Feb. 15, 1966 N. R. McRAE ET AL 3,235,300

MANUALLY OPERATED ELECTRICALLY INTERLOCKED DOOR LOCK KEEPER

Filed May 27, 1963 2 Sheets-Sheet 1

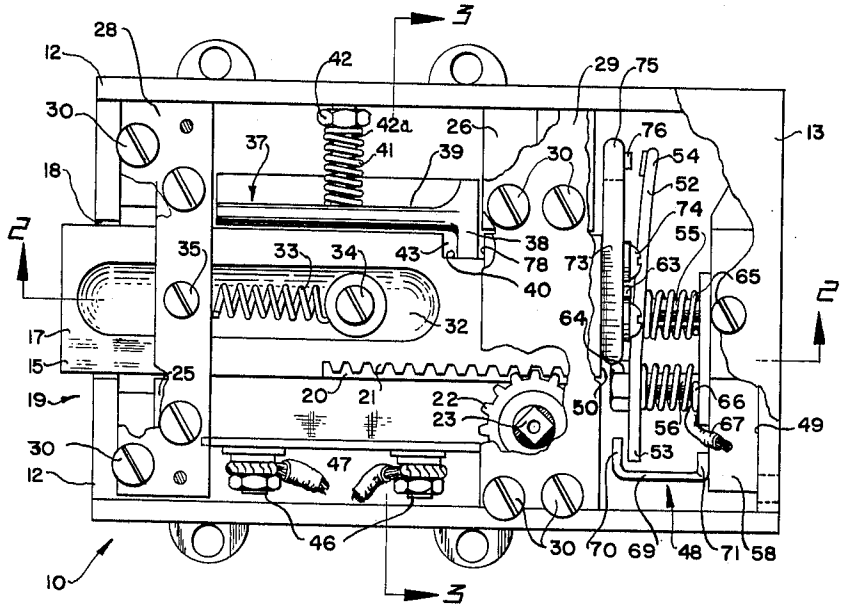



Fig. 1.

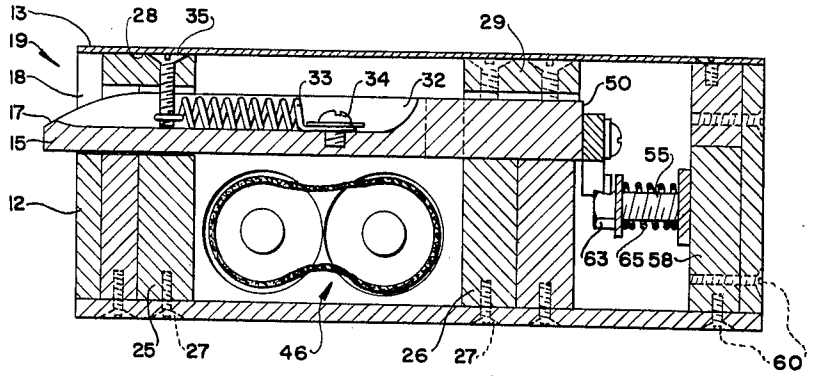



Fig. 2.

INVENTOR
NORMAN R. McRAE
BY
Fetherstonhaugh & Co.
ATTORNEYS

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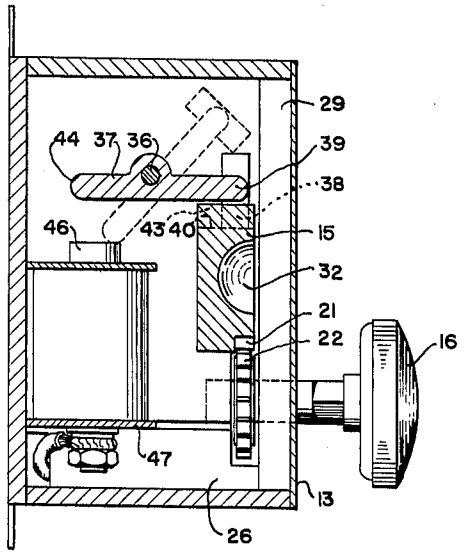



FIG. 3.

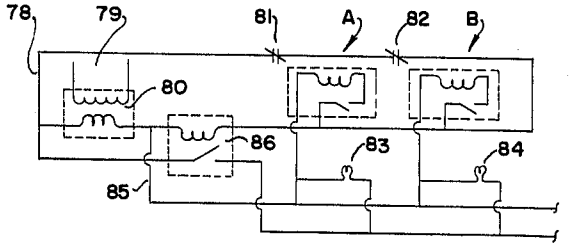



FIG. 4.

