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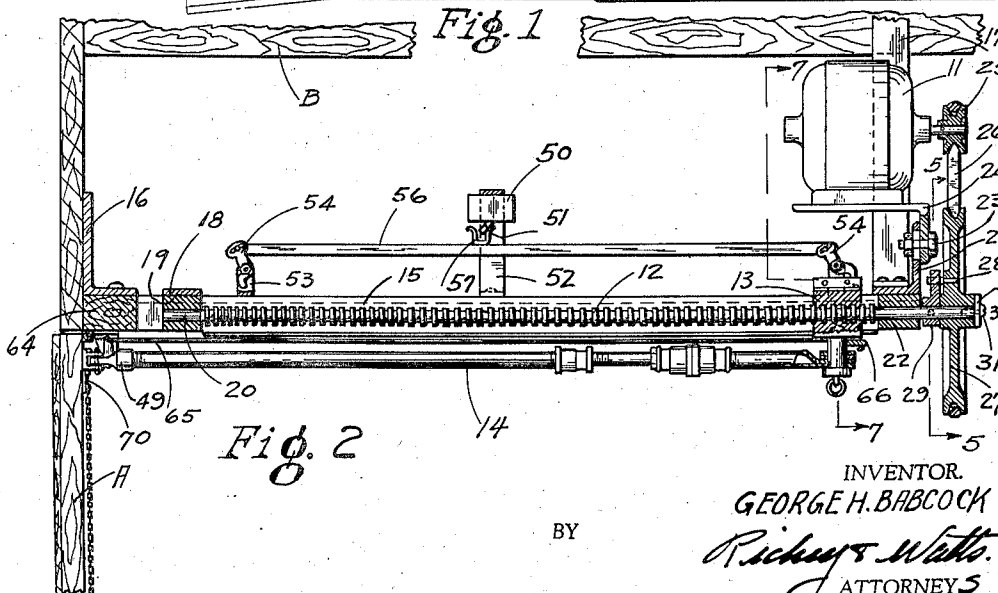
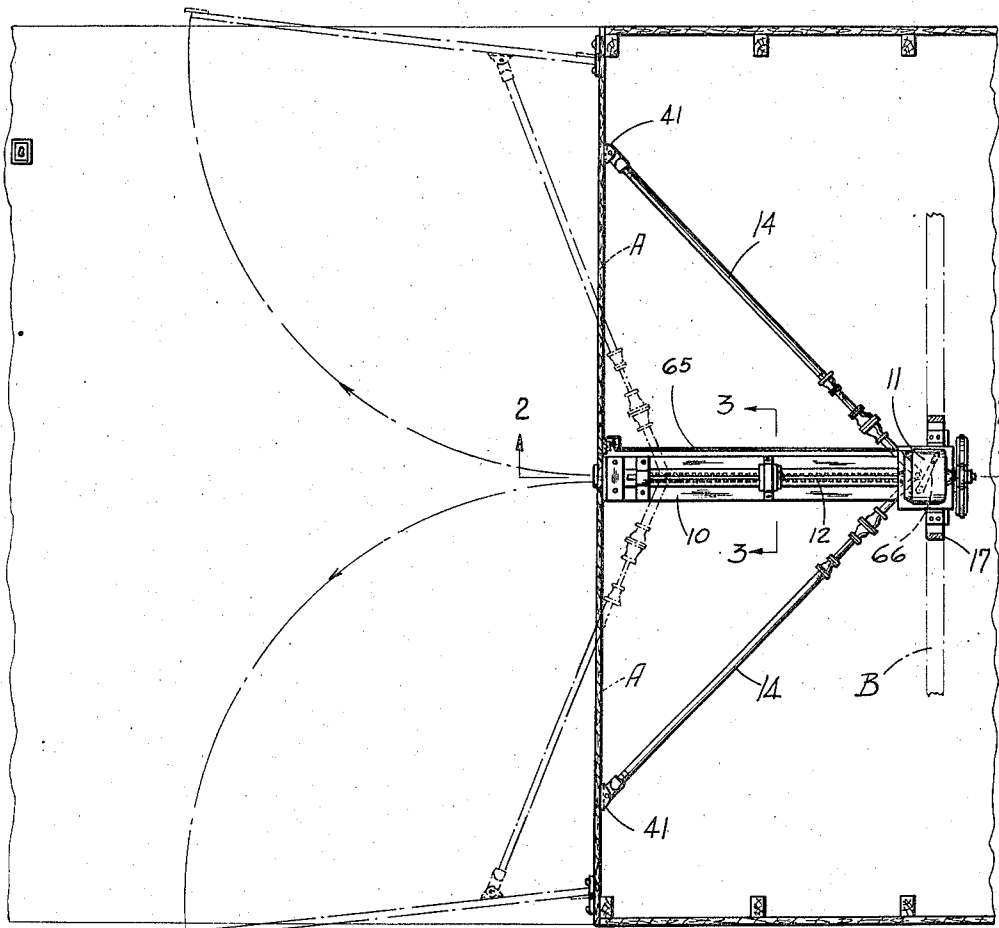
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2,221,039

