

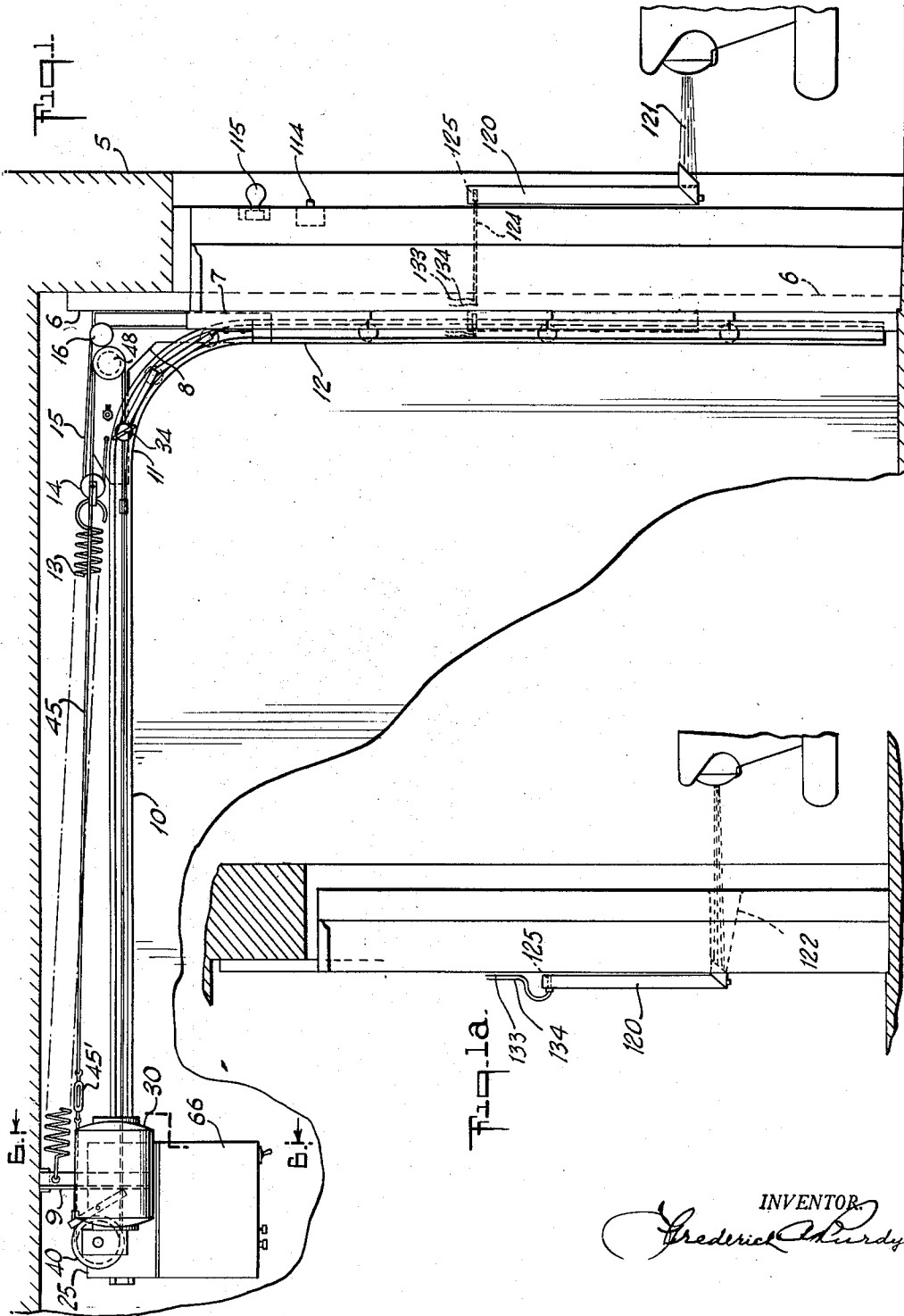
Sept. 1, 1964

F. A. PURDY
DOOR-OPERATORS

3,147,001

Filed July 1, 1957

7 Sheets-Sheet 1



INVENTOR
Frederick Purdy

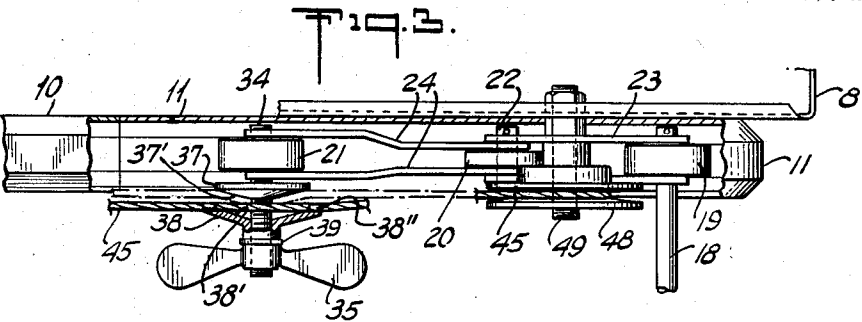
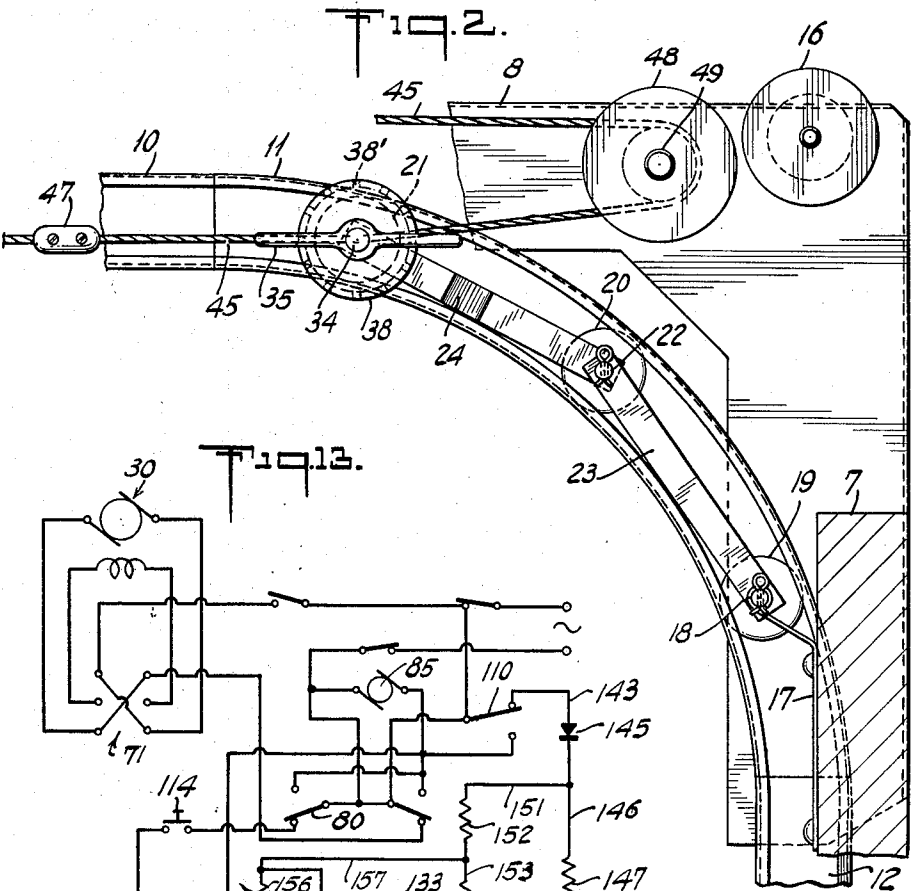
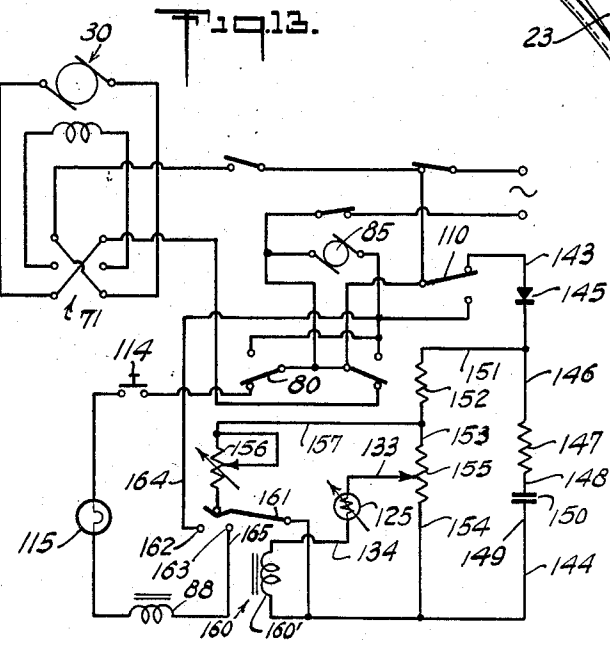
