of the core member **30** and the bolt member **40** are substantially aligned. The link element **50** provides a somewhat loose connection between the two members, which permits slight transverse movement of one relative to the other. In effect, in the engaged position any strain experienced by the bolt member **40** is not transferred to the core member **30** because of the double pivot provided by the link element **50** and because of the sliding relationship between the link arms **51** and **52** and the respective apertures **48** and **49** receiving said arms. Thus, the solenoid core member **30** does not suffer the frequently severe, vibratory forces experienced by the bolt member **40**, which can readily be made sufficiently strong to resist such forces. However, when the car is stationary it is a simple matter for the bolt member **40** to be withdrawn from engagement with the sliding door **15** by actuation of the solenoid **23**, which withdraws the core member **30**. In practice the solenoid **23** is a relatively small conventional unit readily available commercially.

The lock assembly illustrated in FIGS. **4** and **5** is essentially the same as that shown in FIGS. **1** through **3** but is mounted for use with a truck having a pair of interlocking swinging doors one of which is indicated by numeral **15***a*. FIG. **4** shows the bolt member **40** in the locked position and FIG. **5** shows the bolt member in the withdrawn position. In the locked position the bolt member **40** is engageable with an aperture provided on the bottom edge member **13***a*. In effect, the bottom edge member **13***a* provides a framing means defining the opening to the interior of the truck and includes an apertured upper portion **44***a* presenting an engagement face **46***a* to said bolt member **40**.

As shown clearly in FIG. **4**, the bolt member **40** includes a transverse aperture **55** at its beveled end **43**. FIG. **5** shows the location of the aperture **55** when the bolt member **40** is in a withdrawn position and, as can be seen, the aperture receives a stop pin **56**, which may be attached to the bracket **34** as by chain **57** and which is engageable with the lower of the legs **36** of the U-shaped bracket **34**. Said stop pin **56** thereby provides a means by which the bolt member **40** can be held in a withdrawn position during those times when it is not convenient to use the lock, as for example when the truck is empty. In some instances, to discourage tampering and preclude inadvertent damage, the lock may be provided with a cover **60**, indicated in phantom outline.

Although not specifically shown, it will be understood that the lock **10** of the railroad car **11** may be fitted with similar holding means and may also be provided with a cover **60**.

We claim as our invention:

1. An interiorly mounted, electrically operated lock assembly for a carrier vehicle to prevent theft from the vehicle between loading stations comprising:

a. framing means defining an opening to the vehicle interior,

b. door means operatively closing said opening,

c. an electric lock mounted to one of said means and lockingly engageable with the other of said means the lock including:

1. solenoid means carried by said one means and including a movable core member having a longitudinal axis of movement and a connection means,

2. bolt means carried by said one means and including a bolt member engageable with said other means said bolt member having a longitudinal axis of movement and a connection means, and

3. link means including spaced end portions operatively interconnecting said solenoid core member and said bolt member between said connection means for longitudinal movement of said bolt member by said core member, said spaced end portions permitting relative, transverse translational movement of said bolt member and said core member connection means substantially without transfer of transverse shear forces to said solenoid core member from said bolt member, and

d. an electric energy supply means selectively connectible with the solenoid means for actuating said solenoid means and inducing longitudinal movement into the bolt member said supply means including:

1. a remote conventional 110 volt alternating current power supply outlet at the loading station, and

2. an extension cord extending between the outlet and the carrier vehicle.

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