

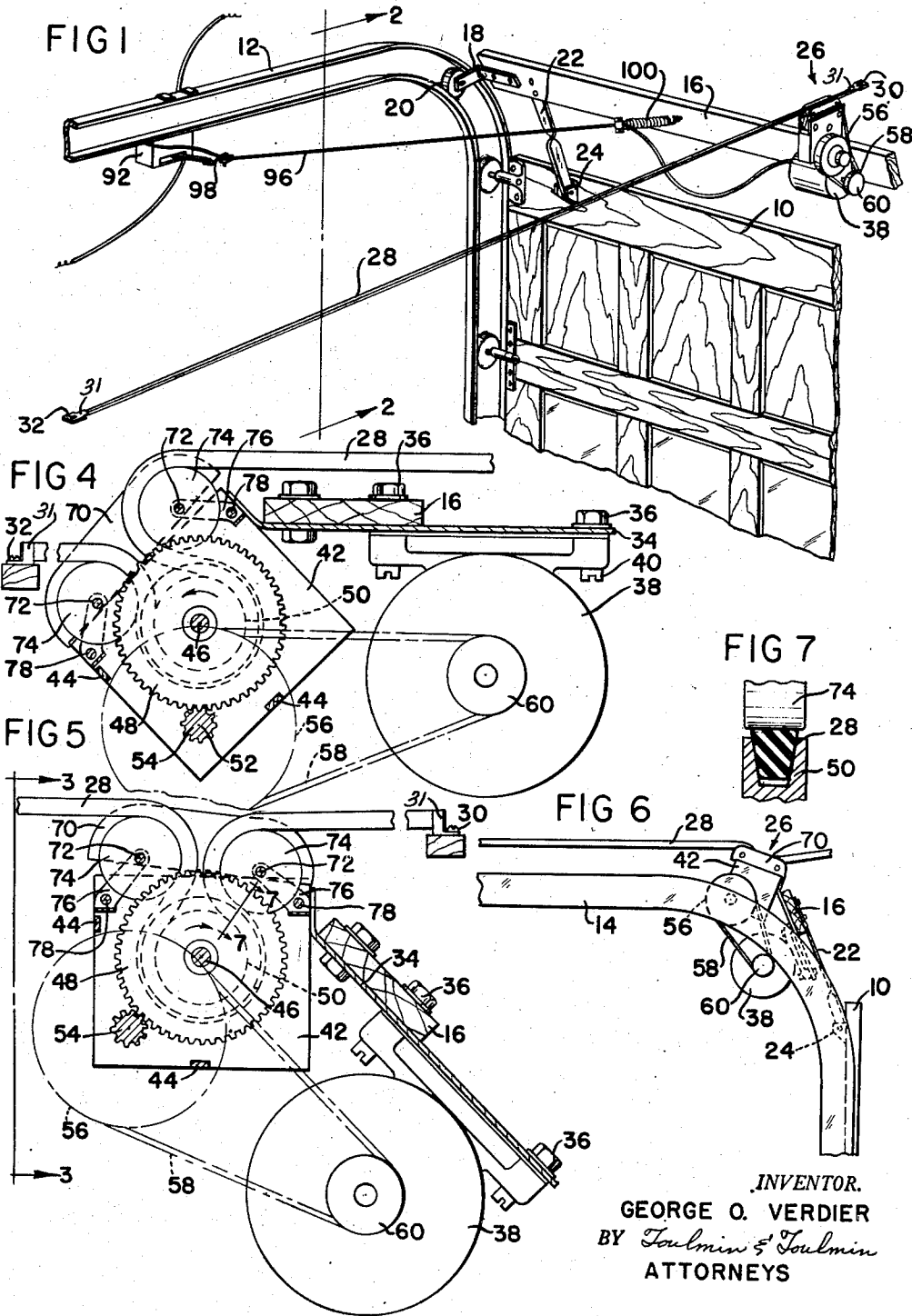
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G. O. VERDIER
CLOSURE OPERATING MEANS