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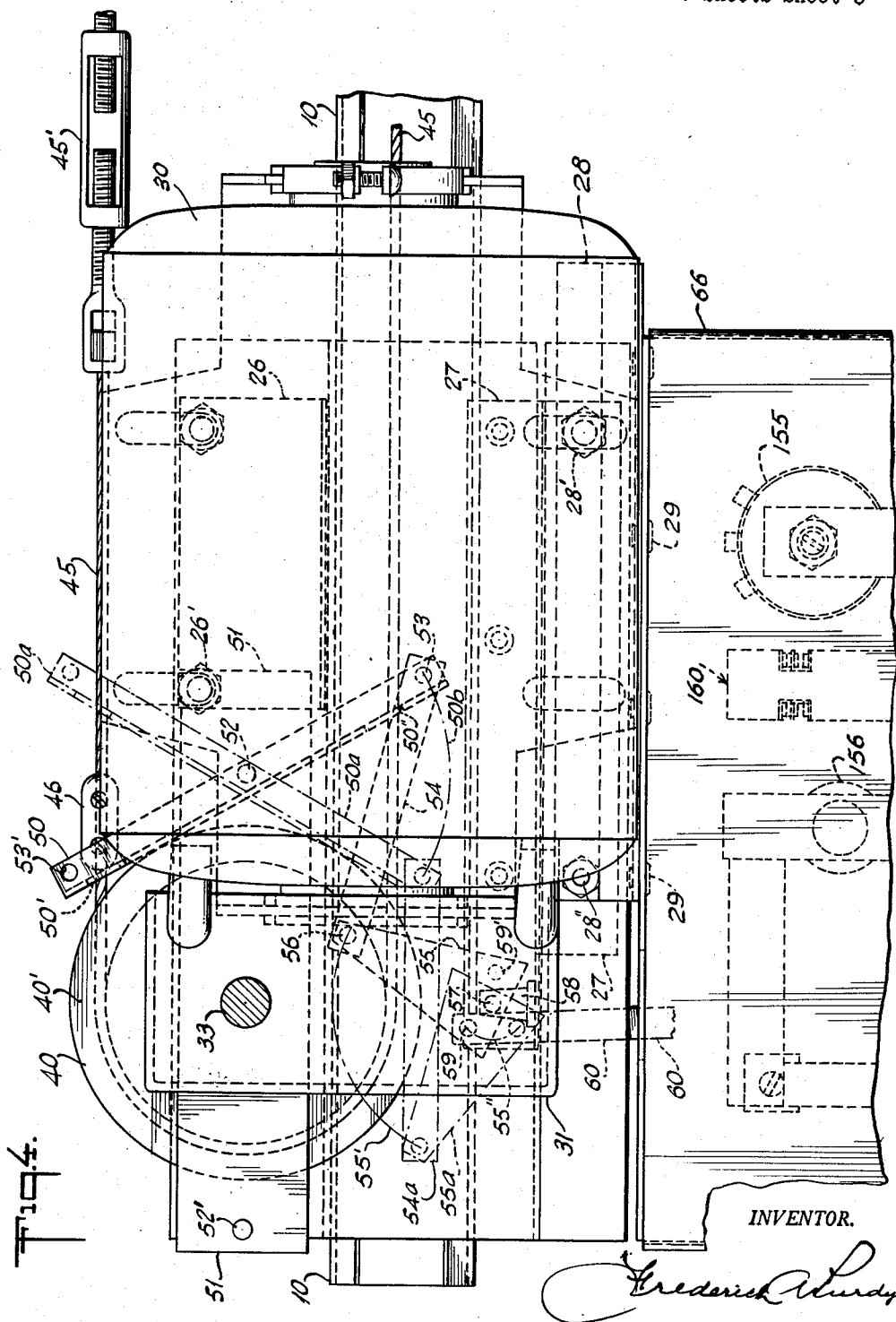
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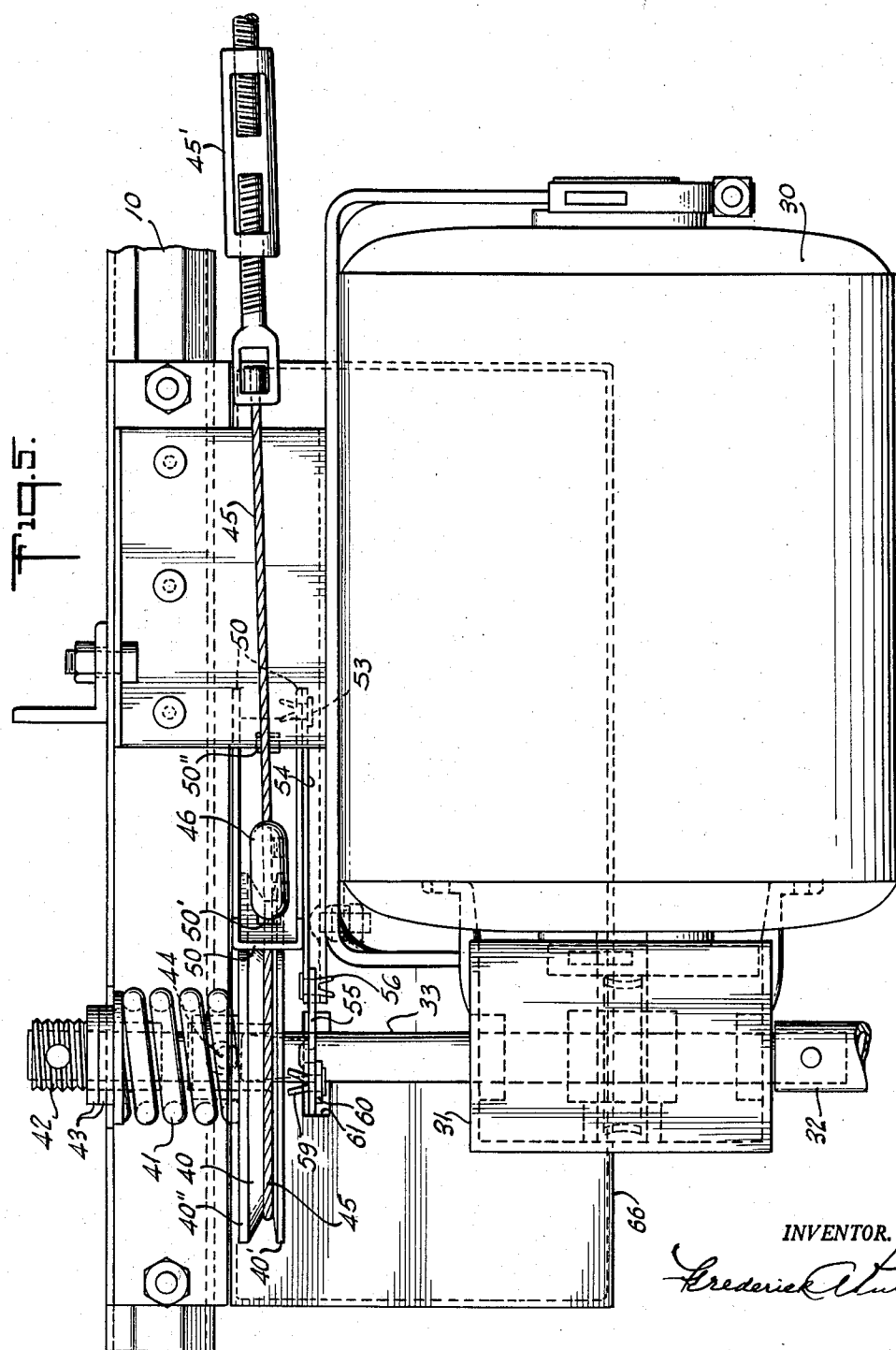
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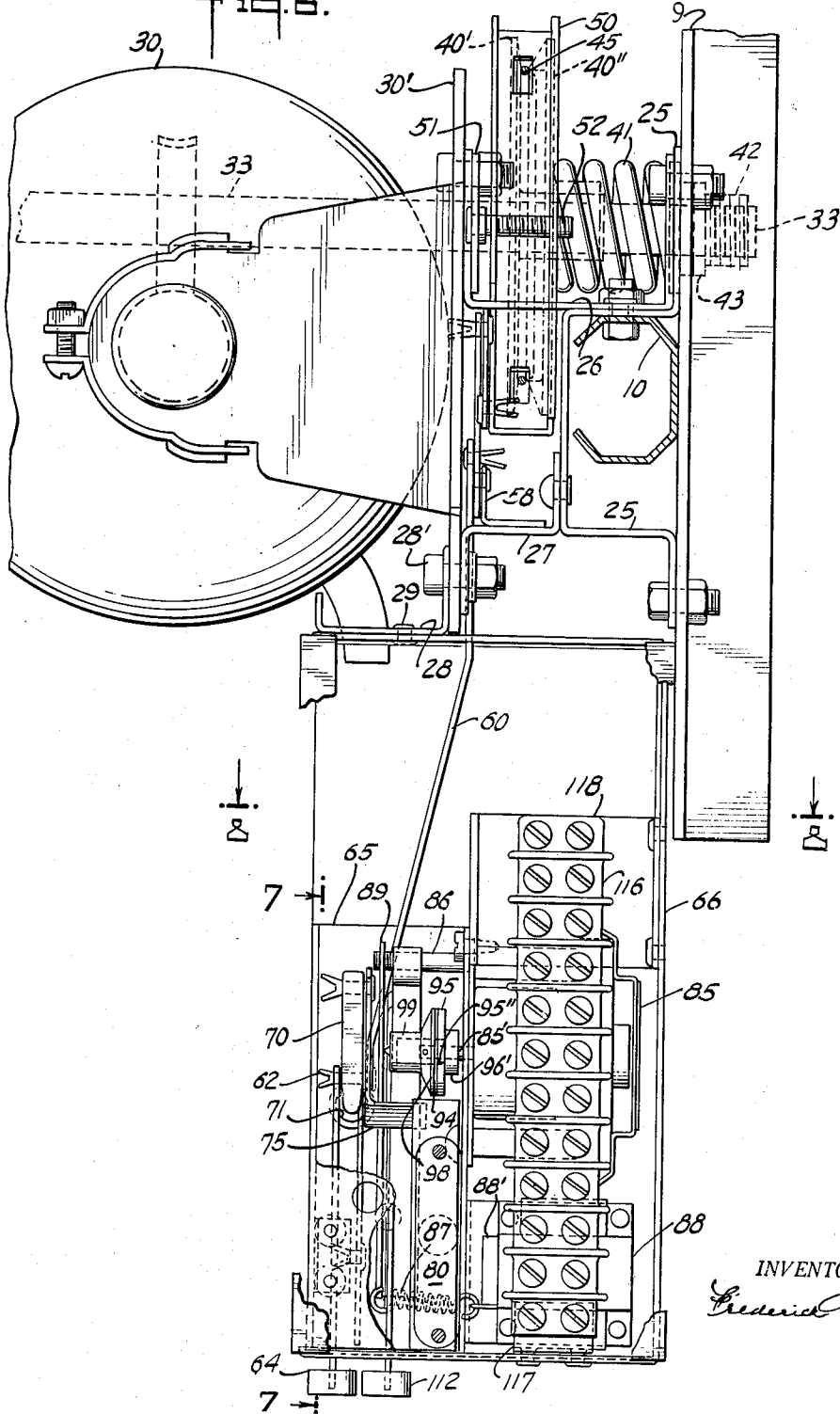
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7 Sheets-Sheet 5



