United States Patent

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[45] **Sept. 26, 1972**

[54] REVERSING DOOR OPERATOR

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[52] **U.S. Cl.** **307/149,** 200/61.43, 49/28

[51] **Int. Cl.**.....**F16d 71/00**

[58] **Field of Search** .....307/119, 149; 200/61.43; 49/27, 28, 26, 360, 361, 362; 318/226, 282; 192/142 R, 150

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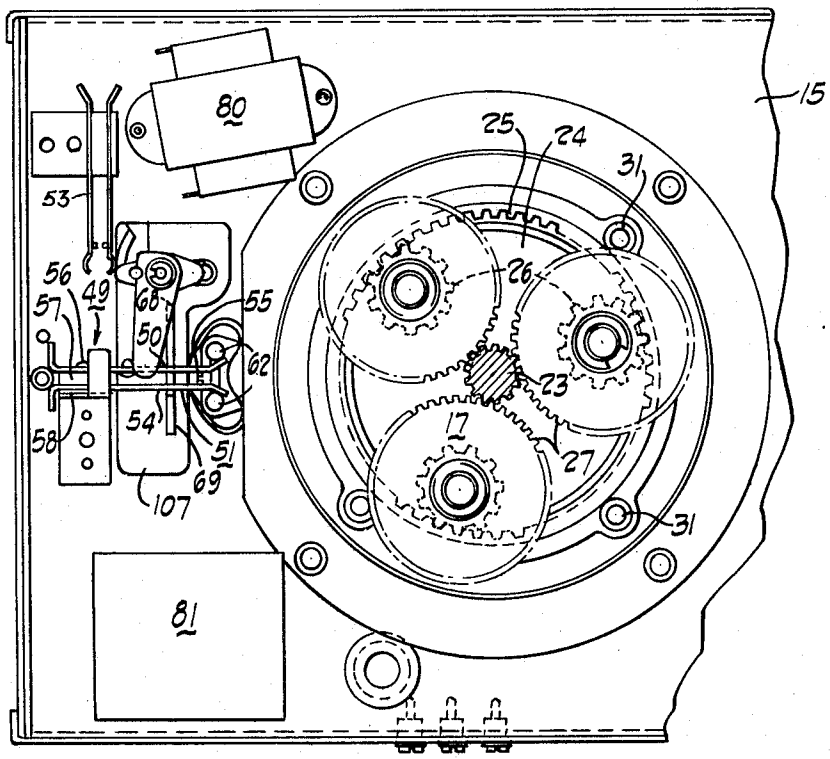
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[57] **ABSTRACT**

A garage door motor driven operator is disclosed which, when the door is being driven in the closing direction, is capable of automatically reversing direction to be moved in the door opening direction should the door strike an obstruction which stops or slows the door. A torque sensitive switch actuator actuates a first switch upon an overload condition of the door moving in a closing direction. This overload of torque compresses an overload torque spring urging a reaction member toward a neutral position. The first switch de-energizes the motor and thus there is no longer any torque to oppose the torque spring which thereupon moves the reaction member in a return direction whereupon a second or reversing switch is actuated. This energizes the motor for driving the door in an opening direction. The foregoing abstract is merely a resume of one general application, is not a complete discussion of all principles of operation or applications, and is not to be construed as a limitation on the scope of the claimed subject matter.