2,703,236

Filed Sept. 22, 1952

2 Sheets-Sheet 1



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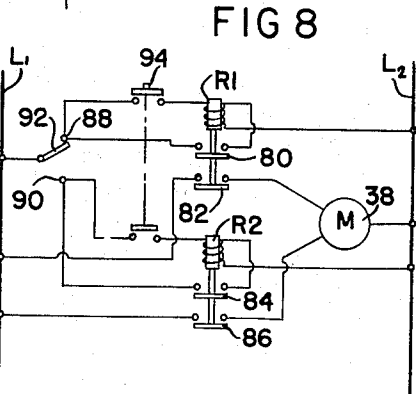
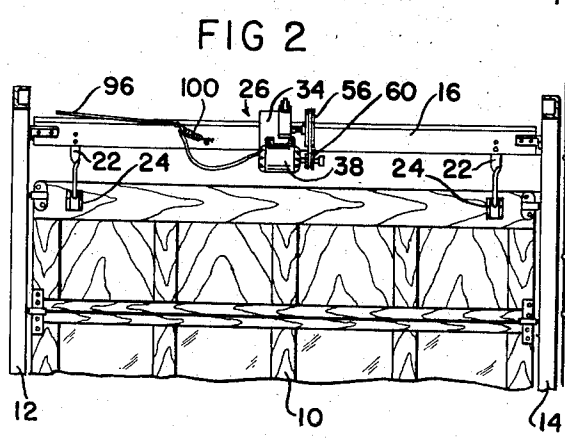
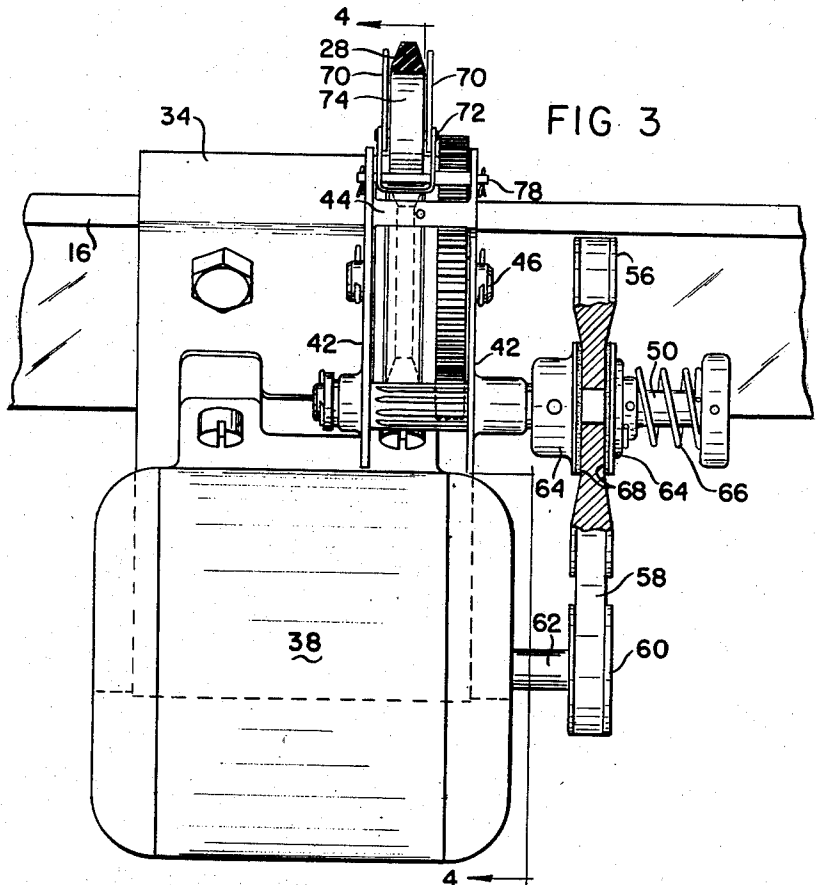
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2 Sheets-Sheet 2



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2,703,236

CLOSURE OPERATING MEANS

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Application September 22, 1952, Serial No. 310,756

9 Claims. (Cl. 268—59)

This invention relates to an operator for a door, particularly a vertically slidable door such as a garage door, and to a method of operation thereof. This invention represents a further advance in the art over the door operator arrangement illustrated in the copending application, Serial No. 99,720, in the name of Willis J. Verdier, filed June 17, 1949, now issued as Patent No. 2,628,090.

In the co-pending application referred to, a driven drum movable with the door to be operated had two cables leading therefrom in opposite directions to anchor points so rotation of the drum in one direction would open the door while rotation thereof in the opposite direction would close the door. This arrangement requires a large drum with means to fasten thereto the ends of the cables, and the drum and cables are in an exposed location and are thus subject to rusting and corrosion.

Further, unless the cables are held taut at all times, the device will start with a jerk that severely loads all operating parts of the mechanism, including the cable and the anchors therefor.

Having the foregoing in mind, it is an object of this invention to construct an operator of the nature referred to which overcomes the above-mentioned faults.

A particular object of this invention is the provision of an improved automatic operator for opening and closing an overhead sliding garage door which is compact and inexpensive.

A further object is the provision of a novel arrangement for limiting the travel of the door and operator at the fully opened and fully closed positions of the door.