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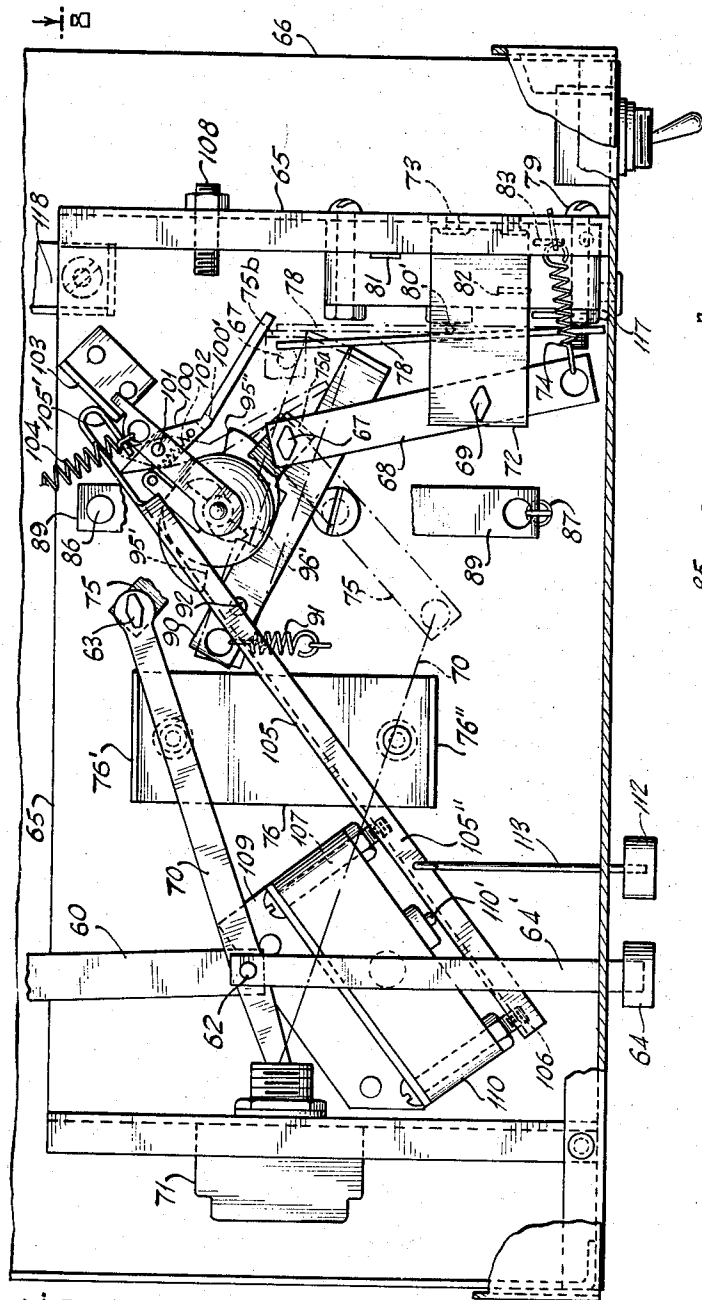
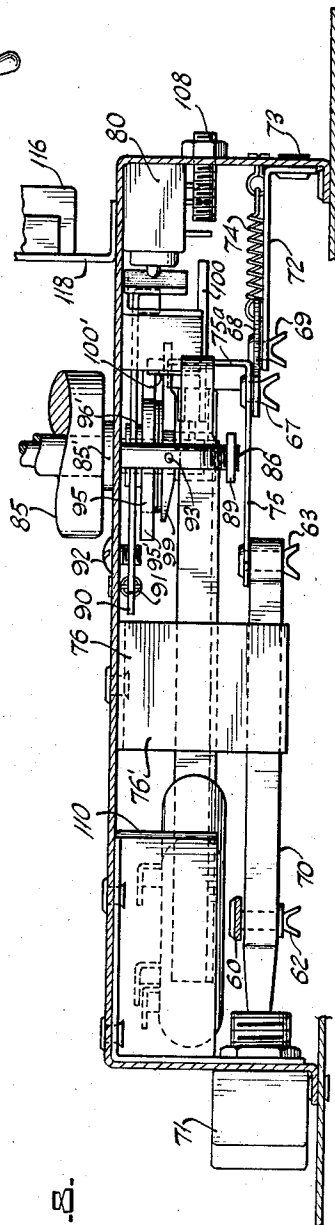
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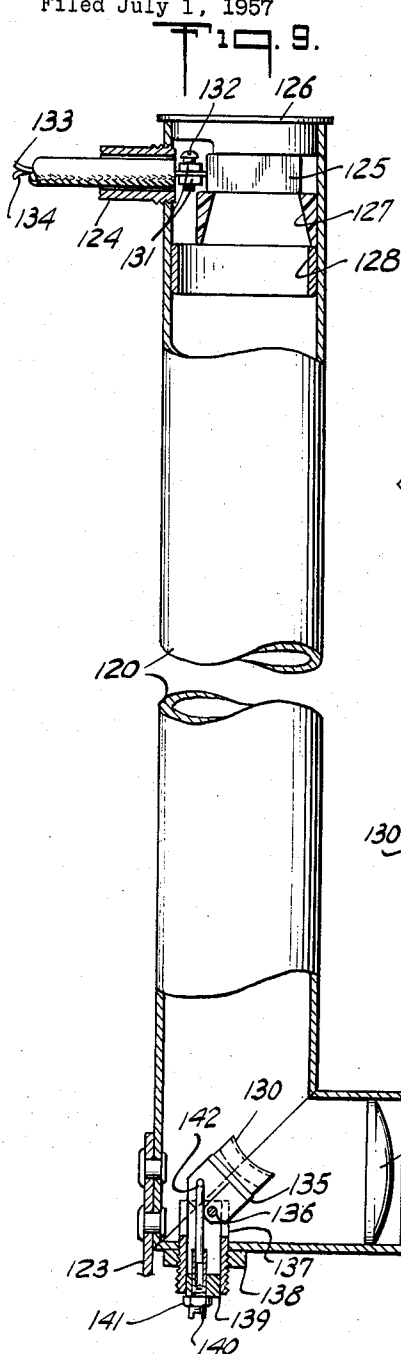
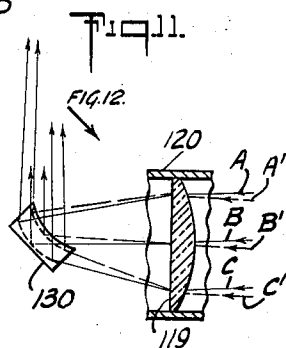
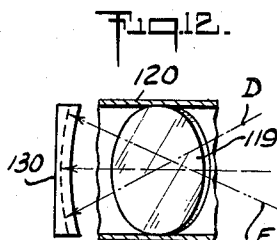
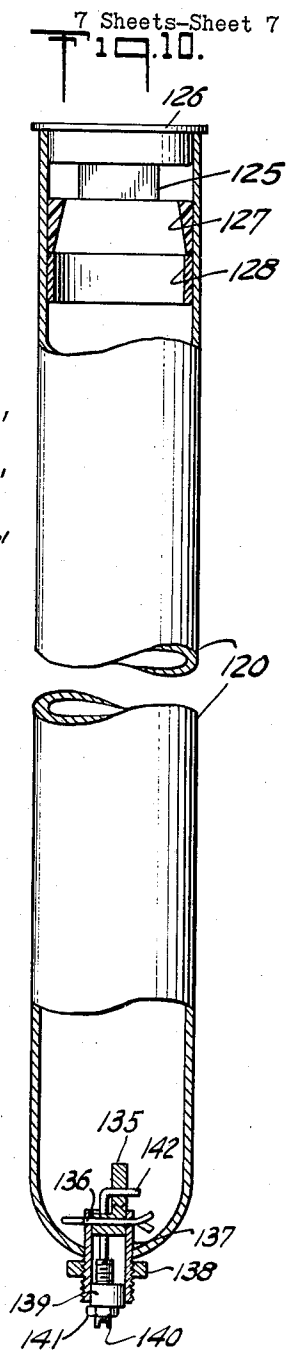
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7 Sheets-Sheet 7