DOOR OPERATING MECHANISM

Filed April 19, 1939

3 Sheets-Sheet 1



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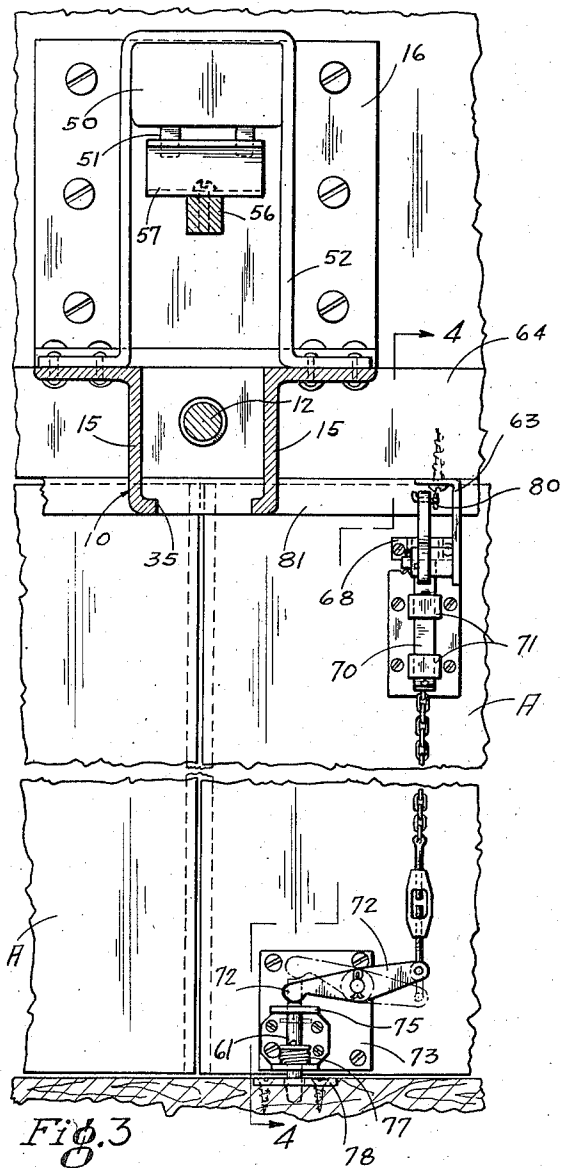


