June 7, 1966 J. W. WANNER 3,254,699

DOOR OPERATING MECHANISM

Original Filed June 22, 1955 4 Sheets-Sheet 1

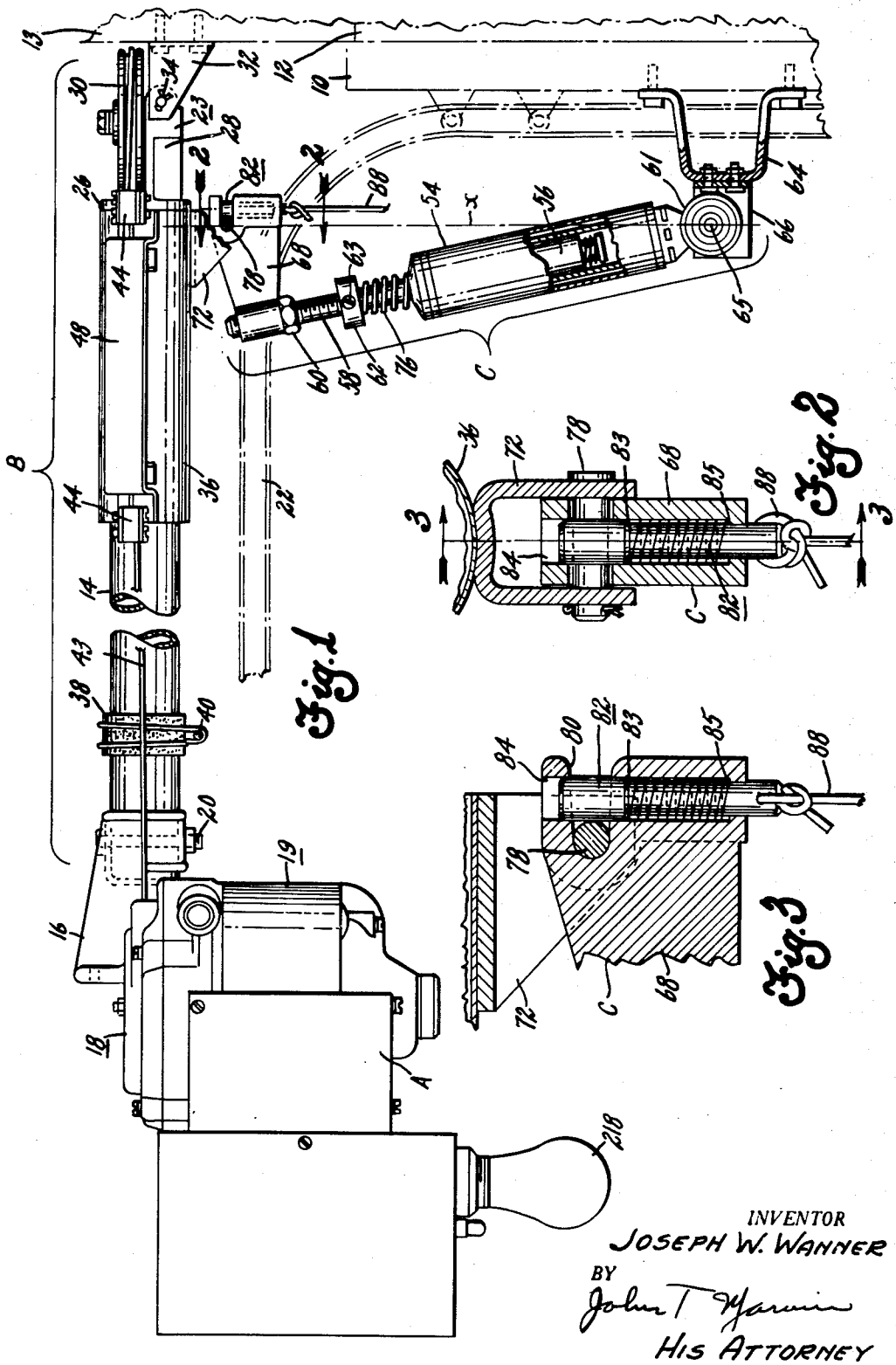


Fig. 1

Fig. 2

Fig. 3

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DOOR OPERATING MECHANISM