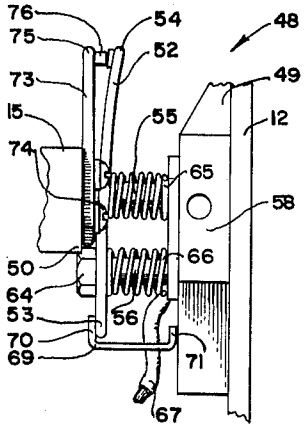



FIG. 5.

INVENTOR
NORMAN R. McRAE
BY
Fetherstonhaugh & Co.
ATTORNEYS

United States Patent Office 3,235,300 Patented Feb. 15, 1966



3,235,300

# MANUALLY OPERATED ELECTRICALLY INTERLOCKED DOOR LOCK KEEPER

Norman R. McRae, South Burnaby, British Columbia, Canada, assignor to The Vancouver General Hospital, Vancouver, British Columbia, Canada

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This invention relates to a manually operated electrically locked door lock keeper which, when electrically interlocked with other similar door lock keepers, each of which is affixed to a door in a door system, will permit the opening of only one door in the door system at one time.

This type of lock is especially adapted for use in clothes chutes or the like in multi floor buildings, in which the clothes chute has a door on each floor, and which may be opened to thereby permit clothes to be dropped down the chute. Due to the heavy loads sometimes dropped, it is very important that the clothes chute be devised such that only one door may be opened at one time, thereby eliminating the risk of injury to personnel who may be removing clothes from lower levels while other clothes are being dropped from upper levels.

It will be appreciated that if the clothing dropped is of exceptionally heavy weight, the doors in this system will experience a heavy buffeting action or the like. In lock systems heretofore devised, the buffeting action beforesaid has tended to cause derangement of the operating parts of the locks, especially those types of locks in which the keeper is withdrawn by spring or electrical means.

It should also be appreciated that the lock, although admirably suited for use in connection with laundry chutes and the like, as indicated, may be used to interlock any system of doors or gates, whether horizontally or vertically arranged, in which it is preferable or necessary that only one of the doors or gates in the system be open at one time.

The object of this invention, therefore, is to provide a door lock keeper which may be withdrawn by manual pressure and which, therefore, may be operated regardless of any undue force exerted upon the door or the keeper. The present invention consists of a manually operated door lock keeper comprising a locking bolt mounted for axial movement, resilient means for urging said bolt outwardly to a normal locking position, means connected to the bolt whereby the latter may be moved axially, an obstructing member to releasably lock the bolt in said locking position, said obstructing member being adapted to permit a predetermined inward movement of the bolt while the bolt is in its locking position, and electrical means, operated by the bolt to move the obstructing member upon said predetermined movement of the bolt, to permit said bolt to be moved fully inwardly to an unlocking position.

An example of this invention is illustrated in the accompanying drawings, in which:

FIGURE 1 is a side elevation of the keeper assembly,

FIGURE 2 is a section taken along line 2—2 of FIGURE 1,

FIGURE 3 is a section taken along line 3—3 of FIGURE 1,

FIGURE 4 is a wiring diagram showing the interlocking aspect of the number of keepers, and



FIGURE 5 is a view showing the engagement of the bolt and switch mechanism.

Referring to the drawings, **10** generally represents a keeper assembly contained within a substantially rectilinear casing **12** having a cover plate **13** and consists essentially of a longitudinally slidable bolt **15** operable from outside the casing by a knob **16**, the locking end **17** of the bolt protruding outwardly of a slot **18** formed in one end **19** of the casing. The casing is adapted to be mounted on the edge of the door to permit the operating end **17** of the bolt to be received in a standard striker plate carried by a jamb against which the door closes. The inner end portion of the bolt is reduced or cut away at **20** to form a gear rack **21** which meshes with a spur gear **22** which is non-rotatably secured to an operating spindle **23**, said spindle extending outwardly through the cover plate **13** and carrying at its outer end the operating knob **16**.