Fig. 3

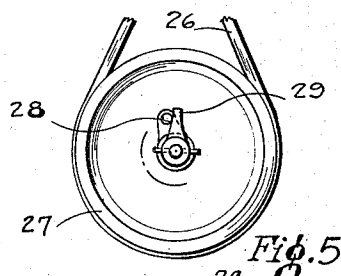


Fig. 5

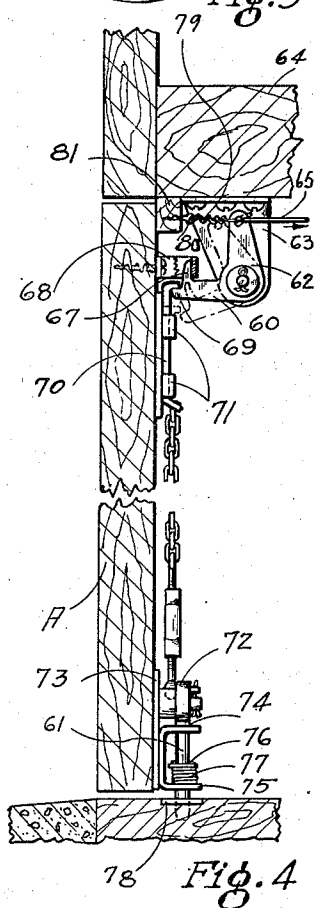


Fig. 4

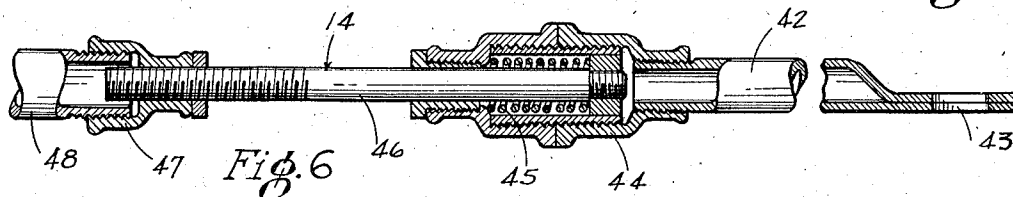


Fig. 6

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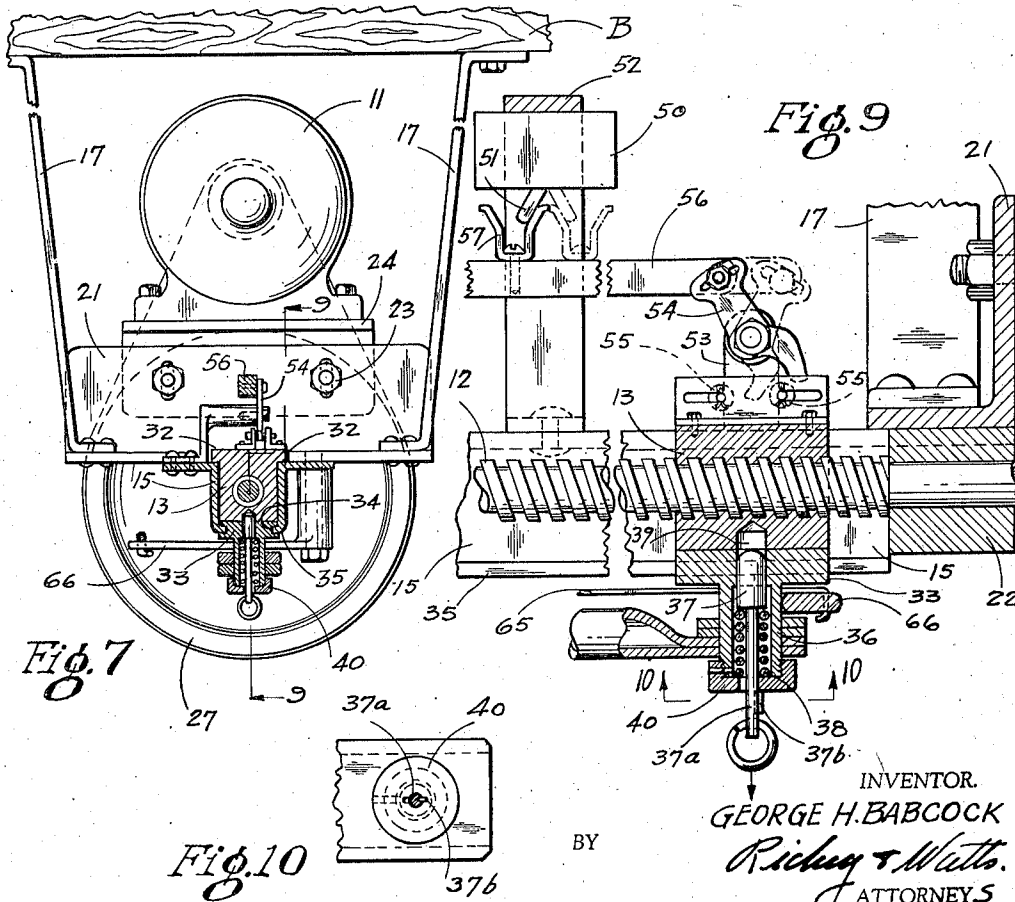
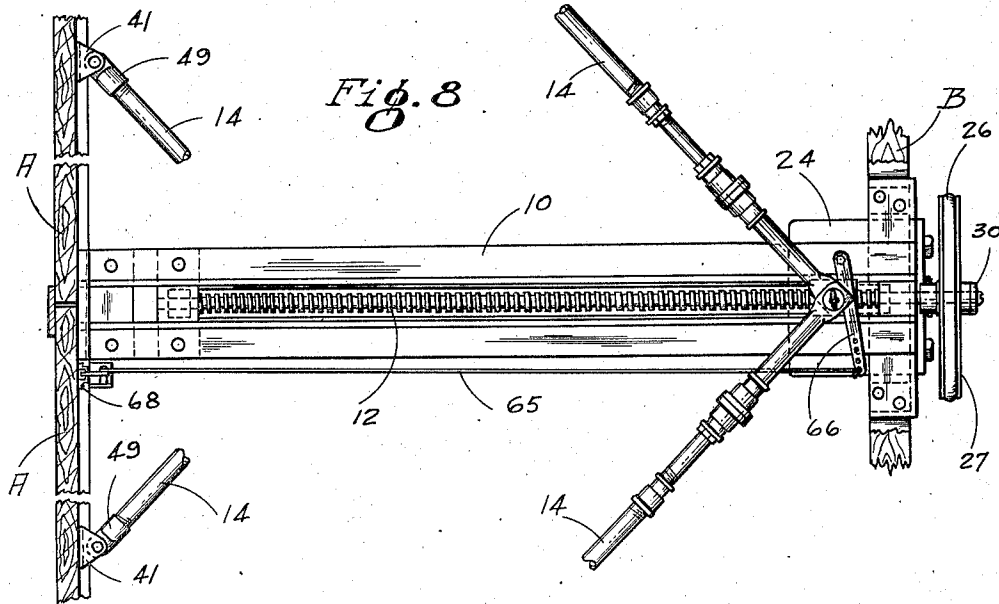
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3 Sheets-Sheet 3