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Filed July 1, 1957, Ser. No. 669,143
3 Claims. (Cl. 268—59)

The present invention relates to doors and controls therefor, and has particular reference to doors of garages, residential and commercial.

The invention embodies improvements upon devices disclosed in my prior Patent 2,758,836 issued August 14, 1956, also devices described in my pending applications, Serial Number 287,167 filed May 10, 1952 now Patent Number 2,850,088; Serial Number 526,035 filed August 2, 1955 now Patent Number 2,876,002; Serial Number 589,910 filed June 7, 1956 now Patent Number 2,926,727, and Serial Number 628,036 filed December 13, 1956 now Patent Number 2,902,276.

Objects of Invention

A timing-control is shown, having characteristics of that in my application filed December 13, 1956, Serial No. 628,036 now Patent Number 2,902,276, but of greater simplicity and fewer parts, having the objectives of lower cost and greater dependability following with directness in application of movements.

An object is to provide a compact unit comprising motor-drive, door-drive, timing-control, and related setting-off subassemblies, using as a seat for this the rear end of the horizontal door-track already in place, on one side of the garage or the other, so as to require of the average "do-it-yourself" home-owner, unpractised in iron-work, a minimum of installing study and attention.

Another object is to position the unit in close quarters where there may be little or no space to accommodate it between track and wall, or between the track and a low ceiling, bringing the unit onto the side of the track that is inward of the garage, and substantially below track-level. This enables architects to save cubic-footage costs in construction.

Another object is to provide push-button means for reversing the polarity of the door-drive motor, so that, as in emergency, a closing door may be returned to open position.

A further object is to obtain, within a chamber that holds a light-sensitive crystal, a substantial differential between ambient daylight, that may reach the interior of the chamber, and applied light such as may be directed to the chamber by an automobile headlamp beam. The greater such differential may be, the less critical is the adjustment needed, as by potentiometer, to provide positive closing of relay in daytime from the headlamp beam, and, upon extinguishment or withdrawal of the beam, positive opening of the relay against the tendency of daylight to hold it closed.

A further object is to contribute to durability in the crystal. Durability is related to the degree of darkness in the crystal's surroundings. The darker the crystal may be kept, the less the current that may flow through it, and the less the heat that such flow may develop to cause deterioration. Heat, affecting durability, is related also to voltage.