12 Claims, 8 Drawing Figures



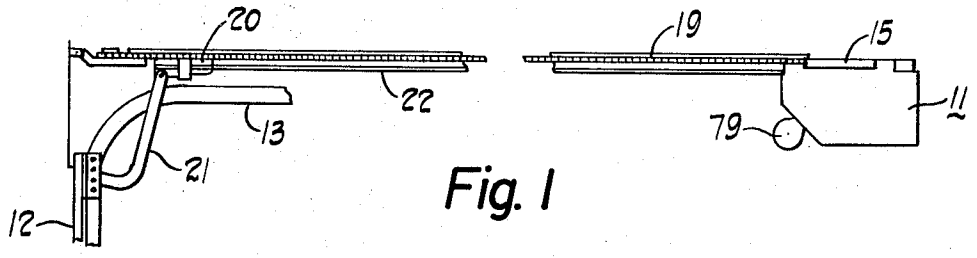


Fig. 1

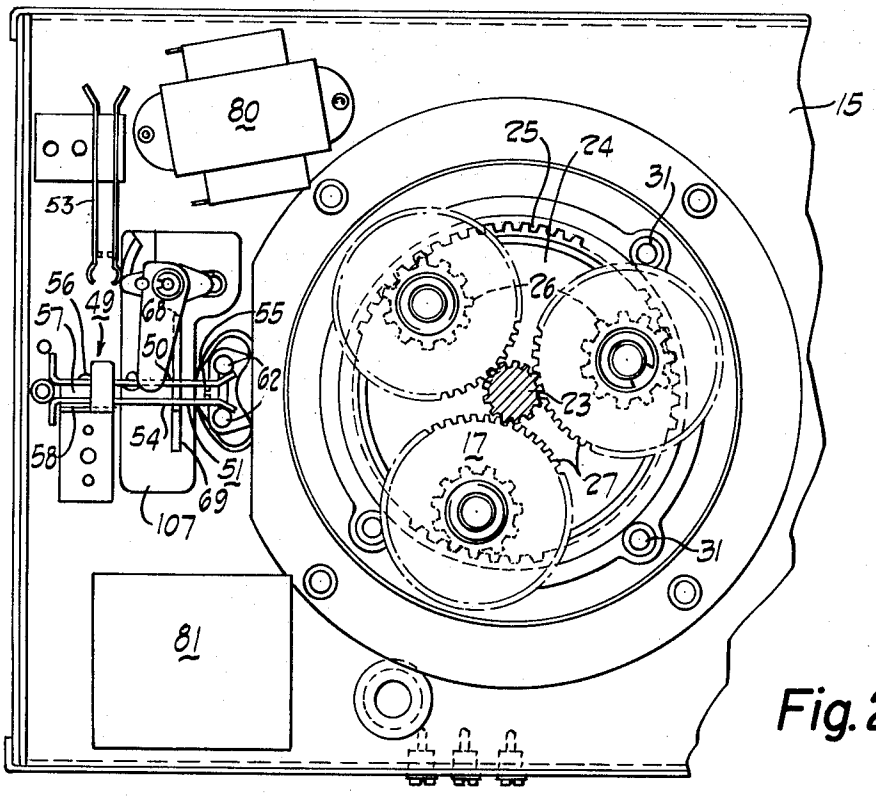


Fig. 2

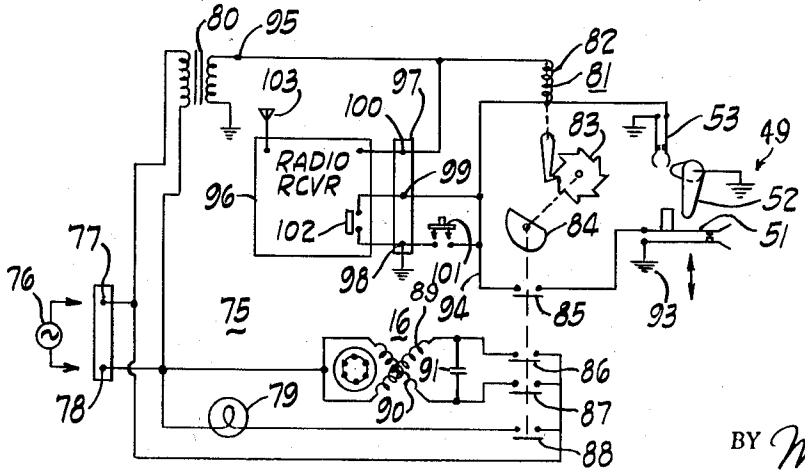
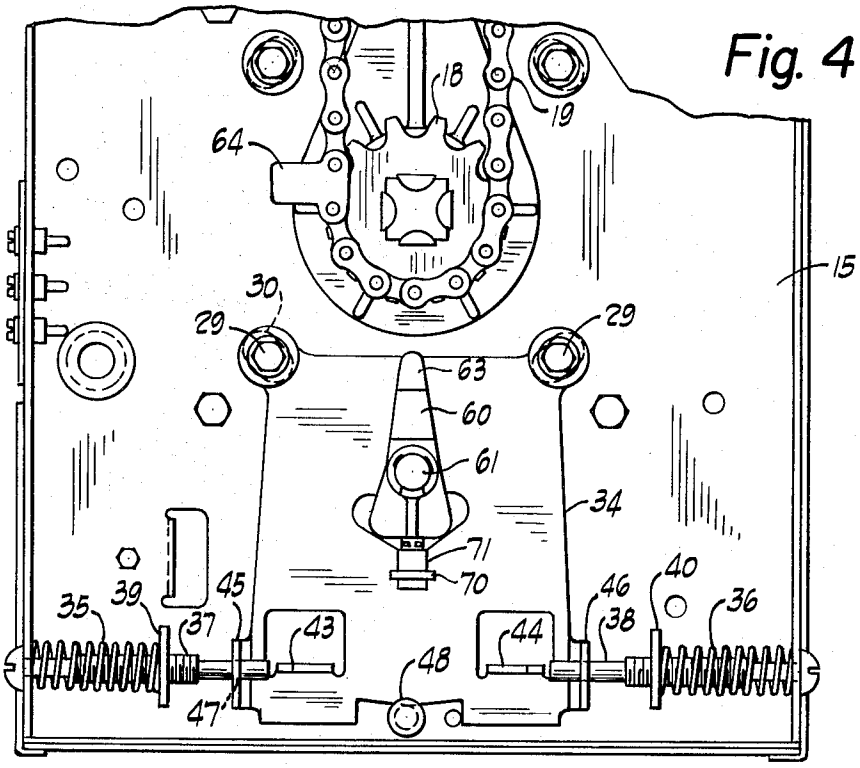


