

April 1, 1969

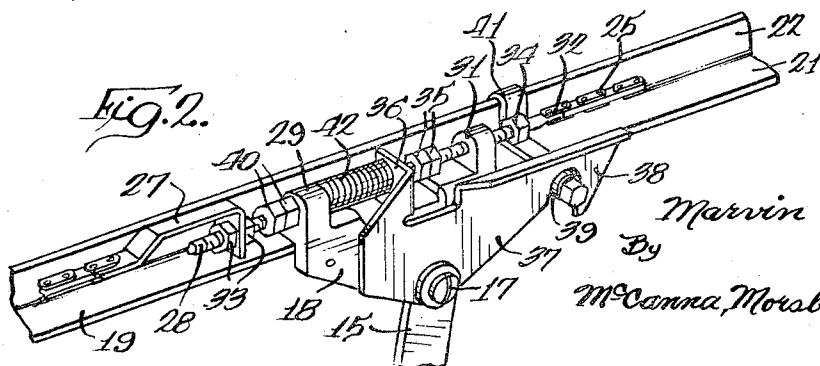
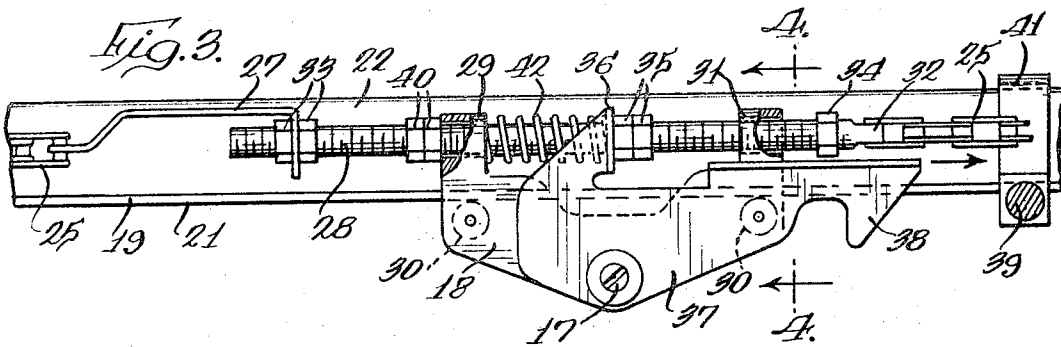
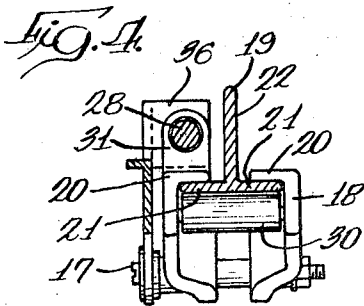
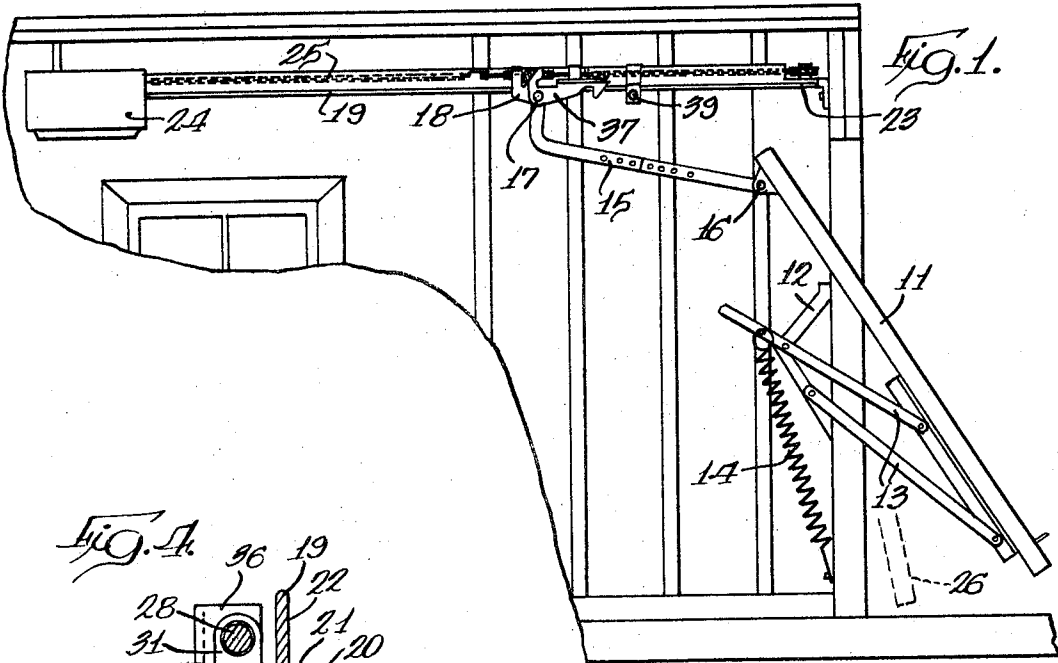
M. A. KRUSE