Other inventive objects relate to the design of the chamber that holds the crystal and to the orienting of means to convey rays of light from their source to the crystal.

Up to the present and commencing with the first door-operators made for power opening and closing of garage-doors that move on guides or tracks, as on horizontal tracks overhead, a rigid rail-member, in the form of a pipe, or an angle-iron, or a T-bar, or a channel-iron has been used, usually above the middle-line of the door, parallel to, and halfway between, the door's guides or tracks, in

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order to brace a power-driven door-connected member against door resistance or recoil during the opening or closing operation. It appears that, up to the present invention, no one has discerned that one or both of the door's guides or tracks provide, ready-to-hand, the rigid rail-member or members which may be used to carry or embrace power-driven door-connections. One of the objects of the present invention is application of the door's guides or tracks to this additional function.

Another object is to provide an articulated connection which may follow a curve or curves in the guide or track, while applying a positive drive upon the door.

Another object is to provide a novel and economical clutch or clamp for hand-release of the door to permit manual opening and closing in emergency, as in failure of electric-power supply.

One of the limitations of the rail-member, positioned above the middle line of doorway halfway between the tracks, is the height at which it must be placed clear of the course of the door's top, rising with the track's curves as the door moves up from closed position. An object of the invention is to position the drive outward of this course, clear of interference by any part of the door, and at track-level to save cubic-footage costs in building construction.

Although drive-connections between power-source and door could embrace the horizontal track and could slide outside the track, within the scope of this invention, it is an object of the invention, for simplicity and economy, to let the track embrace the drive connections, utilizing a freely available space which heretofore has been traversed only by the door's guide rollers.

These and other objects, such as later described more specifically for a "tappet," will become apparent in the development of the description.

Definitions

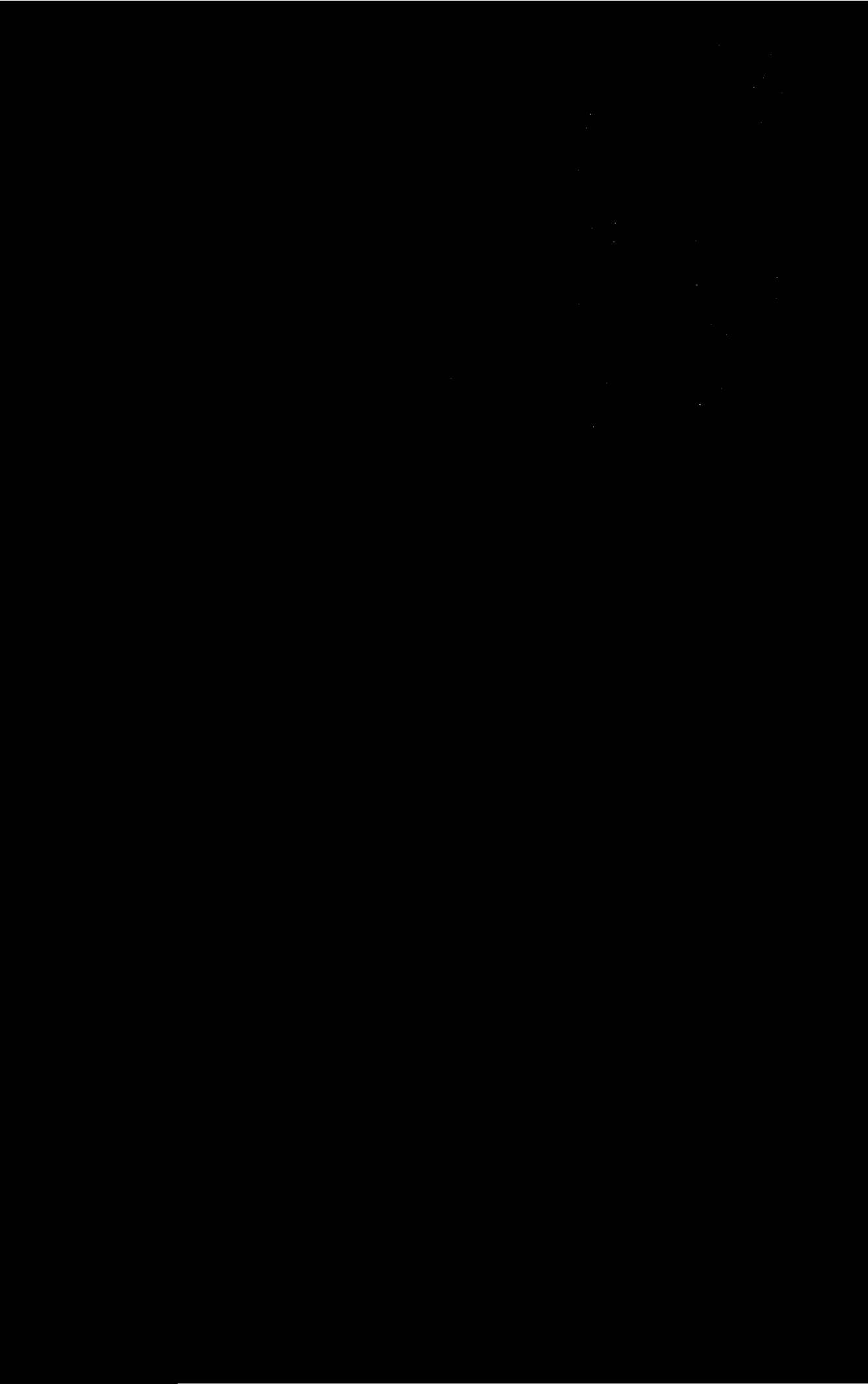
For the purposes of this description, the terms "right-hand" and "right-hand wall" are defined as at or toward that side of the garage which is to the right-hand side of an automobile headed into garage; "left-hand" and "left-hand wall" at or toward the left-hand side of the automobile; the terms "left," "leftward," "right," "rightward," "up," "upward," "down," "downward," "clockwise," and "counter-clockwise," apply upon the face of the drawing under consideration; the term "rearward" is defined as the direction parallel to right-hand and left-hand walls, in which an automobile would move entering garage; "forward" as the direction parallel to right-hand and left-hand walls, in which an automobile would move backing out of the garage. The term "inward of" is defined as meaning in a direction away from a side-wall of the garage towards a forward-rearward center-line substantially parallel to, and half way between, the side-walls. The term "outward of" is defined as meaning in a direction towards a side-wall of the garage, away from a forward-rearward center-line substantially parallel to, and half-way between, the side-walls. The terms "set off" and "setting off" are defined as meaning to initiate movement, putting specified parts into action.

Drawings

The accompanying drawings show, for purposes of illustration, one embodiment in which the invention may take form. But the invention is not limited to this embodiment.

FIGURE 1 is an elevation-view toward the right-hand side of a garage-doorway, showing relative positions of door-operating and control devices, and door in closed position.