Fig. 3

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Fig. 4



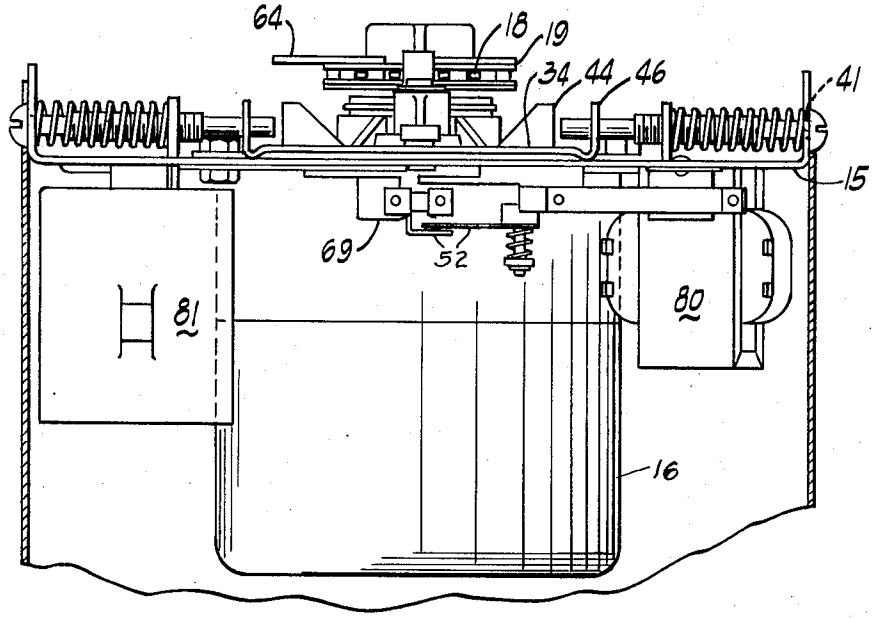


Fig. 5

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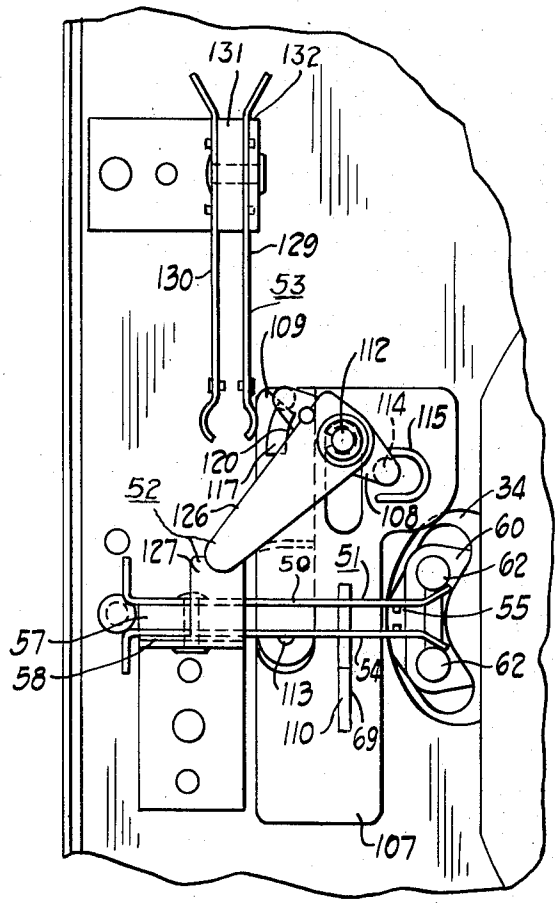


Fig. 6

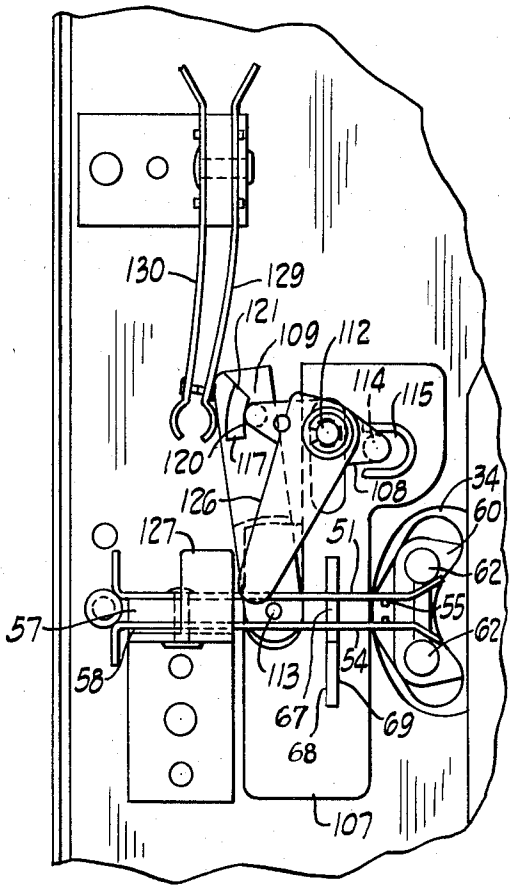


Fig. 7

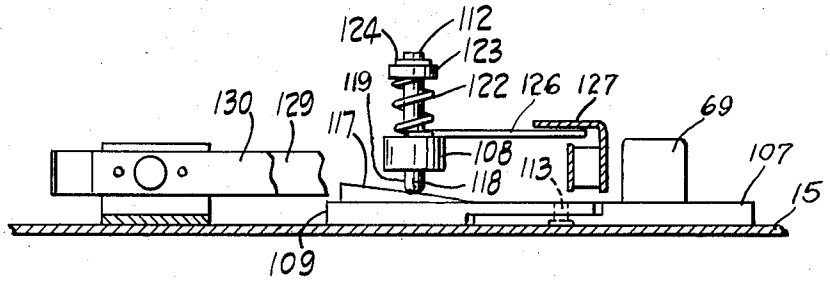


Fig. 8

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REVERSING DOOR OPERATOR

BACKGROUND OF THE INVENTION

This invention is an improvement on the dual response drive train application, Ser. No. 886,175, filed Dec. 18, 1969.