3,435,558

DOOR OPERATING MECHANISM

Filed Sept. 1, 1967

Sheet 1 of 2



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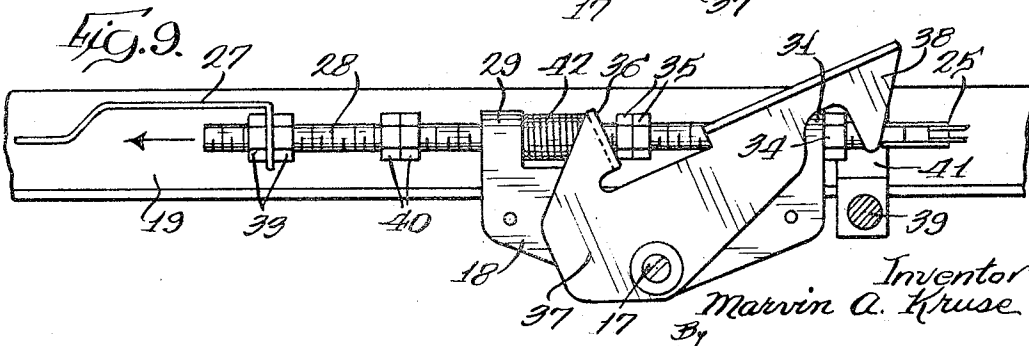
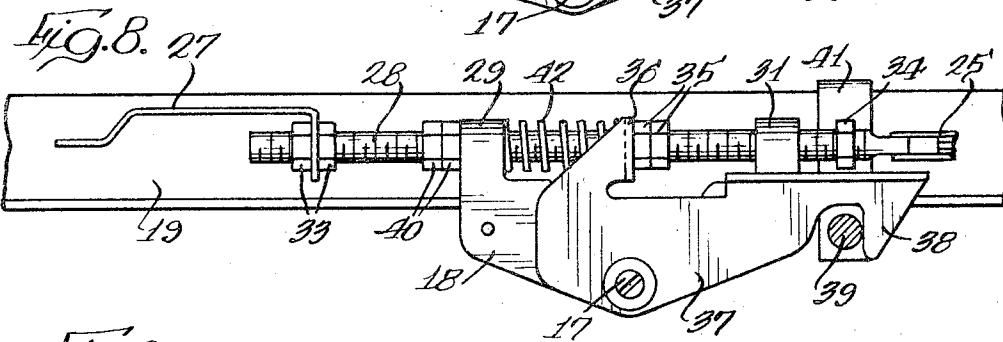
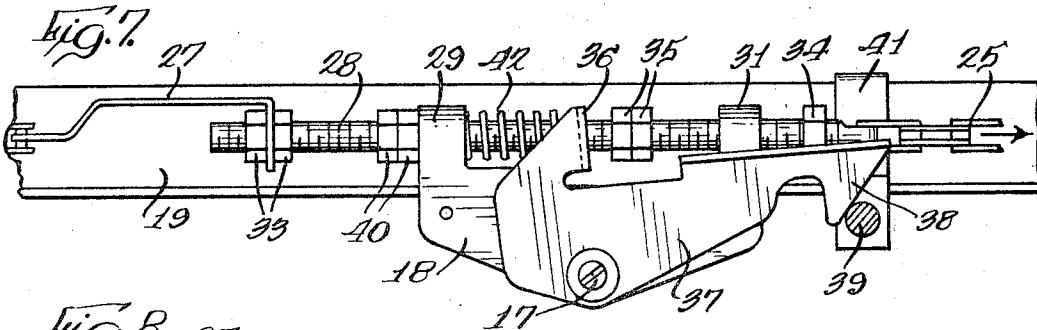
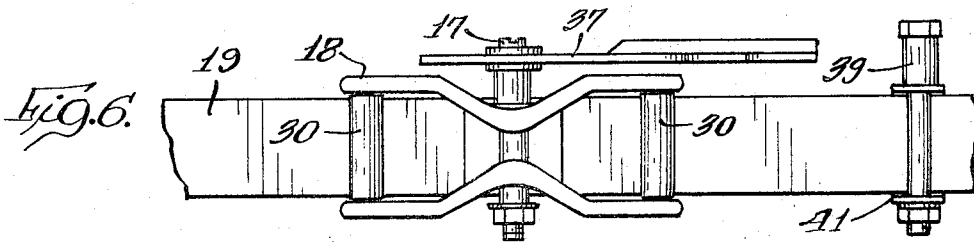
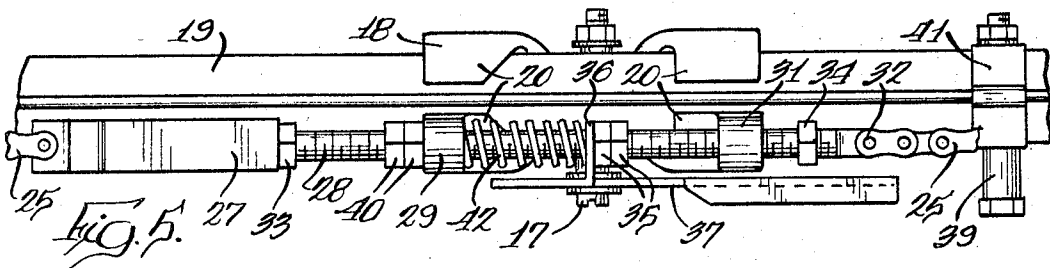
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Sheet 2 of 2



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3,435,558

DOOR OPERATING MECHANISM

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Filed Sept. 1, 1967, Ser. No. 665,128

Int. Cl. E05f 15/00

U.S. Cl. 49-200

6 Claims

ABSTRACT OF THE DISCLOSURE

A power operated upwardly acting door having means supporting the door for movement between open and closed positions and a track supporting a trolley which is secured to the door and is movable with the door between its open and closed positions. A latch assembly is connected to the trolley for locking the door in the closed position and means operated in response to door opening movement of the power means to release the latch prior to moving the trolley in the door opening movement.

This invention relates to mechanisms for opening and closing doors, particularly garage doors, but applicable to industrial and commercial doors and the like.

The invention provides mechanism for opening and closing doors of this general type having inherent therein and combined therewith means for locking the door in the closed position and being immobilized to opening of the door by any external force applied to the system such as would be incurred when an intruder attempts to force open the door from the outside.