FIGURE 1a is a view showing a modified arrangement of a light transmitting conduit provided in accordance with the invention.



passes through slots 50' and 50'' in switcher 50; rightward of switcher 50 the cable carries buttons 46 (FIG. 4) and 47 (FIG. 2) adjustable as to position on the cable for effecting the throw of switcher 50. With door in closed position, one of the buttons, 47, is forward (FIGURE 2), the other, 46, (FIGURE 4) is shown holding switcher 50 against drive-wheel 40. Pivotally pinned, by pin 53 to the lower end of switcher 50 is a link 54, this link being pivotally pinned by pin 56 to the top of a rocker 55 which is supported pivotally by rivet 57 on bracket 58 riveted to an end of motor-support 27. Rocker 55 carries pivotally by pin 59 a switcher bar 60 which extends down through a slot 61 (FIG. 5) into cabinet 66 described under caption Timing and Controls. As door opens, and approaches the termination of its opening movement, button 47 on cable 45 engages the bottom end of switcher 50, moving the switcher from its solid-line position to its position indicated by dot-and-dash lines at 50a (FIG. 4) where it is brought to stop against drive wheel 40. In this movement, switcher 50 throws link 54 and rocker 55 leftward of FIG. 4 to their positions 54a and 55a respectively indicated by dot and dash lines. The movement of top end of rocker is through about 90°, described by arc 55', transmitting to switcher bar 60 a substantially vertical movement downward with its upper end moving along a 90° arc 55''. The reverse of these movements occurs as door closes and approaches the termination of its closing movement, transmitting an upward movement to switcher bar 60. A travel by upper end of rocker 55 halfway, through 45°, is effected by the lesser movement of switcher 50 through arc 50b. The door-drive motor, as later noted, is stopped when switch handle 70 (FIG. 7) passes center; thereafter the door coasts under its momentum the rest of the closing distance to avoid undue bumping on sill. The throw of reversing switch is completed closely after switch handle 70 passes center, so that the polarity of motor 30 is reversed when door is about an inch and a quarter from fully closed position, ensuring that the next movement of door will be upward, even though door may be prevented from closing fully by an obstruction such as dirt at sill, or a garden-hose or tool-handle.

Pins 53, 56, and 59, (FIG. 5) are split-rivets and are shown only slightly opened until it is determined whether switcher 50 and link 54 are to be moved for an installation on the left-hand track. Switcher 50 is required to face toward the doorway, so in a left-hand installation bolt 52 would be transferred and locked to plate 51 at hole 52'; switcher 50 would be turned over and link would be pinned through hole 53', link 54 would approach rocker 55 from the direction opposite to that shown in FIG. 4 and switcher bar 60 would be moved slightly rightward of FIG. 4 within the bounds of slot 61, and pinned through hole 59' in rocker 55.

Timing and Controls

The bar 60 has been noted as extending into cabinet 66 from rocker 55, and as being shifted downward when the door reaches the termination of its opening movement and as being shifted upward when the door reaches the termination of its closing movement. Bar 60 is attached pivotally by pin 62 to a rod 70 (FIG. 7) which serves as the actuating handle of motor-reversing switch 71; stem 64' of push-button 64 is attached to rod 70 by the same pin for manual operation of the switch under certain conditions.

Link, or tappet, 75 hinges by pin 63 to the free end of rod 70 and by pin 67 to guide-arm 68 which is pivoted by pin 69 on bracket 72 held to frame 65 by rivets 73. The lower end of guide-arm 68 is biased to the right of FIG. 7 by spring 74, this spring tending to resist the tendency of the friction of cable moving through slots in switcher 50 from swinging the latter, which might displace rod 70 and dislodge pawl 100, to be described while motor is running; also spring 74 serves to complete the

swing of rod 70 after the rod has passed dead center. Normally, rod 70 at its upward or downward position, is held by one or other of flanges 76', 76'', of stop 76 riveted to frame 65, so that tappet 75 affords a rest for the tail of pawl 100, controlling the position of the pawl when the pawl is advanced clockwise to escape the lip 105' of lever-handle 105, (FIG. 7). When passing center, tappet 75 extends to its broken line position 75b where it throws a switch lever 78 fulcrumed to move freely clockwise or to the right (FIG. 7) on threads of screw 79 and to press button 80' of single pole double throw safety switch 80. Button 80' is biased by spring pressure internally of the switch body to recover and hold a position outwardly of switch body when free. From the common tab 81 of switch 80 and through tab 82 the circuit normally is closed to supply electric current to the primary circuit of relay 160 (FIG. 13) through crystal 125; and to supply current, when the relay (a double pole one) closes, to energize timing clock 85 and solenoid 88 (FIG. 6). When button 80' is depressed the circuit through tab 82 opens, and the circuit through tab 83 closes to supply current to timing clock 85 independently of the solenoid 88. Timing clock 85 and solenoid 88 are mounted behind frame 65 (FIG. 6); and shaft 85' of timing-clock extends through the frame, as also does draw-spring 87 between solenoid plunger 88' and clutch-lever 89, this clutch-lever being held loosely by threads of screw 86 fastened to frame 65, and brought to bear against carrier 99 for clutching, later to be observed. A latch 90 pivots on thread of screw 92 and is biased by spring 91 (FIG. 7) to move into place to hold lever 78 as thrown by tappet 75; and to hold button 80' pressed inward of switch 80. Lever 78 and button 80' are freed to regain normal positions by a minor cam 96' of cam-disc 95 moving to disengage latch 90 downward from lever 78. In the downward position of latch 90 spring 91 holds latch against lever 78 but is not of such strength as to apply the lever to depress button 80'.

Cam-disc 95, fastened by pin 93 to shaft 85' of timing-clock 85, has two diametrically opposite major cams 95' and 95'' on its periphery, and two diametrically opposite minor cams embossed on its plane, as shown at 96', (FIGS. 6, 7, and 8), shaped as in FIG. 7. The minor cams disengage latch 90 as observed. The major cams, as about to be observed, protect the motor against over-run and over-heating, by disengaging pawl 100 from switch-lever 105, to stop the motor if that has not been done by tappet 75 before one of the cams 95' or 95'' reaches horn 100' on pawl 100. Cams disengage respective latch and lever upon each rotation of timing clock through 180 degrees. Major and minor cams are so spaced that each major cam gets clear past horn 100' of pawl 100 before the related minor cam commences its disengagement of latch, and that the minor cam then disengages the latch within about 12° of travel, corresponding to about two seconds of time, all before timing clock is stopped and switch 80 thrown. Thus the motor is ensured as subject to being energized at all times except during a safety period of ineffectiveness when button 80' is pressed inward of switch 80.

A pawl-carrier 99, a pawl 100, the cam disc 95, clutch-facings 94 and 98, switch-lever 105, and switch 110, are substantially as shown in my application filed December 13, 1956, Serial Number 628,036, now Patent Number 2,902,276, except that provisions for self-closing of the door are here omitted. Cam-disc 95 is pinned as noted to shaft 85' of timing clock 85; a bore of pawl-carrier 99 rides free on hub of cam-disc 95, clutch facings 94 and 98 are cemented to adjacent faces of cam-disc 95 and pawl-carrier 99 respectively; pawl 100 pivots at 101 on pawl-carrier and is biased by spring 102 in two directions according as a straight line between ends of spring 102 moves past center of pivot 101. The purpose of screw 108 is explained under Operation—Overturning of Pawl. A horn 100' cast integral with pawl-

body, extends from the pawl-body into the path of cams 95' and 95". A lever 105 is held loosely by thread of screw 106 and is held in line by screw 107 for pressure of button 110' to close switch 110 when it (lever 105) is lifted from stop 103 by pawl 100 under pull of spring 104 upon pawl carrier being freed of clutch influence by de-energization of solenoid 88. Switch 110 supported by bracket 109 riveted to frame 65, is a normally open, single throw switch, having two contacts on its movable blade respectively engaging, when closed, two stationary contacts that are insulated from each other. One of these stationary contacts is wired for supply of current to the door-drive motor 30, the other is wired for supply of current to timing-clock 85. Thus, with switch closed, the timing clock runs when the motor runs, and either one of the cams 95', 95", disengages pawl 100 from switch-lever 105 if earlier normal disengagement by tappet 75 should fail to be effected. This protects motor from overheating, since motor may not run under any conditions beyond the time afforded for cam 95' or 95" to reach pawl-horn 100'.