Still another object is the provision of an automatic door operator which will function to open and close the door even though the building in which the door is mounted becomes twisted or warped.

A further particular object of this invention is the provision of an improved stationary member along which the door operator is driven during the opening and closing movements of the door.

In general, the objects of this invention are attained by stationarily mounting in an overhead location an elongated member constructed in the same manner as a V-belt. The door operator includes a pulley about which the stationary member passes and, by driving the pulley, the operator moves along the said stationary member.

The operator is mounted in about the center of a transversely extending beam which is guided to move in the same tracks as guide the door, and adjacent the opposite ends of the beam there are rigid and unyielding connections between it and the door.

The operator also includes a reversible motor for driving the pulley and, therefore, the door in opposite directions, and a toggle switch means is provided in the energizing circuit of the motor and is so located that the electric cable leading from the toggle switch to the motor can be employed for actuating the switch as the door approaches its limit positions thereby de-energizing the motor.

The several objects and advantages referred to above, as well as still other objects and advantages, will become more apparent on reference to the following specification taken in connection with the accompanying drawings, in which:

Figure 1 is a perspective view showing an installation according to my invention;

Figure 2 is a view looking at the door and the operator therefor from the inside of the building;

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Figure 3 is a view showing the door operator itself looking in the same direction as in Figure 2;

Figure 4 is a sectional view indicated by line 4—4 on Figure 3;

Figure 5 is a view like Figure 4, but shows the position of the operator as the door is approaching its closed position;

Figure 6 is a view similar to Figures 4 and 5, but showing the position of the operator and the beam on which it is mounted when the door is fully closed;

Figure 7 is a fragmentary sectional view indicated by line 7—7 on Figure 5, showing a detail of construction of the door operator; and

Figure 8 is a diagrammatic representation of one form which a wiring diagram can take for controlling the electric motor of the operator.

Referring to the drawings somewhat more in detail, in Figures 1 and 2 there is illustrated a substantially conventional type overhead door 10 provided with rollers along the opposite side edges that are received in the tracks 12 and 14, by means of which the door is guided during its movement. In a conventional manner, the tracks 12 and 14 are fixedly mounted in the building having an opening for which the door forms a closure.

Positioned above the door is a beam 16 and at its opposite ends beam 16 carries brackets 18 on which are mounted roller means 20 positioned in the tracks 12 and 14. Beam 16, at its opposite ends, also has rigidly connected therewith the downwardly extending pull arms 22 that have their lower ends pivotally connected with the brackets 24 attached to the inside face of door 10 adjacent the top thereof.

In about the middle of beam 16 there is mounted a door operator, generally designated by numeral 26, and which has associated therewith an elongated stationary and flexible element 28 having its one end fixedly supported at 30 on the front wall of the building, and its other end stationarily supported at 32 at a point rearwardly of the rearmost position to which beam 16 will move in full opening door 10. Metallic clips 31 secured to the opposite ends of the member 28 are availed of for securing it in the described manner.

Element 28 is preferably constructed in the same manner as a conventional rubber V-belt and consists of a rubber or rubber-like body in the form of a regular trapezoid having longitudinally extending filaments therein which may consist of wire, glass or a textile material. An element of this nature is highly flexible and is possessed of a certain degree of resilience, but is, at the same time, extremely strong in tension and has long life. The element is inexpensive and also has the advantage of being corrosion and rust-proof.

Turning now to Figures 3, 4 and 5, the operator 26 is illustrated in considerably more detail, and there is also indicated the manner in which the elongated element 28 is engaged by the operator.

The operator comprises a support plate 34 which is attached to beam 16 as by bolts 36 and which also supports the reversible drive motor 38, which may advantageously be secured to the plate by utilizing one of the sets of bolts 36 and another set of bolts 40.

At the top edge of beam 16 plate 34 is bent upwardly and has rigidly secured thereto a frame consisting of a pair of side plates 42 and which may have extending therebetween the brace elements 44.

In about the middle of the frame formed by the side plates 42 is a shaft 46 that provides a journal for a combined gear and pulley, the gear portion of which is indicated at 48 and the pulley portion of which is indicated at 50.

The gear portion 48 meshes with a pinion 52 formed on a shaft 54 journaled in the side plates 42 of the frame and carrying a pulley 56 externally of the frame that is driven by a V-belt 58 which also passes over a pulley 60 mounted on output shaft 62 of the reversible motor 38.

Pulley 56 is arranged for frictionally driving shaft 54 by virtue of the pressure plates 64 arranged on opposite sides of the pulley and pressed toward each other by a spring 66. Friction means such as the cork discs 68 are provided between the pressure pads 64 and the opposite faces of the pulley. By this arrangement the pulley

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56 can slip should the door operator become loaded beyond a predetermined allowable limit.

