

[54] DOOR OPERATING MECHANISM

[75] Inventors: William B. Courtney, Hinsdale;
Edward I. Fox, Chicago, both of Ill.

[73] Assignee: H. W. Crane Company, Maywood,
Ill.

[22] Filed: May 16, 1974

[21] Appl. No.: 470,669

[52] U.S. Cl. 49/199; 49/139

[51] Int. Cl.² E05F 11/00

[58] Field of Search 49/139, 199, 200, 280

[56] References Cited

UNITED STATES PATENTS

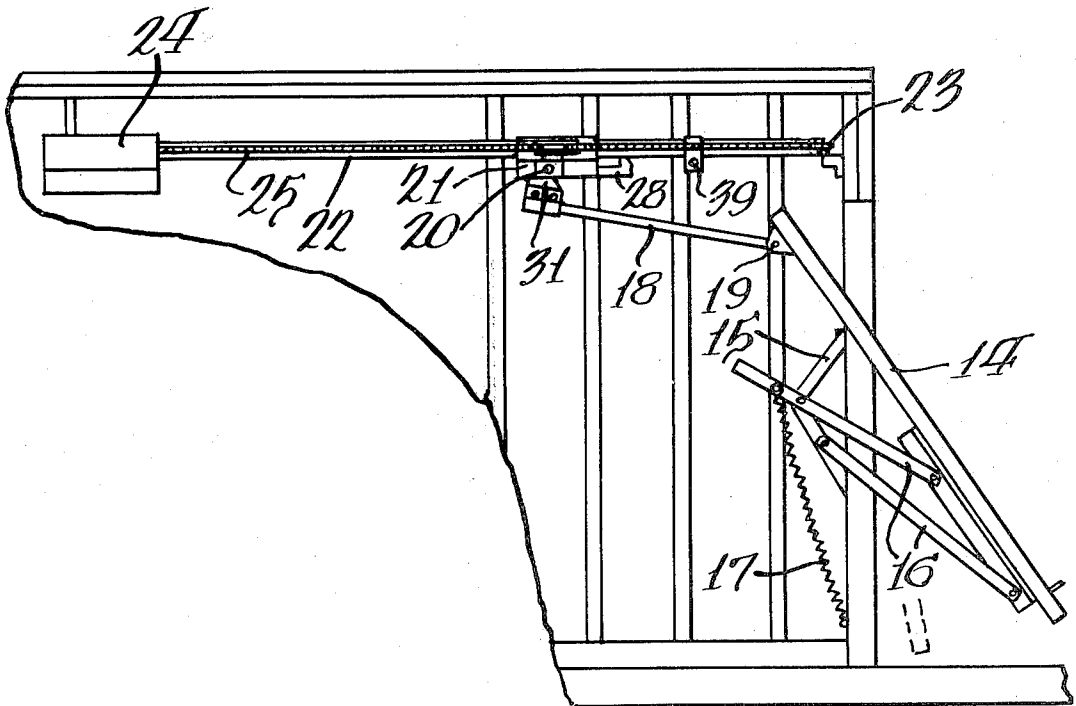
2,544,239	3/1951	Schirmer.....	49/139 X
3,435,558	4/1969	Kruse.....	49/200
3,526,994	9/1970	Delaney.....	49/280 X