Push-button 112, connected by stem 113 to engage into a hole in flange 105" of switch lever 105, is available as a manual means of closing switch 110 to energize motor 30 and set the door into opening or closing movement. To return the door upward when it is under its friction-drive to close, and may come into contact with a car or any object, push-button 64 is pushed upward. This stops the motor through tappet 75, pawl 100, and switch 110; and it reverses the polarity of the motor by throw of switch-handle 70. Button 112 then may be pushed to close switch 110 and energize the motor to return the door upward. The same procedure may be used to bring down an upward moving door. Other push-buttons such as 114, FIG. 1, may be located anywhere in garage or house with wiring shunted across wiring from crystal to relay, to close switch 110 through instrumentalities of relay, timing-clock, solenoid, and pawl.

A pilot-lamp 115, FIG. 1, may be located anywhere conveniently to the range of vision of an automobile driver. It is supplied with current through wiring from the same binding-post on terminal-block 116 as that through which current is supplied to solenoid 88. Thus the driver may be apprised of his headlamp-beam having caused the closing of the relay to clutch and move the pawl-carrier and pawl, and he may estimate his time-allowance from the time of lighting of the pilot-lamp.

Terminal block 116 is held at bottom by bracket 117 and at top by bracket 118 which serves also as a brace for top of frame 65 against wall of cabinet 66.

My Patent 2,758,836 issued August 14, 1956 shows the employment, to stop the door-drive motor, of the arc through which the handle of a motor-reversing switch moves, using the limited end-thrust by the handle afforded in the rise of the arc beyond its chord. The extent of this rise is small and limits its utility. But an inventive idea here shown is that, having a considerable range in the handle's movement either way beyond center-line, a link added pivotally to the tip of the rod-handle 70 can augment the end-thrust in the swing-through, so as to make use of the movement in more simplified conditions as with a pawl that has to be controlled in a number of ways.

This link, also called tappet 75, now performs the following offices:

(1) It makes an extensive reach from the position of its right-angle bend at 75a, FIG. 7, to the broken line position 75b, unlatching pawl 100 from lever 105 for stopping the door-drive motor. Such an extensive reach is necessary in unlatching a pawl having a long tail. Pawl must have a long tail because of the distance of its travel clockwise through an allowed 8 or 10 seconds of time.

(2) Tappet controls pawl to hold it positioned for engagement and throw of switch-lever 105 when pawl is de-clutched and returned counterclockwise by spring 104 to close switch 110 and energize the door-drive motor 30.

(3) Tappet de-positions pawl at end of any clockwise run in excess of 8 or 10 seconds to incapacitate sunlight or other sporadic light as to operational effect upon lever 105, switch 110, and motor 30.

(4) Tappet throws switch-lever 78 and its safety-switch 80 to preclude clutching of pawl-carrier to cam-disc during a safety period of time after each opening or closing of door.

Light-Sensitive Crystal

A crystal 125, FIGS. 1, 1a, 9, 10, and 13, of the kind which when dark, is substantially non-conductive of electric current, and, when lighted, is conductive of current in usable quantity, is held in a periscope-shaped tubular chamber 120 mounted on door-frame or masonry, to one side or other of the doorway, at a level to receive the light beam of an automobile headlamp. Chamber 120 is mitred and welded, whether of metal or plastic, as shown, into a right angle form with long vertical and short horizontal reaches.

A pipe 124 threaded at a right angle into the top of the chamber reaches through a door-frame of wood or through the front wall of garage and holds inside by nuts threaded to it. A bracket 123 fastened to the bottom end of chamber, provides for a screw-hold in the frame or wall. The chamber, alternatively, may be strapped to the interior surface of frame or wall, as at 120a in FIGURE 1. For an interior setting, a funnel-shaped space 122 would be put through frame or masonry to receive headlamp beam directed on an angle.

The chamber is closed at the top by cap 126 (FIGS. 9 and 10). Crystal 125, below the cap, is seated on a ring 127 interiorly beveled and mirrored to deflect light rays toward the crystal, and ring 127 is supported by a sleeve 128 pressed into place within the chamber. Wire-clamps 131, 131, held together by screw 132 hold two wires (that are bonded to the crystal) tightly in contact with two wires 133 and 134 respectively running out through pipe 124 to the relay assembly in accordance with wiring-diagram FIGURE 13.

The interior walls of the chamber are given a dark coating. A filter-glass 129 of a color more obstructive to daylight than to lamp-light is held by press-fit in position shown. Also held by press-fit in chamber 120 is a lens 119 having a convex surface toward the source of light.

130 is a mirror for deflecting, to crystal 125, light such as may be applied, as from an automobile headlamp.

The convexity of lens 119 is determined by the average distance of the automobile headlamp in relation to the distance from lens to mirror 130, so that the lens provides for an optimum normal concentration of rays to mirror 130 and to crystal 125.

In FIGURE 11 the headlight-rays A, B, and C are refracted by lens 119 to a condensed image upon the mirror 130, and the curvature of the mirror is such as to deflect the rays into a further condensed image upon crystal 125. Some variations in headlamp heights above the ground are allowed for, the light-rays being received and deflected by the mirror within its narrower dimension, as, for example, rays A', B', and C'. But, side-wise, a wider range of varying directions of approach by the headlight-rays requires a greater horizontal dimension in the mirror, such, for example, that the ray D or the ray E, FIGURE 12, will find a surface on the mirror for deflection to crystal 125; the concavity of mirror 130 being developed accordingly through both its wider horizontal dimension, and its narrower dimension.

In this arrangement, the reflecting surface afforded by the mirror is so much smaller than the cross-sectional area of the chamber that the degree of ambient daylight

deflected toward the crystal is far less in proportion to the intensity of the automobile headlight than with a horizontal chamber having no right-angle deflection.

Mirror 130 is cemented to a pillow 135 pivoting on pin 136 through a nipple 137 threaded through the bottom wall of chamber 120 and held by nut 138. A plug 139 closes the bottom of the nipple, and into the plug an adjusting-screw 140 is threaded, locked by nut 141. Screw 140 is swiveled to a link 142 pivotally engaging into pillow 135. A turn of screw 140 up or down adjusts the angle of mirror 130 for direction of light-beam to the crystal; a turn of nipple 137 adjusts for directional facing of mirror 130 toward the source of the light-beam.

The circuit which includes the light-sensitive crystal 125, is included in wiring-diagram, FIGURE 13. Alternating current from house-supply through switch 80, and neutral conductor 143 is rectified to undulating direct current by half-wave selenium rectifier 145, on the order of 20 milliamperes. From the positive side of the rectifier, this direct current flows through wiring 146 and a protecting resistor 147 on the order of 50 to 100 ohms, and through wiring 148 to the positive side of an electrolytic filter capacitor 150 on the order of 20 to 30 microfarads, 200 volts, to smooth the wave form and obtain constant direct current; the negative side of this capacitor 150 being connected by wiring 149 the other side 144 of the circuit. Also from the positive side of rectifier 145, direct current flows through wiring 151 to a resistor 152 for moderating power dissipation, on the order of five to ten kilo-ohms, 2 watts, which through conductor 153, in conjunction with a potentiometer 155 on the order of five to ten kilo-ohms, 4 watts (with conductor 154 to the other side 144 of the circuit) is used as a voltage divider to arrive at a voltage reduced below 50 through wiring 133 to crystal 125 through wiring 134 to coil 160' of relay 160 which is on the order of 10 kilo-ohms. The reduced voltage at the crystal 125 minimizes normal power dissipation and prolongs the useful life of the crystal. Also it comes within rules of the National Board of Fire Underwriters permitting wiring without armored cable from door-frame to cabinet. Current from resistor 152 runs through wiring 157 to a potentiometer 156 used to adjust the diminutive current on the order of two milliamperes flowing through the crystal when lighted (to close relay 160) to as low a value as practical without loss of promptness in closing relay 160 while ensuring that, upon the withdrawal of the headlamp beam, the relay will re-open against such ambient daylight as may pervade the interior of chamber 120.