Garage door operators have increased in use in recent years because a garage door, especially the upward acting overhead type, is a heavy door to manually move between open and close positions. The motor driven door operator, and especially the remote radio controlled door operator, offers considerable convenience to the motorist for powered, remote control of the opening or closing of the garage door. The very fact that the door is large, heavy and has considerable inertia, and is also motor driven, brings with it inherent problems of a safety nature. A small child or pet might happen to be in the doorway as the door is closing in a downward direction and might not observe that the door was closing. Also, a child or pet might see the door closing and try to run out of the garage and trip or otherwise be caught underneath the closing door. To be a practical device, the operator must necessarily have enough force to close the door firmly so as to be able to push the door closed through a small amount of snow, for example, or an accumulation of leaves. Also the motor must have enough force to overcome some binding of the door on the door tracks because of improper adjustment or improper lubrication or whatever, in order to be a marketable door operator. It is common knowledge that most people do not keep their garage door in top-notch operating condition, not lubricating it or adjusting it monthly. The average user will operate the door for years without paying any attention to it and will only look at the door when it completely fails to operate. In fact, some people have been known to only buy a door operator when the door has become so hard to move that they could not move it manually, and then they try to install a door operator instead of adjusting or lubricating the door.

This human nature must be taken into account in the safety factor of operating the door, especially in the downward or closing direction, in order to have proper safety precautions in the event a pet or child should happen to become trapped under the door.

Prior systems have been suggested for providing a safety switch of a sensitive slightly moving bar along the bottom edge of the door so that if some obstruction were met in the downward closing movement, then this movement of the switch bar would stop the door. There are two defects to this system. One, is human nature and the other is snow or ice. The snow or ice has been known to freeze the switch bar so that it cannot move and the careless user thus merely disconnects the safety feature in order to be able to use his door operator, rather than attempting to thaw the door safety switch. The human factor comes into the above problem but is also present in the fact that merely stopping the door may not be enough. The child or pet may be trapped under the door and not be able to extricate himself and may suffocate to death.

Accordingly, it is an object of the invention to provide a door operator which obviates the above-mentioned disadvantages.

Another object of the invention is to provide a door operator which automatically reverses if an obstruction is met only when moving in the downward direction.

Another object of the invention is to provide a torque sensitive safety switch which will not only stop but will actually reverse the door when moving in a door-closing direction.

Another object of the invention is to provide a door operator with a safety-reversing mechanism which has amplification of movement and has a time delay to make certain that a relay may properly index to first stop the motor, and second to start the motor in the reversing direction to again open the door.

SUMMARY OF THE INVENTION

The invention may be incorporated in a door operator for a reversibly operable door, comprising, in combination, a base, a reaction member mounted to said base for limited movement, torque urging means acting between said base and said reaction member to establish a neutral position of the reaction member relative to said base, a motor having a rotor and a stator, means mounting said motor relative to said base, means connecting said rotor to open or close the door and to move said reaction member away from said neutral position upon the torque requirements on said motor exceeding the force of said torque urging means, control means establishing at least three conditions of the door including door opening and closing and door stopped with motor de-energized conditions, switch means connected to said control means, first means actuating said switch means upon movement of said reaction member in a first direction from neutral to change said control means to the motor de-energized conditions, switch means connected to said control means, first means actuating said switch means upon movement of said reaction member in a first direction from neutral to change said control means to the motor de-energized condition, and second means actuating said switch means in accordance with movement of said reaction member upon torque urging means return movement thereof to the neutral position to establish the door opening condition.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing.

SHORT DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevational view of a door operator of the invention connected to operate a garage door;

FIG. 2 is a bottom plan view with the motor broken away;

FIG. 3 is an electrical circuit of the reversing door operator of the invention;

FIG. 4 is a top plan view of the door operator of FIG. 2;

FIG. 5 is an end view of the door operator;

FIG. 6 is an enlarged partial view similar to FIG. 2 but with the torque switch in the actuated condition;

FIG. 7 is a view similar to FIG. 6, with the reversing switch actuated; and

FIG. 8 is an enlarged partial end view of the torque and reversing switches.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The figures of the drawing illustrate a door operator **11** which may be used to open and close a door such as a garage door **12**. This door is illustrated as an upward acting overhead door movable on tracks **13** between the open and closed positions. The door operator **11** has a base **15** on which most of the parts are mounted. The door operator includes an electric motor **16**, which in this preferred embodiment is an AC motor of the capacitor induction type. The motor has a rotor, not shown, driving a sprocket **18** which is connected by a chain **19** to a carriage **20**. This carriage slides along a track **22** which may be fastened on the ceiling of the garage, for example. The carriage is connected pivotally to a door arm **21** and the other end thereof is pivotally connected to the door **12**. Thus as the motor rotates in either direction it moves the chain, which moves the carriage **20** along the track **22** and through the door arm **21** this opens or closes the door **12**.