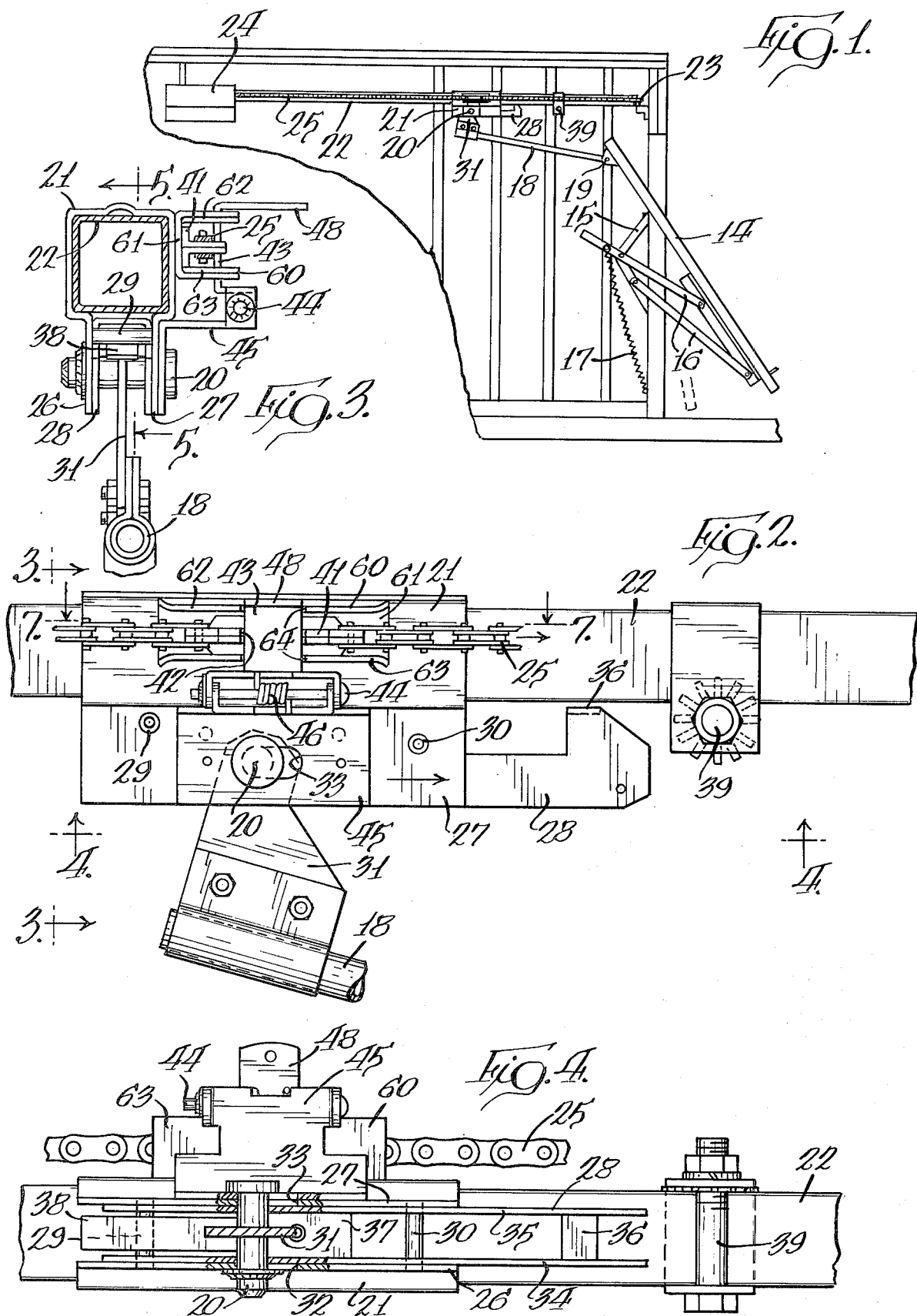
Primary Examiner—Kenneth Downey
Attorney, Agent, or Firm—John F. McCanna