Armature 161 of relay 160 carries two contacts which, at the closing of the relay, close upon two mutually insulated contacts 162 and 163, which respectively convey 110 volt current from supply-lead 144 through wiring 164 and 165 to timing clock 85 and solenoid 88 respectively.

Operation

In clarifying the foregoing texts, comments as to operation have accompanied the observation of parts. The following notes are more general.

Operation—Drive of Door

The drive upon the door is effected from motor 30 through shaft 33 to drive-wheel 40, drive-cable 45, the articulated linkage comprising parts 20 to 34, stem 18, and roller-bracket 17. The direction of rotation of the motor, controlled from cabinet 66, is such as to turn drive-wheel 40 clockwise of FIGURE 4 to open the door and counter-clockwise to close the door. In the position of the linkage within curved track 11, FIGURE 2, the door is closed. A drive clockwise of FIGURE 4 by drive-wheel 40 will draw the lower strand or run of cable 45 to the left and the upper strand or run to the right, moving clamp-stud 34 to pull the articulated linkage leftward of FIGURES 2 and 4, along the interior of track 10, until the linkage, and door reach open position.

As the door is brought towards the termination of its opening movement, button 47 on lower strand 45' comes into contact with lower reach of switcher 50, FIG. 4, and throws bar 60 downward to stop the motor and effect a reversing of the motor's polarity so that, at the next actuation of the motor, drive-wheel 40 will be turned counter-clockwise. Upon the next energization of motor, its drive will close the door, with parts moving in reverse of their movements above described for door-opening, and, as door is brought towards the termination of its closing movement, bring button 46, on the upper strand 45'', to throw the upper reach of switcher 50 leftward of FIG. 4 and move bar 60 upward to stop the motor and reverse its polarity.

This is accomplished in the use of a cable or belt of thin cross-section which can fit into the confined area between track and door, and the stiffness of the track is utilized to lend rigidity to a push upon the door made through an articulated linkage. Of course the same result could be obtained by a linkage outside the track bearing on the track to gain rigidity, while coming within the scope of my invention; the design here shown having been adopted, as already noted, in illustration of the invention and not in limitation of it.

Operation—Actuation from Headlamp-Beam

The driver of an automobile, approaching the garage or leaving it, directs the beam of one headlamp toward that side of the door-frame at which the chamber 120 is mounted. The beam is deflected by mirror 130 to crystal 125. Crystal, upon being lighted, instantaneously conducts electric current through wires 133 and 134 to energize and close relay 160 and actuate timing clock 85 and solenoid 88. Solenoid clutches pawl-carrier 99 to turn with cam-disc 95 on the shaft of timing block. Coincidentally pilot-lamp 115 lights, and driver waits two to seven seconds thereafter, the shorter period possibly being measured by speaking any adopted sentence of six to ten words, then extinguishes the headlamp-beam, or withdraws it from chamber 120 by movement of the car. As pawl-carrier has moved clockwise of FIGURE 7, it has carried pawl 100 to clear the end of lip 105', and to spring into position under the lip. Upon extinguishment or removal of headlamp-beam, crystal 125 obstructs the flow of current to relay 160, relay 160 opens its circuits to timing-clock and solenoid, and the de-energized solenoid releases clutching of pawl-carrier to cam disc, freeing pawl-carrier to snap counter-clockwise under pull of spring 104, and cause pawl 100 to lift lever 105 to press button 110' to close switch 110, and energize door-drive motor to open or close the door, and energize timing-clock to run with the motor. At the termination of door-movement, the motor is stopped by tappet 75 unlatching pawl from lever 105, and is reversed in polarity in the throw-through of rod-handle 70 by switcher 50 and switcher-bar 60.

Operation—Overturning of Pawl

When pawl-carrier 99, clutched to cam-disc 95 by solenoid 88, under influence of sporadic light, such as sunlight, on crystal 125, moves clockwise through 8 or 10 seconds, the pawl becomes overturned against tappet 75 to bring spring 102 above pawl-pivot 101; clutch thereafter slips while timing-clock runs. When the sporadic light passes or is extinguished, and de-energized solenoid 88 releases pawl-carrier from clutch-influence to return counter-clockwise to stop 103 under pull of spring 104, the pawl returns with the pawl-carrier, and its tail is tripped by screw 108, adjusted to throw spring 102 below pivot 101 as the nose of pawl goes beyond range of lip 105' so that the pawl comes to rest in solid-line position of FIGURE 7 without throwing lever 105, and thus without starting motor 30 or effecting door-movement.

I claim:

1. In a door operator, a door, a track for guiding said door between closed and open positions, a motor and

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shaft, a drive-wheel on the shaft and a pulley spaced from said drive-wheel in the direction of movement of said door for confining a cable within a door-driving range, a cable in endless belt arrangement around said drive-wheel and said pulley, a drive linkage within said track connected to said door, means connected to said door independently of said motor and said shaft for counterbalancing the weight of said door as said door is moved in said track between said closed and open positions and means for selectively connecting and disconnecting said cable to said door whereby, when said cable is connected to said door, said door is operated by said motor and said cable and, when said cable is disconnected from said door, said door may be operated manually.

2. In a door operator, a door, a track for guiding said door between closed and open positions, a motor and shaft, a first disc on said shaft, a second disc on said shaft, a spring urging said second disc in a direction on said shaft toward said first disc, a pulley spaced from said discs in the direction of movement of said door, a cable in endless belt arrangement around said discs and said pulley, said cable passing intermediate said first and second discs, a drive linkage within said track, means connected to said door independently of said motor and said shaft for counterbalancing the weight of said door as said door is moved in said track between said closed and open positions, and means for selectively connecting and disconnecting said cable to said door whereby, when said cable is connected to said door, said door is operated by said motor and said cable and, when said cable is disconnected from said door, said door may be operated manually.

3. In a door operator, a door, a track for guiding said door between closed and open positions, a motor and shaft, a first disc on said shaft, a second disc on said shaft, a spring urging said second disc in a direction on said shaft toward said first disc, a pulley spaced from said discs in the direction of movement of said door, a cable in endless belt arrangement around said discs and

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said pulley, said cable passing intermediate said first and second discs, a drive linkage within said track, means connected to said door independently of said motor and said shaft for counterbalancing the weight of said door as said door is moved in said track between said closed and open positions, and manually engageable means connected to said drive linkage for selectively connecting and disconnecting said drive linkage and said cable whereby, when said cable is connected to said drive linkage, said door is operated by said motor and said cable and, when said cable is disconnected from said drive linkage, said door may be operated manually.

References Cited in the file of this patent.

UNITED STATES PATENTS

15	565,027	Pohlig	Aug. 4, 1896
	1,501,705	Decoux	July 15, 1924
	1,846,445	Matthews	Feb. 23, 1932
	2,335,336	Zoller	Nov. 30, 1943
20	2,544,239	Schirmer	Mar. 6, 1951
	2,558,032	Andrews	June 26, 1951
	2,561,572	Herrington	July 24, 1951
	2,580,311	Matchett	Dec. 25, 1951
	2,583,662	Noble	Jan. 29, 1952
25	2,588,880	Richards	Mar. 11, 1952
	2,589,479	Curtis	Mar. 18, 1952
	2,619,346	Weathers	Nov. 25, 1952
	2,661,450	Moler	Dec. 1, 1953
	2,672,582	Hann	Mar. 16, 1954
30	2,690,908	Coit	Oct. 5, 1954
	2,703,235	Reamey	Mar. 1, 1955
	2,732,201	Franko	Jan. 24, 1956
	2,737,621	Hamilton	Mar. 16, 1956
	2,758,836	Purdy	Aug. 14, 1956
35	2,851,266	Klamp	Sept. 9, 1958

FOREIGN PATENTS

4,566	Great Britain	Dec. 24, 1906
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