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2,221,039

DOOR OPERATING MECHANISM

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Application April 19, 1939, Serial No. 268,752

3 Claims. (Cl. 268-63)

This invention relates broadly to door operating mechanisms and more specifically to apparatus for opening and closing doors from a remote point. This invention further contemplates a mechanism to lock the doors automatically in their closed position, an independent control device adapted for manual operation in the event of power failure or mishap to the motor driven linkage and a control unit designed for installation upon doors of variable size and form.

One of the objects of the invention is to provide a door closing mechanism which is constructed to eliminate the closing impact and consequent injury to the door and framing structure of the building.

Another object of the invention is to provide a latching device which is adapted to automatically lock the doors in their closed position yet effect the automatic release thereof upon the internal movement of power actuated door operating mechanism.

Another object of the invention is to provide a release member for disengaging the drive unit without dismantling of the power actuating mechanism.

A still further object of the invention is to provide a lost motion device which will facilitate the operation of the electric motor coincident the operation of the load.

Another object of the invention is to construct a door actuating mechanism which is reliable of operation, sturdy of structure and economic of manufacture.

Another object of the invention is to construct a door operating mechanism which is so organized as to accommodate the ready installation and operative adjustment thereof irrespective of the environs in which the unit may be used.

Other objects and advantages more or less ancillary of the foregoing and the manner in which all the various objects are realized will appear in the following description which, considered in connection with the accompanying drawings, sets forth the preferred embodiment of the invention.

In the drawings, which are made a part of this application;

Fig. 1 is a plan view of the improved door operating mechanism installed in a garage having hinged swinging doors, the garage being shown in horizontal section with the doors in their closed position;

Fig. 2 is a sectional view taken on a plane indicated by the line 2-2 of Fig. 1;

Fig. 3 is an enlarged fragmentary sectional view taken on a plane indicated by the line 3-3 of Fig. 1;

Fig. 4 is a sectional view taken on a plane indicated by line 4-4 of Fig. 3;

Fig. 5 is a sectional view taken on a plane indicated by the line 5-5 of Fig. 2;

Fig. 6 is an enlarged fragmentary vertical sectional view of the links connecting the actuating mechanism to the door;

Fig. 7 is a sectional view taken on a plane indicated by the line 7-7 of Fig. 2;

Fig. 8 is a bottom view of the door operating mechanism rail and associated parts, certain members thereof being broken away and the doors being shown in section;

Fig. 9 is an enlarged fragmentary sectional view of the traveler, the section being taken on a plane indicated by the line 9-9 of Fig. 7; and

Fig. 10 is a sectional view of the releasing mechanism, the section being taken on a plane indicated by the line 10-10 of Fig. 9.

Like reference characters refer to like parts throughout the several views.