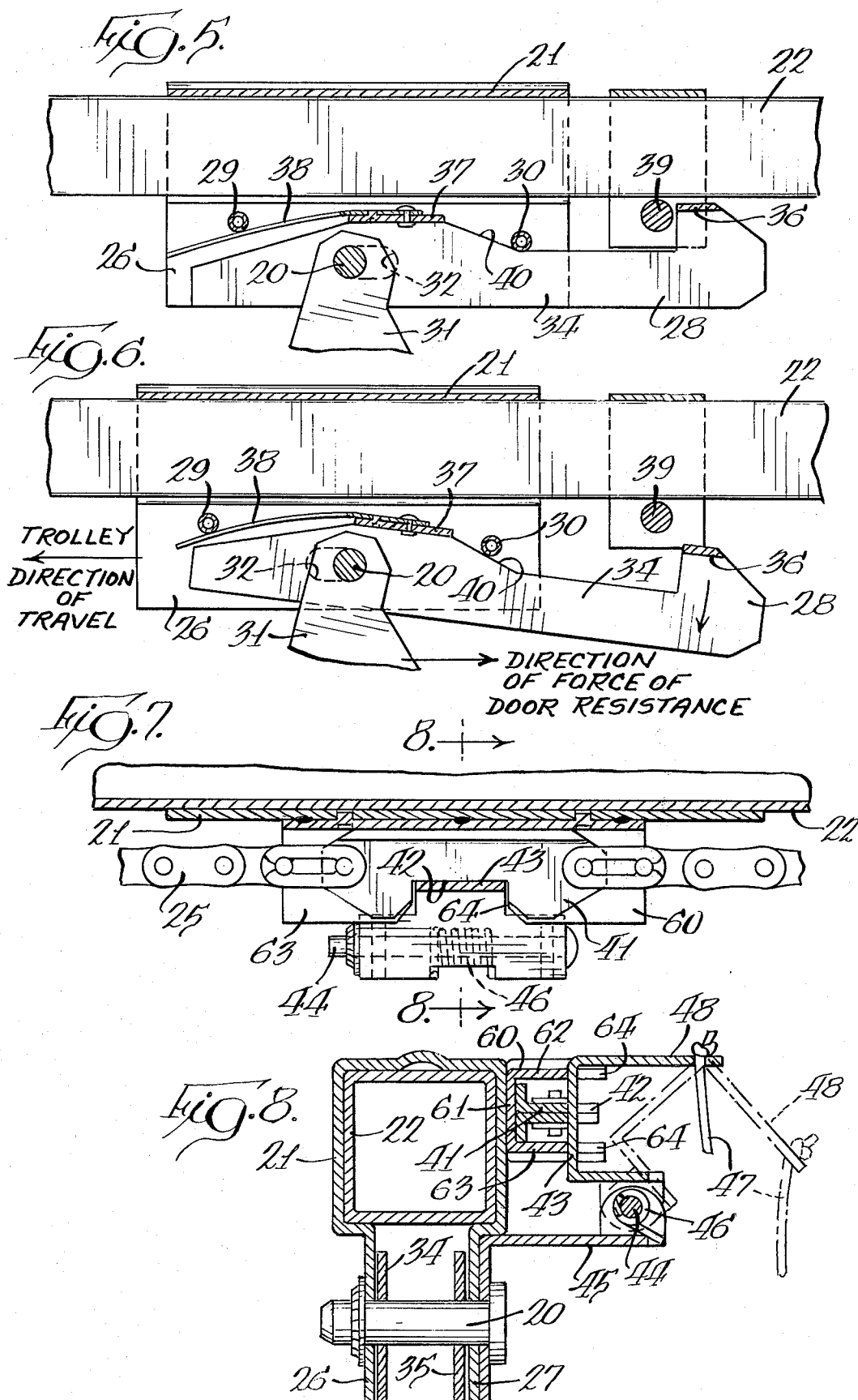
[57] ABSTRACT

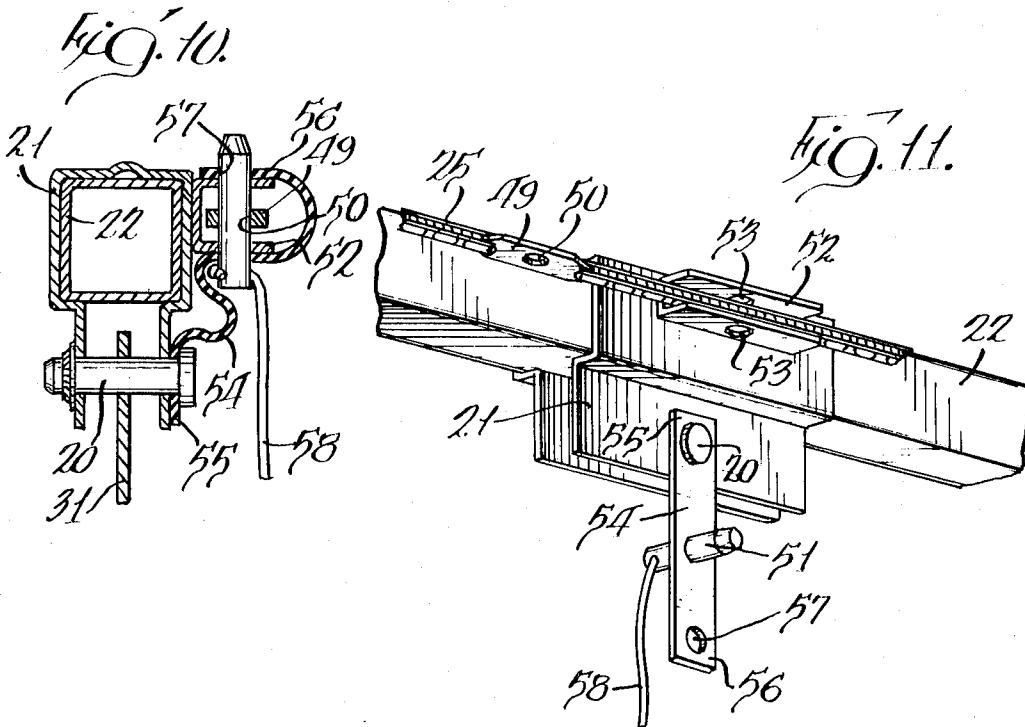
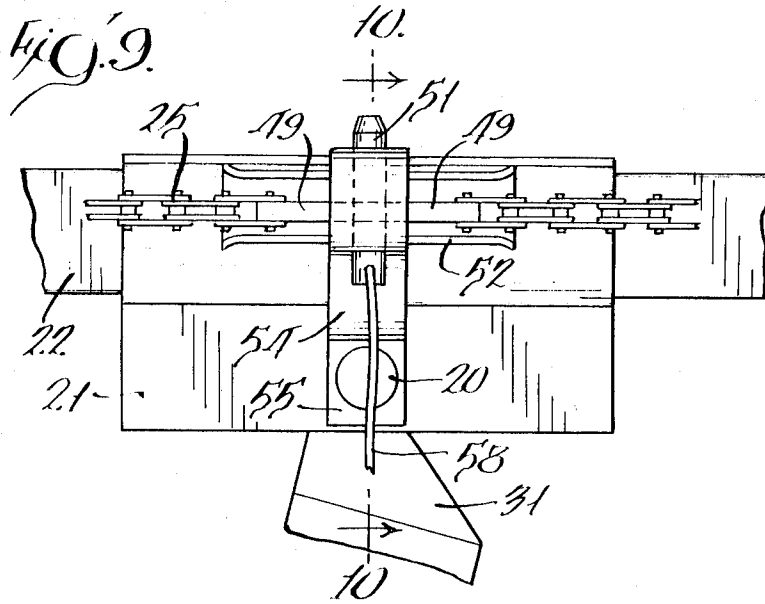
This invention provides mechanism for opening and closing a door such as a garage door but applicable to other doors, including a trolley which moves back and forth on a track and controls the door movement. The invention provides novel means operable between the trolley and the track for latching and unlatching the trolley with respect to the track in a manner to effect safe, accurate and trouble-free operation of the door movements. The invention also provides a simplified and improved track and trolley construction whereby to make for greater economy in the cost of manufacturing mechanism of this type.

1 Claim, 11 Drawing Figures









DOOR OPERATING MECHANISM

This invention relates to mechanisms for opening and closing doors, particularly garage doors, but applicable to industrial and commercial doors and the like. This invention is an improvement on U.S. Pat. No. 3,435,558 by Marvin A. Kruse, granted Apr. 1, 1969 to H. W. Crane Company, a corporation of Illinois, and assignee of the present invention and application for patent.

The invention is designed to provide years of safe, accurate and trouble-free mechanism for opening and closing doors of this general type. Our invention provides novel means for locking the doors in the closed position and being immobilized to opening of the door by an external force applied to the system such as would be incurred when an intruder attempts to force open the door from the outside.