The base **15** may be a sheet metal base upon which many of the other components are mounted. The stator of the electric motor **16** is mounted relative to this base. In this preferred embodiment it is mounted directly on the base **15**. A planetary drive train **17** between the rotor of the motor and the sprocket **18** has an input from the motor **16** at a drive pinion **23**, and has first and second outputs **24** and **25**, respectively. This planetary drive train **17** includes a ring gear **25** as the second output and includes a spider **24** as the first output. The spider **24** is journalled on the frame **15** and carries three planet pinions **26** meshing with this internal ring gear **25**. Integral with each of the planet pinions **26** is a planet gear **27** meshing with the input pinion **23**. These integral planet pinions and gears give a double reduction in speed so that the first output spider **24** has about a 16 to 1 speed reduction. Coaxial with the spider **24** and fixed thereto is the drive sprocket **18** to drive the chain **19**.

The ring gear **25**, which is the second output from the planetary drive train **17**, is mounted for partial rotational movement relative to the frame **15**. This is accomplished by bolts **29** extending through enlarged apertures **30** in the frame **15** and threaded into apertures **31** in the ring gear **25**.

A reaction plate or member **34** has apertures closely received on two of the bolts **29** so that this reaction plate acts like a radial arm extending from the ring gear **25** and has a partial rotational movement therewith. This reaction plate **34** is normally positioned in an intermediate or neutral position shown in FIGS. **2, 4 & 5** by yieldable means or urging means including first and second springs **35** and **36**. Each spring is a compression spring surrounding a first and a second adjusting bolt **37** and **38**, respectively. First and second nuts **39** and **40** are threaded on the bolts **37** and **38**, respectively. Each bolt extends through an aperture in a turned-up flange of the frame **15** so that the respective spring is pre-stressed between the frame and the respective nut. The nuts **39** and **40** are elongated and lie closely adjacent the base plate or frame **15** so as to prevent turning thereof. Ears **43** and **44** are bent from the reaction plate **34** for abutment by the end of the bolts **37** and **38**, respectively. Also for the purpose of keeping these bolts in alignment with the ears, flanges **45** and **46** are bent from the reaction plate **34** and have apertures **47** through which the bolts **37,38** slidably pass. A headed rivet **48** keeps the reaction plate **34** closely adjacent the base plate or frame **15**. The bolt **37** is a down-adjustment screw for downward movement of the door **12** and to adjust a first predetermined limit of torque on the ring gear **25** or force requirements exerted by the chain **19** on the door before the ring gear **25** will partially rotate. The second bolt **38** is an up-adjusting screw to adjust the stress or compression of the yieldable spring **36** and thus establish a second predetermined limit of torque on the ring gear **25** or force exerted by the chain **19** on the door **12** before this ring gear **25** will partially rotate.

The main output from the planetary drive train **17** is on the spider **24**, which is directly connected to and rotates the drive sprocket **18**. However, the ring gear **25** is a second or secondary output which will be partially rotated when the load force or load torque requirements exceeds either the first or second predetermined limits as established by the pre-stress in the spring **35** or **36**. The motor **16** is a bi-directional motor for bi-directional drive of the load or door **12** and thus the reaction plate **34** may partially rotate in either direction whenever the respective predetermined limit is exceeded.

The motor stator may be mounted directly on the reaction member **34** to partially rotate same upon torque overload, however, the use of the planetary drive train **17** with two outputs, and one output connected to member **34**, is the preferred arrangement.

Switch means **49** is controlled by both the first and second outputs **24** and **25** of the planetary drive train **17**. The switch means **49** are mounted on the bottom of the base plate or frame **15** and includes first, second and third switches **51, 52** and **53**. The first switch includes first and second contact blades **50** and **54** having cooperating contacts **55** near the ends thereof. Contact blade **50** is grounded to the frame by a rivet **56** and contact blade **54** is insulated from the frame **15** by insulator blocks **57** and **58**. This switch **49** is normally open and is arranged to be closed by the pivotal movement of an insulator lever **60** pivoted at **61** on the reaction plate **34**. The lever **60** has an insulator fork **62** straddling the two contact blades **50** and **54** so that pivoting of the lever **60** will close the switch contacts **55**. The lever **60** has an extension **63** mounted in the path of movement of up and down limit cams **64**, one of which is shown in FIGS. **4** and **5**. These cams are fixed to the chain **19** and positioned on this chain so that when the door has reached the up limit position, then the up limit cam will actuate the switch **51** and when the door has reached the down-limit position then the down-limit cam will actuate the switch **51**.

An insulator plate **67** is slidably received in a slot **68** in the frame **15** and has a tongue **69** adjacent the contact blade **54**. This insulator plate **67** also has an extension **70** received through an aperture **71** in the reaction plate **34** so that partial rotational movement of this reaction plate **34** clockwise in FIGS. **2** and **6** slides the insulator plate **67** lengthwise in the slot **68** and the tongue **69** thus actuates closed the first switch **51**. The second switch **52** is a torque switch and the third switch **53** is a reversing switch, as described below.