Referring first to Fig. 1, the door operating mechanism is illustrated in conjunction with a garage having hinged doors A supported in the usual manner to the building structure which includes rafters or ceiling joist B.

The door operating mechanism comprises generally a supporting frame 10, a reversible electric motor 11 carried thereby, a screw 12 rotatively mounted upon said frame, and a traveler or nut 13 having arms 14 pivotally connected thereto and to the doors A.

In detail the supporting frame 10 comprises a pair of spaced Z-rails 15 (Fig. 7) anchored at their forward ends by an angle plate 16 secured upon the inner wall of the building structure and suspended at their rearward ends by hangers 17 bolted to the frame structure or joist B of the building. Upon the Z-rails 15, adjacent the forward end thereof there is a plate 18 adapted for the support of a block 19 constituting a journal bearing for the reduced end portion 20 of the screw 12. The screw is disposed para-axial the rails 15 and extends substantially throughout the length thereof.

The opposed ends of the rails 15 are united by a transversely disposed angle iron 21 secured to the hangers 17 and having a journal bearing 22 secured to the lower face thereof for the support of the reduced end portion of the screw 12. The vertical leg of the angle iron 21 is 55

slotted for the reception of bolts 23 provided for the securement of a table 24 drilled to receive the anchor bolts for the electric motor 11. Upon the armature shaft of the motor there is a pulley 25 having a belt 26 thereon which is trained over a sheave wheel 27 loosely mounted on the end of the shank portion of the screw 12. Adjacent the hub of the sheave wheel 27 there is a pintle 28 adapted for abutting engagement with an arm 29 keyed to the screw 12 and mounted on the screw adjacent the sheave wheel 27. The sheave wheel is restrained from outward movement upon the shank of the screw 12 by a washer 30 supported by a machine screw 31 threaded into the end portion of the screw shaft 12.

The traveler 13 is formed with parallel sides adapted for sliding engagement between the depending legs of the Z-bars 15 and further constructed with laterally extended flanged top portions 32 adapted for engagement with the upper legs of the Z-rails 15. Below the traveler 13 there is a plate 33 having grooves 34 machined in the lateral edges thereof for the reception of the lower flanges 35 of the Z-bars 15. The plate 33 is formed with a depending boss 36 drilled to receive a plunger 37 and counter bored for the reception of a spring 38 normally urging the plunger into seated engagement in a drilled opening 39 in the traveler 13. The spring 38 is retained within the counter bored recess in the boss 36 by a cap 40 secured upon the threaded free end thereof.

The plunger is formed with a reduced shank portion 37a which extends through a key hole opening in the cap 40 (Fig. 10) adapted to facilitate the reentrant engagement of a key 37b in the shank of the plunger when the end thereof is seated in the opening 39 and to retain the plunger in its retracted position when the key is withdrawn from the key hole and revolved for abutting engagement with the outer face of the cap 40.

The boss 36 is machined to form a pivotal bearing for the arms 14 which extend divergently therefrom to the brackets 41 mounted upon the doors A adjacent the hinged portions thereof.

The arms 14, as will be seen in Fig. 6, are preferably constructed from a tubular member 42 provided with apertures 43 in their inner ends for the reception of the boss or pivot 36 in the plate 33. The arms 14 are provided with sleeves 44 mounted thereon, having compression springs 45 therein engageable with headed portions of draw bars 46 adapted to facilitate slight distention of the arms 14 during the closing operation of the doors. The outer end portion of the draw bar 46 is threaded to accommodate the reception of an adjusting nut 47 mounted on a tubular extension 48 of the arm 14. The end of the tube 48 is provided with a fitting 49 apertured for the reception of the pivot pin supported in the bracket 41.

Referring now to Fig. 2, the mechanism for controlling the operation of the reversible motor 11 comprises a toggle switch 50 having the operating arm 51 therefor depending from the lower face thereof.

The switch is supported by a bracket 52 mounted upon the upper face of the Z-bars 15 intermediate their ends. Adjacent the journal bearings 19 and 22 of the screw 12 and mounted upon the upper faces of one of the Z-bars 15 there is a pair of brackets 53 having bell cranks 54 pivotally mounted thereon. The free ends of the

bell cranks 54 are constructed with inwardly extended lips arranged for engagement respectively with rollers 55 mounted on the upper face of the traveler 13.