The frame, comprising the two side plates 42, has mounted thereon a smaller frame consisting of the spaced side plates 70 that have spaced shafts 72 therein which support rollers 74. Shafts 72 are also availed of for supporting the U-shaped arms 76 which have their other ends pivoted on the main frame of the operator by the pivot pins 78.

As will be seen in Figures 4 and 5, the assembly comprising the rollers 74 is tiltable on the main frame of the operator so as to move rollers 74 selectively into close proximity with the periphery of pulley portion 50. In this manner the V-shaped elongated element 28 is driven tightly into the V-shaped groove of the pulley portion 50 and a firm driving connection is established between the said pulley portion and the element 28. This action is best illustrated in Figure 7 where it will be seen that element 28 is of such a size that it extends radially outwardly from pulley portion 50 so that the roller 74, which presses thereagainst, can accomplish the wedging of element 28 into the pulley groove.

The rollers 74 can be made of a number of different materials, but I have found that if they are formed of a resilient rubber-like material, an adequate wedging action thereof will be had.

Figure 8 illustrates one form which the electric control circuit for controlling the operator can take, and in this figure the power lines are indicated at L1 and L2 and connected therebetween are a pair of relays R1 and R2. Relay R1 has a first blade 80 thereon that provides a holding circuit for the relay and a second blade 82 that will energize motor 38 for rotation in one direction.

Similarly, relay R2 has a first blade 84 that provides a holding circuit for the relay and a second blade 86 for energizing motor 38 to run in the opposite direction.

The energizing circuit for the relays leads to the terminals 88 and 90 of a toggle switch having a blade 92 that is connected with power line L1. The energizing circuit for each relay comprises a normally open manually-operated switch indicated at 94, and the switches are interconnected for simultaneous operation.

Toggle switch 92, according to the present invention, is mounted in a stationary location, for example, on one of the tracks 12 or 14, as is illustrated in Figure 1, and the electric cable 96 leading from the toggle switch to the motor 38 is employed for actuating the switch between its two operative positions by being connected to the operating lever of the switch at 98, and being then further connected with beam 16 as by spring 100. The position of switch 92 is so selected, and the spring 100 is so located on beam 16 that, as the door approaches its closed position, the toggle switch will be actuated by cable 96 to its door-opening position, thus de-energizing motor 38. Thereafter, by again availing of switch 94, motor 38 can be energized to run in the opposite direction which will cause the door to open, and when the door is fully opened cable 96 will again throw toggle switch 92 back to its initial, or door-closing position, thus again de-energizing motor 38 and preparing the electric circuit for the next door-closing operation.

It is to be noted that, inasmuch as beam 16 is guided directly in the same tracks that guide the door, twisting and warping of the building, for which the door forms a closure, will not interfere with the opening and closing of the door unless the said warpage becomes exceedingly severe. This action of opening and closing of the door is still further enhanced by operator 26 being positioned in about the middle of beam 16 whereby the beam acts as an equalizer for distributing the thrust to the door properly.

The frame 70, which carries the rollers 74, by being floatably mounted on the main frame of the operator, insures that a wedging action will take place of the element 28 in the groove of pulley portion 50 in both directions of movement of the operator and even if element 28 is somewhat slack.

Due to the resilience of the element 28, and to the fact that the engagement thereof by the operator is functional, starting of the closing and opening movements of the door can be accomplished without shock.

Further, by arranging the operator so that it has started around the bend of the track by the time the door has closed, a cushioning of the closing of the door can be

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had so it does not strike hard against the floor of the building.

I claim:

1. In combination; a vertically slidable door guided in track means at its side edges, a beam above the door connected therewith at the sides of the door and guided in the same track means, an operator mounted on the beam in about the middle thereof, and including a motor driven V-pulley, a flexible rubber-like element trapezoidal in cross-section extending in the direction of travel of the beam and having its ends stationarily anchored, said element passing around said pulley, and idler rollers adjacent the pulley and engaging the face of the element opposite the pulley to hold the element in the groove of the pulley, said idler rollers being adjacent one another on one side of said V-pulley thereby to provide for substantially more than 180° of wrap of the said element about said pulley.