FIG. 3 shows schematically a diagram of the electrical circuit 75 for power and control of the operator 11. An AC source 76 such as a 115 volt source may be connected to input terminals 77 and 78 for operating power to the electric motor 16, an electric lamp 79 and to a stop-down transformer 80. The electrical circuit 75 includes a stepping or sequential relay 81 wherein a relay coil 82 when energized actuates a pawl and ratchet mechanism 83, indexing cam means 84 to sequentially control four sets of contacts 85, 86, 87 and 88. When contacts 86 are closed and contacts 87 are open, then the motor 16 is energized for forward rotational direction for door-opening movement by direct energization of the stator winding 89 and leading current excitation of the stator winding 90 through a capacitor 91. Conversely when contacts 87 are closed and contacts 86 are open, then the motor 16 is energized for reverse rotation for door closing direction by direct energization of the stator winding 90 and leading current excitation of the stator winding 89 through capacitor 91. When contacts 88 are closed, the lamp 79 is energized to illuminate the interior of the garage and when contacts 85 are closed, the switches 51 and 52 are made operable to control the circuit. One side of the first switch 51 is connected to ground 93 and the other side of contacts 85 are connected by a conductor 94 through the relay coil 82 to a terminal 95 on the step-down transformer 80. Low voltage such as 28 volts is available on this terminal 95. A radio receiver 96 is connected to terminals on a terminal strip 97. Terminal 98 is grounded. Terminal 99 is connected to the conductor 94 and terminal 100 is connected to the terminal 95. A normally open pushbutton switch 101 is connected between terminal 98 and conductor 94, and the radio receiver 96 has an internal switch 102 which may be actuated closed whenever an appropriate signal is received on the antenna 103 of the receiver 96.

The ratchet and pawl mechanism 83 actuates the cam means to control the contacts 85–88 and the relay index sequence is such that when the door is closed all contacts 85–88 are open. In the door opening condition of the relay 81, the contacts 85, 86 and 88 are closed with contact 87 open. In the door open stationary position, contacts 88 are closed and contacts 85–87 are open. In the door closing condition of the relay 81, contacts 85, 87 and 88 are closed with contacts 86 open. Also in the door opening and door closing conditions of the relay 81, the contacts 85 are open so long as the relay coil 82 is energized.

The switch means 49 includes the first switch 51 above described, as well as the switches 52 and 53. First, second and third insulators 107, 108 and 109 are provided. The first insulator is a plate having a slot 110 which fits over the insulator plate 67 to move therewith. The second insulator 108 is pivotally and axially movable on a post 112 fixed on the base 15. The third insulator 109 is pivoted at 113 to the first insulator 107. The second insulator 108 has a crank arm 114 interfitting in a slot 115 of the first insulator 107. This provides a pivotal movement to the second insulator 108 as the first insulator 107 moves with the reaction plate 34. The third insulator 109 has a first cam 117 and the second insulator 108 has a first cam follower 118. The second insulator 108 has a second cam 119 which in fact is a side of the first cam follower 118. The third insulator 109 has a second cam follower 120, which in fact is the side of the first cam 117. The first cam 117 has an edge 121 over which the first cam follower 118 may drop. The first cam follower 118 is urged into cooperation with the first cam 117 by means of a cam spring 122. This surrounds the fixed post 112 and is held on by a washer 123 and a snap ring 124.

The second switch 52 includes a pivotable contact blade 126 mounted and movable with the second insulator 108. This second switch 52 also includes a contact tab 127 with which the blade 126 cooperates and this tab 127 is fixed electrically to the contact blade 54. The third switch 53 includes contact blades 129 and 130 mounted on the base 15 with contact blade 130 grounded and contact blade 129 insulated by insulator blocks 131 and 132.

OPERATION

The door operator 11 is used to control movement of the load or door 12 in both directions of movement. The drive train 17 provides speed reduction for movement of the chain at an appropriate speed for opening and closing the garage door. It also provides a convenient means to drive the reaction member 34 which has a reaction against the torque urging means or springs 35 or 36 in the event of overload. This torque reaction could be taken from the stator itself but has a force amplifier motion if taken from the ring gear 25, which is one of the two outputs of this planetary drive train.

Assuming that the garage door is closed, if the pushbutton 101 is momentarily closed, or if a received radio signal momentarily closes the switch 102, then the lower end of the relay coil 82 is grounded to energize this relay coil. This indexes the cam means 84 and closes the contacts 85, 86 and 88. Closing of contacts 86 energizes the motor for forward rotational direction which raises the door 12. Closing of the contacts 85 places the first switch 51 in the circuit, however, this switch 51 at that time will be open. As the door reaches the up limit of travel, then one of the limit lugs 64 will actuate the lever 60, closing the first switch 51 which will momentarily energize the relay coil 82 and thus the relay will be indexed to the door opened stationary condition. In such condition only the contacts 88 are closed for illumination of the lamp 79 and the remaining contacts 85–87 are open. This opening of contact 86 de-energizes the motor 16 and thus stops the door 12.

To close the door 12, the switch 101 and 102 may be closed momentarily to energize the relay coil 82 and index the cam means 84 to the next position which will be the door closing condition. In such condition of the relay, the contacts 85, 87 and 88 are closed, and the closing of contacts 87 energizes the motor 16 for reverse rotation to drive the door 12 in a closing direction. Again when the door reaches the down limit position, the down limit cam or lug 64 will actuate the lever 60 to momentarily close the first switch 51. This again momentarily energizes relay coil 82 and indexes the cam means 84 so that in this condition all contacts 85–88 are open. This de-energizes the motor 16 and controls the load 12 to stop this load.