Some prior 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 a link for transmitting door opening and closing movements. In such cases it is possible for the intruder to pull outwardly the lower end of the door sufficiently to transmit through the connecting link a movement to the trolley which will cause operation of the power operating means or otherwise permit opening the door. Our invention provides improved and more practical and accurate means for preventing any such unauthorized opening of a door after the door has been moved by the trolley to the closed position.

More particularly, our invention provides an improved trolley latching and locking mechanism which overcomes objections to prior mechanisms and makes for trouble-free and satisfactory operation under all conditions.

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

FIG. 1 is a side elevation of a door operating mechanism embodying a preferred embodiment of our invention, showing the door in a partially open position;

FIG. 2 is a side elevation of the latching mechanism shown in FIG. 1 moved closer to the door locking position;

FIG. 3 is a cross-section taken on the section line 3—3 of FIG. 2;

FIG. 4 is a sectional view taken on the section line 4—4 of FIG. 2;

FIG. 5 is a sectional view taken on the section line 5—5 of FIG. 3, showing the trolley with its latching hook locking the door closed;

FIG. 6 is a sectional view similar to FIG. 5 but with the latching hook just opening;

FIG. 7 is an enlarged top sectional view taken on the section line 7—7 of FIG. 2;

FIG. 8 is a cross-section taken on the section line 8—8 of FIG. 7, showing in dotted lines the trolley disconnected from downward pull on the hand cord;

FIG. 9 is a side elevation of a modified form of means for connecting the trolley to the chain and disconnecting the trolley from the chain;

FIG. 10 is a cross-section taken on the section line 10—10 of FIG. 9; and

FIG. 11 is a perspective view of the parts shown in FIG. 9 with the trolley disconnected from the chain.