2. In combination; a vertically slidable door guided in track means at its side edges, a beam above the door connected therewith at the sides of the door and guided in the same track means, an operator mounted on the beam in about the middle thereof, and including a motor drive V-pulley, a flexible rubber-like element trapezoidal in cross-section extending in the direction of travel of the beam and having its ends stationary anchored, said element passing around said pulley, and idler rollers adjacent the pulley and engaging the face of the element opposite the pulley to hold the element in the groove of the pulley, said idler rollers being movably supported adjacent said pulley so that tensioning of said element will bring about movement of the rollers toward the pulley to wedge the element tightly in the groove of the pulley.

3. In combination with a slidable door and a power driven operator therefor for moving the door in its opposite direction; a reversible motor drivingly connected with said operator, a circuit for energizing said motor in each direction of rotation thereof, a toggle switch having one position where one of the said circuits is effective, and another position where the other of the said circuits is effective, an arm for operating said toggle switch, a flexible inextensible electric cable forming a part of said circuits electrically connected at one end to said motor and being mechanically connected to said door and to said switch, said switch being so located and the length of the cable between the door and switch being such that as the door approaches its opposite limit positions the said toggle switch will be actuated into position to make the circuit effective for moving the door in the opposite direction.

4. In combination with a slidable door having track means guiding the opposite side edges of the door; an operator for driving the door along the track means comprising a beam having its ends guided in the track means and connected with the door, a motor driven pulley mounted in about the middle of said beam, a flexible element having its opposite ends anchored and frictionally engaging said pulley, a reversible motor drivingly connected with said pulley, an energizing circuit for each direction of rotation of said motor, a toggle switch mounted on one of said tracks and having one position where one of said circuits is effective and another position where the other of said circuits is effective, an arm for operating said toggle switch, an electric cable leading from said toggle switch to said motor and being connected with said arm and with said beam, and the said electric cable between its said points of connection being of such length that the toggle switch is actuated by the said electric cable as the door approaches its opposite limit positions.

5. In combination with a door operator of the nature described; a beam, a plate secured to said beam and projecting beyond the beam at one side, a motor mounted on the said projecting side of said plate, a frame rigidly secured to the other end of the plate so that the said frame and motor are disposed on opposite sides of the beam, a V-pulley in said frame drivingly connected with said motor, idler rollers carried on said frame on the side thereof opposite the motor, and a flexible element trapezoidal in cross-section extending between said idler rollers and around said pulley.

6. As a new article of manufacturing in use in connection with a door operator of the nature described; an elongated flexible rubber-like element trapezoidal in

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cross-section, metallic connectors secured to the opposite ends of said element and providing means for stationarily anchoring the said opposite ends of said element, the body of said element comprising a rubber-like material, and tension means extending in the direction of the length of said element imbedded in the said body.

7. In an arrangement of the nature described; a beam adapted for having its ends connected with a door to be moved, an operator mounted on the beam in about the middle thereof for driving the beam, said operator comprising a frame, a V-pulley journaled in the frame, a flexible rubber-like element trapezoidal in cross-section extending in the direction of the travel of the beam and having its opposite ends stationarily anchored, said element passing around said pulley, a second frame movably mounted on the frame of the operator toward one side of said pulley, a pair of idler rollers mounted in said second frame in spaced relation, said element passing between said idler rollers and around said pulley, and means for reversibly driving said pulley.

8. In combination; a beam adapted for being connected at its opposite ends with a door to be moved, an operator mounted on the beam in about the middle thereof and comprising a frame, a V-pulley journaled in the frame, a pair of idler rollers floating mounted on the frame at one side of the pulley, an elongated flexible rubber-like element trapezoidal in cross-section extending in the direction of travel of the beam and having its opposite ends stationarily anchored, said element passing between said idler rollers and around said pulley, a gear connected with the pulley, a pinion meshing with the gear, and a reversible motor mounted on said operator and connected for driving said pinion.

9. In an arrangement of the nature described; spaced tracks comprising a vertical portion, a horizontal por-

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tion and an arcuate portion interconnecting the said vertical and horizontal portions, a slideable door having its side edges guided by said tracks and being disposed substantially entirely in said vertical portion when the door is closed, a beam above the top edge of the door having its ends guided by said tracks and connected adjacent its opposite ends with said door, an operator mounted on the beam in about the middle thereof and extending beyond the top edge of the beam, said operator comprising a V-pulley, a pair of idler rollers mounted on said operator in spaced relation on the upper side of said pulley, an elongated flexible rubber-like element trapezoidal in cross-section extending in the direction of travel of said beam above the beam and having its opposite ends stationarily anchored, said element passing between said idler rollers and around said pulley, a reversible motor carried by said operator and connected for reversibly driving said pulley, said beam being disposed part way around said arcuate portion said tracks from the said horizontal portion thereof when the door is closed whereby the beam will tilt somewhat when the door commences to open thereby to pull said element taut.

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