Now if at any time the force required to move the garage door 12 in either an upward of downward

direction exceeds the first and second predetermined limits of force established by the prestress on torque springs **35** or **36**, then this increased force will result in an increased stress on one run of the chain **19** and result in an increased torque requirement on the drive sprocket **18**. When this torque requirement exceeds the predetermined limit, then the ring gear **25** will partially rotate. This is a partial rotation of the second output of the planetary drive train **17** and this means that the reaction plate **34** will also partially rotate, and acting through the insulator plate **67** will actuate closed either the first or second switch **51** or **52**. If the door is moving in an upward direction and strikes some kind of an overload such as binding of the door in the tracks **13**, then the reaction plate tends to rotate clockwise as viewed in FIG. **2**. Accordingly, the insulator tongue **69** will move upwardly in FIGS. **2** and **6** and actuate closed the first switch **51**. The stress on the springs **35** and **36** may be independently adjusted, for example, from five pounds up to 100 pounds of force on the door **12**. This has the definite advantage of being able to compensate for weak or improperly adjusted counterbalancing springs on the door **12**. For example, it might take 90 pounds of force to lift the door **12** and thus the up-adjusting screw **38** could be adjusted to provide a limit condition of 95 pounds of force before the reaction plate **34** moves counterclockwise as viewed in FIG. **4**. This will provide a safety condition so that if the door meets some obstruction on its upward travel, the reaction plate **34** will be partially rotated and the door will be stopped. Also, if it takes only 50 pounds of force to close the door garage **12**, then the down adjusting screw **37** might be adjusted for a predetermined stress on this spring **36** equivalent to 55 pounds of force on the door **12**.

Now if the motor is running in the direction to close the door **12** and meets some obstruction to the door so that the torque limits of the spring **35** are overcome, then the reaction plate **34** will move counterclockwise in FIGS. **2** and **6** or clockwise in FIG. **4**. Under these conditions the insulator plates **67** and **107** move downwardly in FIGS. **2** and **6**. Acting through the crank **114**, **115**, the second insulator **108** rotates clockwise, and the first cam follower **118** rides up the first cam **117**. During this rise on the cam **117**, the contact blade **126** not only pivots clockwise but raises above the level of the contact tab **127**. When the first cam follower **118** drops off the edge **121** of the cam **117**, then the contact blade **126** moves downwardly with a snap-action because of the cam spring **122** to have a snap action closure of this second switch **52**. This momentarily energizes the relay coil **82** to index the relay and thus stop the motor and the door **12**. The contact blade **126** will then be in the position shown in FIG. **6**. Now with the motor de-energized, there is no longer any torque on the door **12** and there is no torque reaction on the reaction plate **34**. Accordingly, the torque spring **35** pushes the reaction plate **34** back to the neutral position. This is a motion upwardly in FIGS. **2** and **6** of the first insulator **107**. During this return movement the second cam **119** cooperates with the second cam follower **120** to pivot the third insulator **109** outwardly away from the first insulator **107**. Then as the first insulator **107** returns to its neutral position, this third insulator **109** will move against the third switch **53** and actuate it closed. This actuation momentarily energizes the relay coil **82** to index the relay to the door opening condition. The motor **16** is thus energized and the motor runs in a direction to open the door whereat it stops at the door open condition.

It will be noted that the first cam and follower have a relative motion in a first path which is perpendicular to the plane of the paper of FIGS. **2** and **6**. In other words, the second insulator **108** moves up and down along the fixed post **112**, in the plane of the paper of FIG. **8**. This first path is perpendicular to the path of movement of the first insulator **107**. It will further be noted that the second cam and follower **119** and **120** have a relative movement along a second path which is perpendicular not only to the first path but also perpendicular to the movement of the first insulator **107**. This second path is in the plane of the paper of FIGS. **2** and **6** and is effected by pivotal movement of the third insulator **109**. By having the first and second paths mutually perpendicular, then the third switch **53** is a one-way actuating switch. As the first insulator **107** moves upwardly in FIG. **6**, the switch **53** is not actuated, however, as the first insulator **107** has a return movement to the neutral position, then there is relative movement in the second path and this actuates the third switch **53**. The second switch **52** is a torque switch actuated upon excessive torque in a downward direction of the door and the third switch **53** is a reversing switch for automatically reversing the direction of the door upon meeting an obstruction in the downward direction of door movement.

The second insulator **108** having a crank connection to the first insulator **107** gives an amplified motion to this second insulator **108** to provide adequate switch movement. The first insulator **107** may not have much movement, for example, only one-eighth of an inch, yet the contact blade **126** has a swinging movement of the tip end thereof which may be about three-fourths of an inch. This provides ample movement for compensating for manufacturing tolerances to assure proper and consistent operation of the safety switch. Further the crank arm **108** provides amplified movement to the third insulator **109** so that the third switch **53** is readily actuated during the return movement of the insulator **107**.