The bolt **15** is slidably carried in notched ways formed in two guides **25** and **26** which are secured in the casing **12** by screws **27**, and secured against lateral movement by a pair of bridging members **28** and **29** which are secured to guides **25** and **26**, respectively, by screws **30**. The bolt **15** is also provided with a slot **32** formed longitudinally in the face thereof adapted to receive a coil spring **33**, said coil spring being secured at one end to the bolt by a screw **34** and at the other end to a retainer **28** by a screw **35**. The coil spring **33** being under tension continually urges the bolt **15** outwardly to its normal locking position.

The guides **25** and **26** which are spaced apart longitudinally also serve as end supports for a longitudinally disposed shaft **36** which pivotally carries an elongated armature **37** adapted to revolve around its central axis, and is so disposed relative to the bolt **15** that a dog **38** which is carried by and projects downwardly from one arm **39** of the pivotally mounted armature will bear against the upper edge **40** of the bolt **15**. A coil spring **41**, mounted under compression between said one arm **39** of the armature, and a nut **42** adjustably mounted on a threaded shaft **42***a* depending downwardly from the upper wall of the casing **12** continually forces the dog **38** into a notch **43** formed in said upper edge when the bolt is in its normal outward locking position. It will be seen by referring to FIGURE 1 that when the dog **38** is engaged in the notch **43**, the bolt **15** cannot be withdrawn from the aforesaid locking position.

The other arm **44** of the armature **37** lies directly above a pair of electromagnets **46** which are mounted on a bracket **47** secured between the guides **25** and **26**. The electromagnets **46** when energized by an electric current are sufficiently powerful to cause the armature **37** to pivot on its shaft **36** against coil spring **41** to thereby release the dog **38** from the notch **43**, to thereby permit bolt **15** to be withdrawn from its normal locking position. The armature in this latter position is shown in dotted lines in FIGURE 3 of the drawings.

The electromagnets **46** are connected to an electric circuit through a switch mechanism **48** secured to an inner wall **49** of the casing **12** between said inner end of the casing and the inner end **50** of the bolt **15**. The switching mechanism **48** which is adapted to be closed by a relatively short inward movement of bolt **15** from its said normal locking position consists, in the preferred form of the invention, of an arm **52** having a contact

end 53 and an operating end 54 mounted slidably and pivotally captive on a pair of parallel spaced pins 55 and 56, said pins projecting outwardly and being held securely in a dielectric base 58, said base being secured to the inner end 50 of the casing by screws 60. The arm 52 is urged outwardly against a pair of nuts 63 and 64 which are threaded on the outer ends of the pins 55 and 56, by two coil springs 65 and 66 mounted under compression on the pins 55 and 56, respectively, between the arm 52 and the dielectric base 58. In this example of the invention, one of the pins 56 is connected into an electric circuit by wire 67.

A U-shaped contact element 69, one leg 70 adapted as hereinafter set out to contact the contact end 53 of the arm 52, is secured to the dielectric base 58 by the other leg 71, said leg 71 being connected by electrical conducts 72 to the electromagnets 46. The inner end 50 of the bolt 15 is provided with a finger 73 fixedly secured at one end to the inner end 50 of the bolt by screws 74, the other end 75 being provided with a tip 76 composed of dielectric material, said tip 76 being arranged to contact and depress the operating end 54 of the arm 52 as hereinafter described upon the bolt 15 being moved inwardly.

The arm 52 is adjustably positioned on the pins 55 and 56 by the nuts 63 and 64, such that in its normal position, i.e. with the tip 76 of the finger 73 spaced outwardly from the operating end 54 of the arm, the contact end 53 is spaced inwardly from the leg 71 of the contact element 69. With the arm in this latter position, it will be seen that the electromagnets 46 cannot be energized. The dog 38 of the armature will therefore remain in engagement with the notch 43 in the bolt. However, the notch 43 is wider in a longitudinal direction than the width of the dog 38 to permit a certain degree of longitudinal play of the bolt, which in this particular example, is approximately ⅛ of an inch. FIGURE 1 shows the relative positions of switch mechanism 48, bolt 15 and armature 37 in the locked position. When the knob 16 is rotated to simultaneously spur gear 22 against rack 21, the bolt 15 will start to withdraw from its outer locking position. The parts are so arranged that before the dog 38 meets the shoulder 78 of the notch 43 to thereby stop the inward withdrawal of the bolt 15, the tip 76 of the finger will contact and depress the operating end 54 of the arm 52, causing said arm to pivot on pin 56, and clamping the contact end 53 of the arm into contact with leg 70 of the contact element 69, thereby effecting a closure of switch 48. In this latter position, with the switch mechanism 48 closed, as shown in FIGURE 5, the electromagnets 46 are energized to thereby rotate the armature 37, to thereby disengage the dog 38 from the notch 43. The bolt 15 may then be fully withdrawn from its locking position. To reset the lock, it is only necessary to release the operating knob 16, thus allowing the spring 33 to return the bolt to its normal outer locking position. When the door is closed, the bolt will strike the striker plate on the door jamb moving the bolt inwardly, thus causing the switch mechanism to close and to release the dog from the notch permitting the bolt to move fully inwardly, the spring 33 thrusting the bolt outwardly to its locking position when the door is fully closed.