In FIG. 1 we have illustrated somewhat diagrammatically a side elevation of a conventional garage door operator together with an application of our invention. It will be understood that this is a preferred embodiment and that the invention may be used with suitable modification if necessary to commercial and industrial door structures. As shown in the drawings the garage door designated generally by reference numeral 14 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 by any suitable means which permit movement of the door from a vertically closed position to a horizontally disposed position. In the present instance this mounting includes (usually at each side of the door) a bracket 15 fixed to the door jamb, linkage 16 between the bracket 15 and the door 14, and a contractile spring 17 counter-acting the weight of the door and acting to urge the door toward the open position. A link 18 is pivotally connected at one end 19 to the door and at its opposite end to a pin 20 on a trolley designated generally by 21. This trolley is preferably of rectangular form, shaped to fit over and around a track 22 and slide back and forth thereon. 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 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 21 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.

Our invention provides a track of tubular form, preferably rectangular as shown in FIG. 3. The trolley is shaped to fit around the track and has depending side plates 26 and 27 to which the door operating link 18 is connected. A trolley latching and locking hook lever 28 is pivotally mounted upon and between the plates 26—27, as also are latch control pins 29 and 30. The door operating link 18 is connected to the trolley by means of a bracket 31 which is fixed at its upper end to the above mentioned pin 20 which transmits movement between the link 18 and the trolley. The pin 20 is slidable back and forth in identical slots 32 and 33 in the depending side plates 26 and 27, respectively, of the trolley. These slots provide a lost-motion connection between the pin 20 and the trolley, as will be noted below in connection with the operation of the latching device. The latching lever 28 has laterally spaced side members 34 and 35 joined at 36 (the hook end) and also at 37 (an intermediate point) and is pivotally mounted on pin 20 to move back and forth with the pin when the pin is moved in the slots 32—33. Fixed to the intermediate part 34 of the lever 28 is a flat spring 38 which is stressed against the underside of the pin 29 so as to constantly urge the lever 28 in a counterclockwise direction on the pin 20 viewing FIGS. 5 and 6, that is, in a direction to move the hook end of the lever into locking engagement a pin 39 which is fixedly mounted on the track 21 but adjustable to different fixed positions along the track. The latching and unlatching of the lever 28 with respect to the track pin 39 is governed by a cam 40 on the upper side of each side member 34—35. These cam surfaces are identical and are de-

signed to coact with the pin 30 on the trolley to control the latching and unlatching movements of the lever 28. When the door is closed the chain 25 has pulled the trolley forward to the position shown in FIG. 5. The connection between the chain and the trolley is described below. At this position the latching lever 28 in its travel to the right has cleared the pin 39 and the action of the spring has moved the lever into latching position limited by the pin 30. To open the door the motor 24 is actuated to move the chain 25 in the opposite direction, thereby moving the trolley an initial short distance from the position shown in FIG. 5 to the position shown in FIG. 6. This initial movement of the trolley moves the control pin 30 to the left along the cam 40, thereby unlatching the lever 28 as shown in FIG. 6. This momentary travel of the trolley moves its slots 32 to the left from the position shown in FIG. 5 to that shown in FIG. 6. Thus the lever 28 is momentarily free and unlatched by the pin 30 acting on the cam 40 without influence from the force of the spring 17. This is the lost-motion effect above mentioned. Continued movement of the trolley to the left under the motor power moves the door to the open position.

Our invention provides means for connecting the trolley 21 to the chain 25 and disconnecting it therefrom. The chain is connected to the trolley in the normal operation. The trolley is disconnected from the chain mainly in the event of failure of the power unit or for any reason it is desired to manually operate the door, such as in an emergency need. Referring to FIGS. 3, 4, 7 and 8, the chain is provided with a link 41 having a recess 42 in one side for receiving a latch member 43 which is pivoted at 44 on a bracket 45 which in turn is fixedly mounted on the trolley 21. A coil spring 46 constantly urges the latch member 43 into connection with the chain. A second bracket 60 of U-shape in cross section, is fixed at its closed side 61 to the trolley and each top and bottom wall 62 and 63, respectively, is provided with a recess 64 to receive the latch member 43. The bracket 60 is arranged so that the chain and its link 41 are located intermediate the top and bottom walls 62 and 63, making a compact co-operation of parts. Suitable means such as a cord 47 is attached to an extension 48 of the latch member 43 so that the cord may be pulled down to withdraw the latch member from the chain and also from the bracket 60 and the trolley. Another cord (not shown) is connected to the latching lever 28 and to the cord 47 to unlatch the lever 28 at the same time as the latch member 43, thus completely disconnecting the door operating parts from the trolley.