As illustrated, the rollers are preferably mounted between a pair of spaced angle irons secured to the upper face of the traveler 13, and formed with slots in the end portions thereof to accommodate the longitudinal adjustment of the rollers 55 relative to each other and to the position of the fulcrums of the bell cranks 54. The upper ends of the bell cranks 54 are pivotally connected to a rod 56 having a yoke 57 mounted thereon arranged to straddle the depending arm 51 of the toggle switch 50. The pivotal connection between the bell cranks 54 and rod 56 are constructed with adequate clearance to permit the arcuate movement thereof and may, if desired, be provided with a suitable compensating member to facilitate lateral adjustments.

The doors may be locked in their closed position by a latch 60 and throw bolt 61 arranged respectively adjacent the top and bottom portions of the doors. The latch 60 comprises a bell crank 62 pivotally supported upon a bracket 63 mounted upon the filler block 64 subjacent the angle plate 16. The upper arm of the bell crank 62 is apertured for the reception of a pull rod 65 extending rearwardly therefrom and connected with an arm 66 pivotally mounted upon one of the Z-rails 15. The arm 66 is disposed for engagement with the boss 36 in the plate 33 (see Fig. 8). The free end of the bell crank 62 is formed with a vertically disposed ear 67 engageable with the rearward wall of a channular strap or keeper 68 mounted upon the upper portion of the door A. Subjacent the ear 67 of the bell crank 62 there is a lip 69 adapted for abutting engagement with the outwardly bent end portion of a rod 70 which is guided in a frame 71 mounted upon the door. The lower end of the rod 70 is apertured to receive a chain which is connected to an arm 72 pivoted intermediate its ends upon a plate 73 mounted on the lower portion of the door. The free end of the arm 72 is formed with a rounded head arranged for engagement with the end of the throw bolt 61 which is mounted for reciprocative movement within apertures 74 formed in a channel 75 mounted on the plate 73. The throw bolt 61 is cross drilled for the reception of a pin 76 which engages a spring 77 telescopically mounted upon the throw bolt 61 intermediate the lower leg of the channel 75 and pin 76. Upon the floor of the building structure there is a plate 78 apertured for the reception of the conical end of the throw bolt 61. The pull rod 65 is tensioned through a contractile spring 79 connected to the upper arm of the bell crank 62 and to an eyelet 80 retained in the header 81 constituting a portion of the door frame.

The electric motor 11 may be wired in a circuit having electric switches arranged therein to accommodate the operation thereof concomitant with the environs of each particular installation, for example, it may be desirable to mount one of the motor control switches upon a post located adjacent the driveway and accessible from the driver's seat of the vehicle. Such switch may be of the type adapted for operation by a key in order to safeguard unlicensed operation of the control mechanism. When the switch is thrown the armature shaft is free to revolve until the pintle 28 on the sheave wheel 27 engages

the arm 29, thus relieving the starting strain upon the motor. The arm 29 being keyed to the screw 12 causes the rotation thereof and thus effects the longitudinal translation of the nut or traveler 13 upon the screw, which in turn advances the pivotally mounted arms 14 and doors A to the distended position illustrated in dotted lines in Fig. 1. When the traveler nut 13 reaches a point on the screw 12 adjacent the end thereof the roller 55 engages the contiguous bell crank 54, thus shifting the rod 56 to cause the actuation of the toggle switch 50, which is wired to break the circuit leading to the electric motor 11. Obviously, the converse operation will be effected when the traveler nut 13 reaches its innermost position where the second roller 55 will engage the second bell crank 54, thus operating the switch 50 and again breaking the circuit to the motor. As previously stated, the motor 11 is of the reversible type, the circuit therefor being arranged with the reversing switch disposed either in the building structure within which the door operating mechanism is mounted or at some remote point or both.

By virtue of the elongated slots in the brackets carrying the rollers 55 suitable adjustment is provided to effect the operation of the circuit breaker switch 50 in timed relation with the closure of the doors.

The drift of the motor and inertia forces imparted to the traveler nut during the actuation of the door will cause a slight overrun of the traveler nut 13 upon the screw 12, such action, however, will be fully absorbed by the compression springs 45 interposed in the arms 14. In the event the crack between the two doors is covered by a framing strip, the door carrying such strip may be adjusted for operation slightly in advance of the second door.