Referring now to FIGURE 4 which represents diagrammatically two similar locks A and B installed each in a door, it will be seen that the locks are connected in parallel in a circuit 78 which is energized from an electrical power source 79 through a step-down transformer 80. The circuit 78 passes through two momentary pressure switches 81 and 82, each of which is installed between a door and its jamb and each operable when the corresponding door is opened to break the circuit 78. It will thus be seen that if the door to which lock A is affixed is opened, this will open pressure switch 81 thereby de-energizing the entire circuit 78. As the electromagnet



contained in lock B cannot be energized, the lock cannot be operated nor can the door to which it is attached be opened. Also installed near each door are lights 83 and 84 interconnected in a secondary circuit 85, said secondary circuit being controlled by a relay switch 86 in circuit 78. The relay switch is of the type operable to close secondary circuit 85 when circuit 76 is de-energized and to open the former circuit when the later is energized. The lights, therefore, serve as a signal, when alight, that a door in the system is opened and when not alight, that all doors are closed.

What I claim as my invention is:

1. A manually operated door lock keeper comprising an elongated longitudinally slidable locking bolt having a gear rack formed along an edge thereof, a rotatable gear engaging the gear rack, a handle connected to the gear to rotate the latter and thereby move the locking bolt longitudinally, a spring connected to the locking bolt for urging the latter outwardly to a normal locking position, an obstructing member movably mounted for movement into and out of the path of the locking bolt, resilient means normally urging the obstructing member into the path of the locking bolt when the latter is in its normal position, said obstructing means being arranged to permit a predetermined movement of the bolt while the latter is in its locking position, an electromagnet of which the obstructing member forms an armature adapted, when energized, to move the obstructing member out of the path of the locking bolt, a circuit for the magnet, said circuit being normally open when the bolt is in its locking position, and a switch in the circuit located in the path of the bolt to be operated by the latter during said predetermined movement thereof to close the circuit and thereby energize the magnet and permit the locking bolt to be fully withdrawn from its locking position.

2. A manually operated door lock keeper as claimed in claim 1 including a second switch in the circuit operable between open and closed positions responsive to the opening and closing of a door with which the keeper is associated.

3. A manually operated door lock keeper comprising an elongated longitudinally slidable locking bolt having a gear rack formed along one edge thereof and a notch in the opposite edge, a rotatable gear engaging the gear rack, a handle connected to the gear to rotate the latter and thereby move the locking bolt longitudinally, a spring connected to the locking bolt for urging the latter outwardly to a normal locking position, an armature member mounted for swinging movement adjacent the locking bolt, resilient means connected to the armature member normally urging the latter towards the locking bolt, a dog projecting from the armature member to engage the notch when the bolt is in its locking position, said notch being wider than the dog to permit a predetermined inward movement of the bolt while the latter is in said locking position, an electromagnet located adjacent the armature member for operating the latter, a circuit for the electro-magnet, said circuit being normally open when the locking bolt is in its normal position, and a switch in the circuit located in the path of the locking bolt so as to be operated by the latter during said predetermined movement thereof to close the circuit and thereby energize the magnet, said energized magnet swingably moving the armature member against the resilient means so as to disengage the dog from the notch to permit the bolt to be fully withdrawn from its normal locking position.

4. A manually operated door lock keeper as claimed in claim 3 including a second switch in the circuit operable between open and closed positions responsive to the opening and closing of a door with which the keeper is associated.

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JOSEPH D. SEERS, *Primary Examiner.*

M. HENSON WOOD, JR., *Examiner.*