In FIGS. 9, 10 and 11 we have shown a modified form of means for disconnecting the trolley from the chain. In this form a link 49 is provided in the chain 25, the link having an opening 50 for reception of a pin 51 which is guided into alignment with the opening 50 by a bracket 52 which is fixed to the trolley and has openings 53 for receiving and holding the pin 51 in alignment with the opening 50 in the chain link 49. The pin 51 is attached to a flexible strip 54 intermediate the ends thereof. One end 55 of the strip is attached to the trolley at the pin 20. In the opposite end 56 of the strip is an opening 57 to receive the upper end of the pin 51 when this pin has been inserted through the openings 53, 50 and 57 to thereby lock the chain to the trolley, as shown in FIGS. 9 and 10. By means of a cord 58 attached to the outer end of the strip 54 the pin 51 may

be manually pulled down to an unlocking position, as shown in FIG. 11.

Referring to the sequence of operations: When the door is closed the trolley locking mechanism is in the position shown in FIG. 5. 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 has closed. At this point the power is automatically disconnected and the lever 28 snaps into the latching position by the action of the spring 38 as shown in FIG. 5. The door is thus locked against any door opening movement if an attempt would be made by an intruder to force open the door from the outside as by pulling the door in the direction of the dotted line position shown in FIG. 1. To open the door, the person in control causes the power unit to be operated usually by push button or radio control from the car, thereby moving the chain to the left. Since the door is directly connected to the trolley through the link 41 and latching member 43, the trolley will be moved to the left. In the initial movement of the trolley to the left, the lost-motion provided by the slots 32-33 allows the pin 30 (which moves with the trolley) to engage the cam 40 and unlatch the lever 28 as shown in FIG. 6. At this point the continuing movement of the chain to the left together with the action of the spring 17 moves the door to the open position. During this door opening operation the trolley slots 32-33 are urged against the pin 20 (as shown in FIG. 6) until the power unit automatically stops movement of the chain with the door in the desired open position.

It will be noted that the door operating mechanism disclosed herein is composed of comparatively few parts so designed as to be economical in cost of manufacture. Also, the functions are so few and simple that the mechanism is trouble-free in its operation. These results are due in part to the rectangular track and the trolley which is shaped to fit around the track, such parts being formed by die-pressing and bending operations. Also, the latching lever and the lost-motion coaction between the trolley, the latching lever, and the door operating means are a simplification which promote accuracy and dependability. This arrangement of parts is a definite improvement over the complicated constructions of the prior art, some of which have numerous and intricate settings. Our invention, therefore, makes for more safe and accurate operation of garage doors and doors of this general type.

We claim:

1. Door operating mechanism comprising, in combination with a door movable back and forth between a closed and an open position, a tubular track rectangular in cross-section, a trolley formed of a single sheet of material shaped to fit around four sides of the track and adapted to slide back and forth lengthwise on the track, the opposite side members of the trolley depending in laterally spaced relation beneath the track, a lock pin fixed to the track, a latching lever located intermediate said side members of the trolley and having a hook end adapted to engage and disengage said lock pin, said side members each having an elongated slot in lateral registration with the other slot and extending parallel with the track, a link connected at one end to the door and having a pivot pin at its opposite end extending through said slots and pivotal therein, said latching lever having pivotal movement on said pivot pin for movement of its hook end into and out of engagement

5

with said lock pin, spring means for yieldingly urging the latching lever on said pivot pin in a direction for locking engagement with the lock pin, a latch control pin extending between and fixed to said side members of the trolley, and a cam surface on the latching lever arranged to engage said latch control pin against the action of said spring means for controlling movement of the latching lever on said pivot pin, in which the

6

pivot pin fixed to the door connected link has a lost motion coaction with the latching lever through the elongated slots whereby upon movement of the trolley in a door opening movement with described cam surface on the latching lever engages its coacting pin and disengages the latching lever from the pin fixed on the track.

* * * * *

10

15

20

25

30

35

40

45

50

55

60

65