Heretofore, door operating mechanisms have been susceptible to the danger of intruders breaking into a garage because the garage door has not been effectively locked against unauthorized opening. This is particularly true with such mechanisms which include a power moved trolley connected to the door through an arm or link for transmitting door opening and closing movements. In such cases it is possible for an intruder to pull outwardly the lower end of the door sufficiently to transmit through connecting arm or link a movement to the trolley which will cause operation of the power or otherwise to permit opening of the door. My invention provides a simple and practical means for preventing any such unauthorized opening of a door after the door has been moved by the trolley to the closed position.

In furtherance of my invention I have provided, in a preferred form, a relatively inexpensive locking device coacting and in combination with a trolley mechanism to effectively lock the door in the closed position when the door has been moved to such position and also to unlock the door in response to door opening operation of the trolley. Thus, in a distinctive and novel manner, security is assured against the opening of a garage door or the like under these circumstances.

Other objects and attendant advantages will be appreciated by those skilled in this art as the invention becomes better understood by reference to the following description together with the accompanying drawings, in which:

FIG. 1 shows a garage door operating mechanism embodying my invention, with the door in a partly open position;

FIG. 2 is a perspective view of the trolley locking mechanism, showing the trolley in the locked position;

FIG. 3 is a side elevation of the trolley locking mechanism with the trolley in an unlocked position at a point in its movement toward locking the door in its closed position;

FIG. 4 is a cross-section taken on the section line 4-4 of FIG. 3;

FIG. 5 is a top view of the trolley locking mechanism in the position shown in FIG. 3;

FIG. 6 is a bottom view thereof;

FIG. 7 is a side elevation of the trolley locking mechanism with the trolley approaching the final door closing position and the latching member engaging the locking pin;

FIG. 8 is a similar view but with the trolley latched in the locking position when the door is closed; and

FIG. 9 shows the trolley latching member unlatched in the operation of opening the door.

In FIG. 1 of the drawings I have illustrated somewhat diagrammatically a side elevation of a conventional garage door operator together with an application of my invention. It will be understood that this is a preferred embodiment and that the invention may be applied with suitable modification if necessary to commercial and industrial door structures. As shown in the drawings the garage door designated generally by reference numeral 11 is a one-piece door. However, any door structure may be used such, for example, as a sectional door. The door is mounted to the door jamb structure by any suitable means which permits movement of the door from a vertically disposed closed position to a horizontally disposed open position. In the present instance this mounting means includes (usually at each side of the door) a bracket 12 fixed to the door jamb, linkage 13 between the bracket 12 and the door 11, and a contractile spring 14 counteracting the weight of the door and acting to urge the door toward the open position. In this adaptation a single arm or link 15 is pivotally connected at 16 to the door and at 17 to a trolley designated generally by 18. This trolley is mounted to slide back and forth along a track 19. In this instance the track has an inverted T-shape with horizontal flange ways 21 extending laterally from a central vertical flange 22. The trolley has at its top, inwardly extending flanges 20 which ride on top of the flange ways 21 of the trolley, and is provided on its underside with rollers 30 which ride against the underside of the track way 21 when upward thrust is applied to the trolley through the arm 15. The track is suitably mounted at one end 23 to the wall or door jamb and at its opposite end is connected to a power unit 24 which in turn is fixedly mounted to the building structure. The power unit may be of any suitable type and construction for operating a chain 25 to move the trolley 18 along the track in door opening and closing movements. However, a cable or other means may be used to move the trolley back and forth.

My invention contemplates, in combination with door structures of the character described, a trolley locking mechanism which immobilizes the trolley to any external movement applied to the system through the door such as would be incurred when an attempt is made to force open the door. I refer particularly to acts of an intruder attempting to open the door after the door has been closed and presumedly is locked. However, in door operators of this general type there is sometimes a slackness or play in the connections between the door and the trolley with the result that an intruder may pull out on the lower end of the door in a movement approximating the dotted line position in FIG. 1, thereby moving the trolley and chain sufficiently to permit opening the door or to cause actuation of the motor unit in a door opening operation. My invention positively prevents any such opening of the door.