Should the source of electric power fail or injury occur to any of the power driven operating mechanism the doors may be manually operated by retraction of the plunger 37 from its seated position in the traveler nut 13 to facilitate the free movement of the plate 33 upon the flanges 35 of the Z-bars 15. The plate may then be sustained in its disengaged position by adjusting the key 37-B in the shank of the plunger in abutting engagement with the outer face of the cap 40.

Since each operative movement of the doors require the rotation of the motor in different directions the pintle 28 on the sheave wheel 27 will be disposed alternately on opposed sides of the arm 29, thus when the motor is started the armature shaft will always be free to rotate until the sheave wheel has completed a full revolution.

When the doors are in their closed position they are locked by the latch 60 and throw bolt 61 (see Figs. 3 and 4). Upon actuation of the switch for operating the motor, the screw will be rotated, thus causing the movement of the traveler 13, which relieves the preloaded springs 45 in the arms 14 coincident with the initial movement of the traveler permitting the arm 66 (Fig. 8) to move forwardly under the influence of the spring 79 before movement is transmitted to the doors through the arms 14, which in turn causes the oscillation of the bell crank 62, thus effecting disengagement of the ear 67 with its keeper 68. The oscillatory movement of the bell crank 62 will likewise effect the disengagement of the lip 69 with the shouldered portion of the rod 70 and permit oscillation of the arm 72 under the influence of the spring 77 mounted on the

throw bolt 61. At the completion of the closing operation of the doors the springs 45 are compressed and the inner ends of the sleeves 44 are positioned in spaced relation with the inner ends of the draw bars 46, thus during the initial movement of the traveler nut 13a sufficient lag or lapse of time occurs to permit actuation of the latching mechanism before the driving thrust for opening the doors is imparted to the arms.

Conversely, when the traveler nut 13 is translated to the limit of its inward movement the plate 33 will engage the arm 66, thus tensioning the spring 79 and simultaneously causing the ear 67 to engage with its keeper 68. Moreover, the lip 69 on the bell crank 62 will elevate the rod 70, thus oscillating the arm 72 in the position which compresses the spring 77 and likewise forces the throw bolt 61 into its engaged or seated position within the plate 78. Any movement of the plate 33 will release the locking unit whether the movement is made manually or by the mechanism.

Although the foregoing description is necessarily of a detailed character, in order that the invention may be completely set forth, it is to be understood that the specific terminology is not intended to be restrictive or confining, and that various rearrangements of parts and modifications of detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

I claim:

1. In combination with a pair of hinged garage doors, mechanism for the operation thereof comprising, a motor, a screw rotated thereby, a traveler nut mounted for reciprocation thereon, a plate detachably mounted on said nut, arms pivotally mounted on said plate and connected with said doors, an electrical switch for reversing said motor, a rod for controlling said switch, bell cranks supporting said rod actuated by said traveler nut and means coordinated with said bell cranks and adjustably mounted on said nut for regulating the actuation of said bell cranks contemporaneous the initial movement of said screw.

2. In combination with a pair of hinged garage doors, mechanism for the operation thereof comprising, a motor, a screw rotated thereby, a traveler nut mounted for reciprocation thereon, a plate detachably mounted on said nut, arms on said plate connected with said doors, an electrical switch for reversing said motor, a rod for controlling said switch coordinated with said traveler nut to regulate the actuation of said rod contemporaneous the initial rotative movement of said screw, a latch mounted on one of said doors, a spring coordinated therewith normally urging said latch in unlocked position and a lever connected to said latch and disposed for engagement with said plate when the nut is moved into door closing position, whereby said latch is held in locking adjustment by said lever when the doors are closed and spring operated to unlock the doors coincident the initial movement of said nut.

3. In combination with a pair of hinged garage doors, mechanism for the operation thereof comprising, a motor, a screw rotated thereby, a traveler nut mounted for reciprocation thereon, a plate mounted on said nut, arms on said plate connected with said doors, an electrical switch for reversing said motor, a rod for controlling said switch coordinated with said traveler nut to regulate the actuation of said rod contemporaneous the initial rotative movement of said

screw, a latch mounted on one of said doors, a
spring coordinated therewith normally urging
said latch in unlocked position, a lever connected
to said latch and disposed for engagement with
5 said plate when the nut is moved into door closing
position, and a detachable connection inter-

mediate said plate and said nut, whereby said
latch, arms and doors may be actuated independent
of said traveler nut and the mechanisms coordinated
therewith.

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