The present disclosure includes that contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A door operator for a reversibly operable door, comprising in combination, a base,

a reaction member mounted to said base for limited movement,

torque urging means acting between said base and said reaction member to establish a neutral position of the reaction member relative to said base,

a motor having a rotor and a stator,

means mounting said motor relative to said base,

means connecting said rotor to open or close the door and to move said reaction member away from said neutral position upon the torque requirements on said motor exceeding the force of said torque urging means,

control means establishing at least three conditions of the door including door opening and closing and door stopped with motor de-energized conditions,

switch means connected to said control means,

first means actuating said switch means upon movement of said reaction member in a first direction from neutral to change said control means to the motor de-energized condition,

and second means actuating said switch means in accordance with movement of said reaction member upon torque urging means return movement thereof to the neutral position to establish the door opening condition.

2. A door operator as set forth in claim **1**, wherein said motor is a reversible motor to establish the reversible drive of the door.

3. A door operator as set forth in claim **2**, wherein said torque urging means has first and second spring means acting oppositely between said base and reaction member with the neutral position being an intermediate position of the reaction member for movement in opposite directions.

4. A door operator as set forth in claim **1**, wherein said switch means includes first and second separate switches, the first switch being actuated by movement in a first path and said second switch being actuated by movement in a separate second path.

5. A door operator as set forth in claim **4**, wherein said second switch is a one-way actuated switch.

6. A door operator as set forth in claim **1**, wherein said control means is a relay having contacts establishing four conditions including a door opened condition with the motor de-energized, and said switch means being connected to control said relay.

7. A door operator as set forth in claim **1**, wherein said first and second actuating means includes a first cam and follower and a second cam and follower,

said first cam follower cooperable with said first cam and movable in a first path upon movement of said reaction member in a first direction from neutral to actuate said switch means to change said control means to the motor de-energized condition,

said second cam and cam follower relatively movable in accordance with movement of said reaction member in a second path different from said first path to actuate said switch means upon torque urging means return movement of said reaction member.

8. A door operator as set forth in claim **1**, wherein said first and second actuating means includes a first cam and follower and a second cam and follower,

said first cam follower cooperable with said first cam and movable in a first path substantially perpendicular to said reaction member movement upon movement of said reaction member in a first direction from neutral to actuate said switch means to change said control means to the motor de-energized condition,

said second cam and cam follower relatively movable in accordance with movement of said reaction member in a second path perpendicular to said first path,

and means mounting said switch means to be actuated in accordance with movement of said second cam follower in said second path upon torque urging means return movement of said reaction member.

9. A door operator as set forth in claim **8**, wherein said second path is perpendicular to said direction of movement of said reaction member.

10. A door operator as set forth in claim **1**, wherein said first and second actuating means includes a first cam and follower and a second cam and follower and said switch means includes first and second switches,

said first cam follower cooperable with said first cam and movable in a first path substantially perpendicular to said reaction member movement upon movement of said reaction member in a first direction from neutral,

said first cam and follower actuating closed said first switch upon movement of said reaction member in said first direction to change said control means to the motor de-energized condition,

said second cam and cam follower relatively movable in accordance with movement of said reaction member,

said second cam having a component to move said second cam follower in a second path perpendicular to said first path,

and means mounting said second switch to be out of said first path and to be actuated in accordance with movement of said second cam follower in said second path upon torque urging means return movement of said reaction member.

11. A door operator as set forth in claim **1**, wherein said first and second actuating means includes first and second insulators,

said first insulator being connected to move in first and second opposite directions with said reaction member,

said second insulator being pivoted to said first insulator,

a first cam being on said second insulator and having a component perpendicular to the movement of said first insulator,

a first cam follower movable substantially perpendicular to said base upon movement of said first insulator in said first direction,

a spring acting to urge said first cam follower against said first cam,

an edge on said first cam over which said first cam follower is urged by said cam follower spring upon a first distance of movement of said first insulator in said first direction,

first and second switches in said switch means,

means actuating closed said first switch upon at least said first distance of movement of said first insulator in said first direction to change said motor to the de-energized condition,

a second cam on said first cam follower,

and a second cam follower on said second insulator to pivot said insulator and close said second switch upon return movement of said first insulator in said second direction when said motor is de-energized to change to said door opening condition.

12. A door operator as set forth in claim 1, wherein said first and second actuating means includes first, second and third insulators,

said first insulator being connected to move in first and second opposite directions with said reaction member,

said second insulator being pivoted on said base,

said third insulator being pivoted to said first insulator,

a first cam being on said third insulator and having a component perpendicular to the movement of said first insulator,

a first cam follower on said second insulator and movable substantially perpendicular to said base upon movement of said first insulator in said first direction,

a spring acting to urge said first cam follower against said first cam,

an edge on said first cam over which said first cam follower is urged by said cam follower spring upon

a first distance of movement of said first insulator in said first direction,

first and second switches in said switch means,

means actuating closed said first switch upon at least said first distance of movement of said first insulator in said first direction to change said motor to the de-energized condition,

a second cam on said first cam follower,

and a second cam follower on said third insulator to pivot said third insulator and close said second switch upon return movement of said first insulator in said second direction when said motor is de-energized to change to said door opening condition,

whereby if an obstruction prevents the door from closing completely, the door will not merely stop but the operator will reverse and operate the door in the opening direction to stop the door at the door open condition.

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