Referring now more particularly to FIGS. 2, 3 and 4, it will be seen that the chain 25 is connected at one end through a bracket 27 to a slide bolt 28. This bolt passes freely for axial movement through upstanding arms 29 and 31 formed on the trolley bracket 18 at opposite ends thereof. The opposite end of the chain is connected at 32 to the forward end of the bolt 28. Nuts 33 threaded

on the bolt 28 clamp against opposite sides of the bracket 27 and are adjustable to take up slack in the chain. Nut 34 on the forward end of the bolt is an adjustable stop adapted to contact the trolley arm 31 to impart movement to the trolley in its unlocking and door opening movement as shown in FIG. 9. Intermediate the trolley arms 29-31 adjustable nuts 35 on the bolt 28 provide an abutment adapted to act against an upstanding arm 36 on a trolley latching and locking member 37. This member 37, pivoted to the trolley at 17, has a latch arm 38 adapted to latch and lock over a locking pin 39 which is fixed to the track by a bracket 41. A compression spring 42 on the bolt 28 intermediate the trolley arm 29 and the latch member arm 36 constantly urges the latch member in a direction to hold its latch end 38 in the position shown in FIGS. 3, 7 and 8, in the latter of which it is latched in locking engagement with the locking pin 39. The spring 42 also urges the bolt 28 axially forward until its movement is stopped by nut 40 on the bolt abutting against the rear side of the trolley arm 29. Thus, when the chain is pulling forward, to the right as shown in FIGS. 2, 3 and 7, the trolley will be moved to the right by pull of the bolt 28 and its nut 40 against the trolley arm 29, until the arm 38 latches over the locking pin 39, FIG. 8. At this time the door is closed and the motor unit has shut off, stopping closing movement of the chain. The door is now effectively locked in the closed position as will be evident from the fact that any attempt to pull open the door in a direction as indicated by 26, such movement will be resisted because the thrust or force thereof will be transmitted back through the arm 15 to the trolley and thence resisted by the latching and locking engagement of 38 with the fixed locking pin 39. When now the motor unit is operated to open the door the chain 25 will pull the bolt 28 back, to the left FIG. 9, pulling the nut 40 away from the trolley arm 29 and pushing the nut 33 against the latch member arm 36, thereby unlatching the arm 38 from the locking pin against the compression of spring 42. As this movement of the chain and slide bolt continues and the unlatching has been completed the spring 42 returns the latching member to its normal position shown in FIG. 3.

Referring to the sequence of operations: It will again be noted that when the door is closed the trolley locking mechanism is in the position shown in FIG. 8. In the door closing operation the chain has been moved by the power unit to the right, moving the trolley with it until the door is closed. At this point the power is disconnected and the latch member snaps over the locking pin under the action of the spring 42 to the locking position shown in FIG. 8. Here, the trolley is immobilized to any external movement applied to the system through the door arm 15, as above described, such as would be incurred when an attempt is made by an intruder to force open the door from the outside. The door is positively and effectively locked against any such opening movement. Now, when the power unit is operated by control of the garage owner, usually by remote push button or radio control from the car, the slide bolt 28 which in effect is integral with the chain moves first, compressing the spring and lifting the latch member free of the locking pin, as shown in FIG. 9, an instant before the actual lifting of the door begins. After thus releasing the lock, the door is opened by the power unit acting through the chain, trolley, door arm 15, and influence of the spring 14, or by whatever door opening mechanism is used. For the closing sequence, the slide bolt is pulled forward by the chain as shown in FIGS. 3 and 7, leaving the compression spring 42 free to perform its snap-locking action and closure of the lock. It will be apparent, therefore, that my invention provides a simple and practical means inherent in and combined with the power operated mechanism for opening and closing a garage door and the like in a manner providing absolute door closure security without the need for extraneous locking devices.

It is believed that the foregoing conveys a clear understanding of my invention; and it will be understood that changes and variations may be made in the construction without departing from the spirit and scope of the invention as expressed in the appended claims.

I claim:

1. Door opening and closing mechanism comprising, in combination, a door movable back and forth between a closed and an open position, a trolley connected to the door for transmitting such movements, a track on which the trolley moves, power operated means for moving the trolley on the track, a latch device operable between the trolley and the track for holding the door in the closed position, and means operated in response to door opening movement of the power means to release said latch device prior to moving the trolley in the door opening movement.

2. Door opening and closing mechanism comprising, in combination, a door movable between a vertically disposed closing position and a horizontally disposed open position, a trolley movable back and forth connected to the door for transmitting said door movements, a power unit, a chain propelled by the power unit connected to the trolley for moving it, a spring-pressed latch element on the trolley, a stationary bolt element arranged to be engaged by the latch element for locking the trolley in a door closing position, the latch element being actuated by a lost motion connection with the trolley arranged to move the latch element in an unlocking movement upon movement of the chain to move the trolley in a door opening movement, the latch being subsequently restored to a latching condition for locking engagement with the bolt element in a subsequent movement of the trolley after the latch element has been unlocked from the locking element.

3. Door opening and closing mechanism comprising, in combination with a door and a power mechanism, a track, a trolley mounted to move back and forth along the track, a bolt mounted on the trolley parallel with the track and extending beyond each of the opposite ends of the trolley, a chain band operated by the power mechanism connected at each opposite end respectively to one of the extended ends of the bolt, a latch bolt fixed on the track, a latch element pivoted on the trolley operable on its pivot for engaging and releasing the latch bolt, a spring normally urging the latch element in a direction to latch engage the bolt, a nut element adjustable lengthwise on the bolt, the latch element having an arm engageable by said nut element for unlatching the latch element from the bolt when the chain is moved in a direction for opening the door, said nut acting against said latch arm to transmit chain movement to the trolley in a door opening direction.

4. Door opening and closing mechanism comprising, in combination, a door movable between closed and open positions, a trolley connected to the door for transmitting thereto closing and opening movements, a chain for moving the trolley, a bolt interposed in the chain and connected at opposite ends to the chain, the bolt being freely axially movable with respect to the trolley, a nut threaded on the bolt arranged to engage the trolley for moving it in a door closing direction, a second nut threaded on the bolt arranged to engage the trolley for moving it in a door opening direction, a stationary locking pin, a latch member on the trolley adapted to engage and disengage the locking pin, a third nut threaded on the bolt adapted to actuate the latching element in an unlatching operation, and a compression spring on the bolt operating between the trolley and the latching element normally urging the latter in a direction to latch engage the locking pin, said spring being compressed by movement of the third mentioned nut in said unlatching operation.

5. Door opening and closing mechanism comprising, in combination, a door movable between open and closed positions, mechanisms for so moving the door including a power operated chain having a bolt interposed length-

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wise therein, a trolley connected to the door for transmitting opening and closing movements thereto, a locking pin, a latch member on the trolley arranged to engage the locking pin to lock the door in the closed position, and means operable between the bolt and the trolley for transmitting said opening and closing movements including a lost-motion connection causing the bolt to transmit a latch releasing movement to the latch member prior to transmitting trolley movement to open the door.

6. Door opening and closing mechanism as set forth in claim 5, including a first nut threaded on the bolt and adapted to engage the trolley and move it in a door closing direction by similar movement of the chain, a second nut threaded on the bolt and adapted to engage the trolley and move it in a door opening direction by similar movement of the chain, a third nut threaded on the bolt intermediate the first and second nuts adapted to engage

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and move the latch member in the latch releasing movement by movement of the chain in a door opening movement, and a compression spring on the bolt acting between the trolley and the latch member normally urging the latter in a direction to latch engage the locking pin.

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U.S. Cl. X.R.

49—280