Original Filed June 22, 1955 4 Sheets-Sheet 2

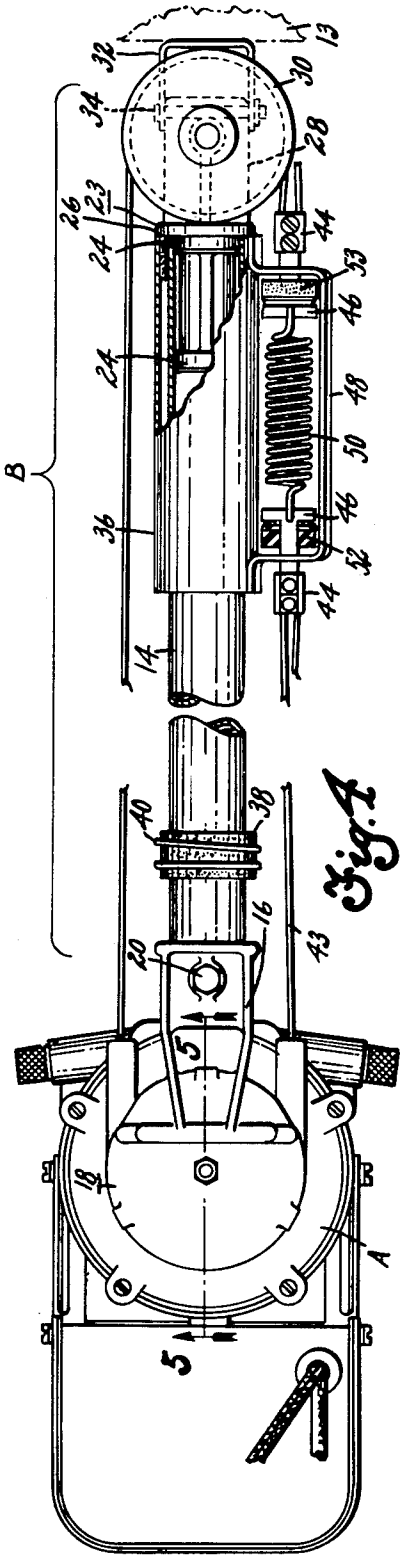


Fig. 4

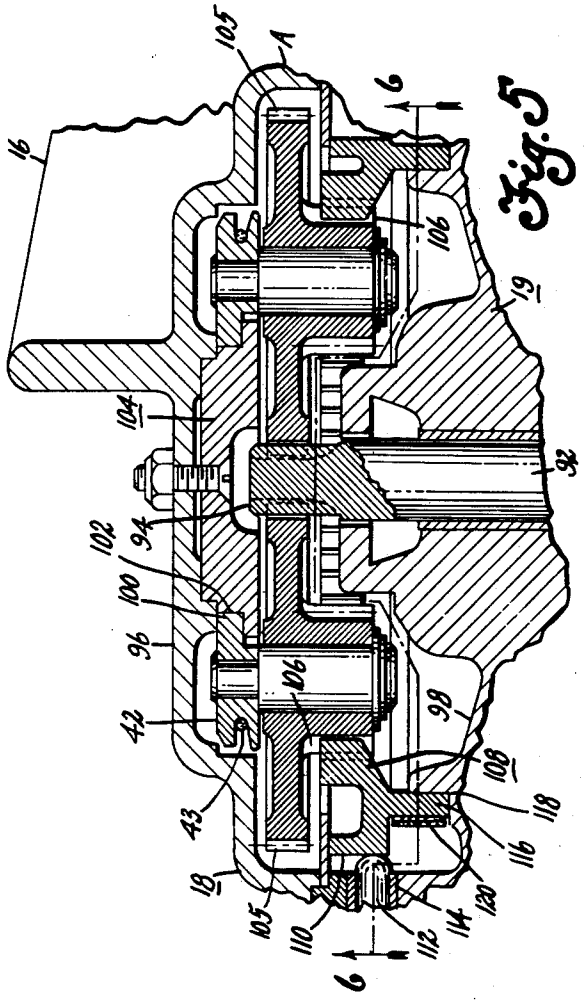


Fig. 5

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DOOR OPERATING MECHANISM

Original Filed June 22, 1955 4 Sheets-Sheet 3

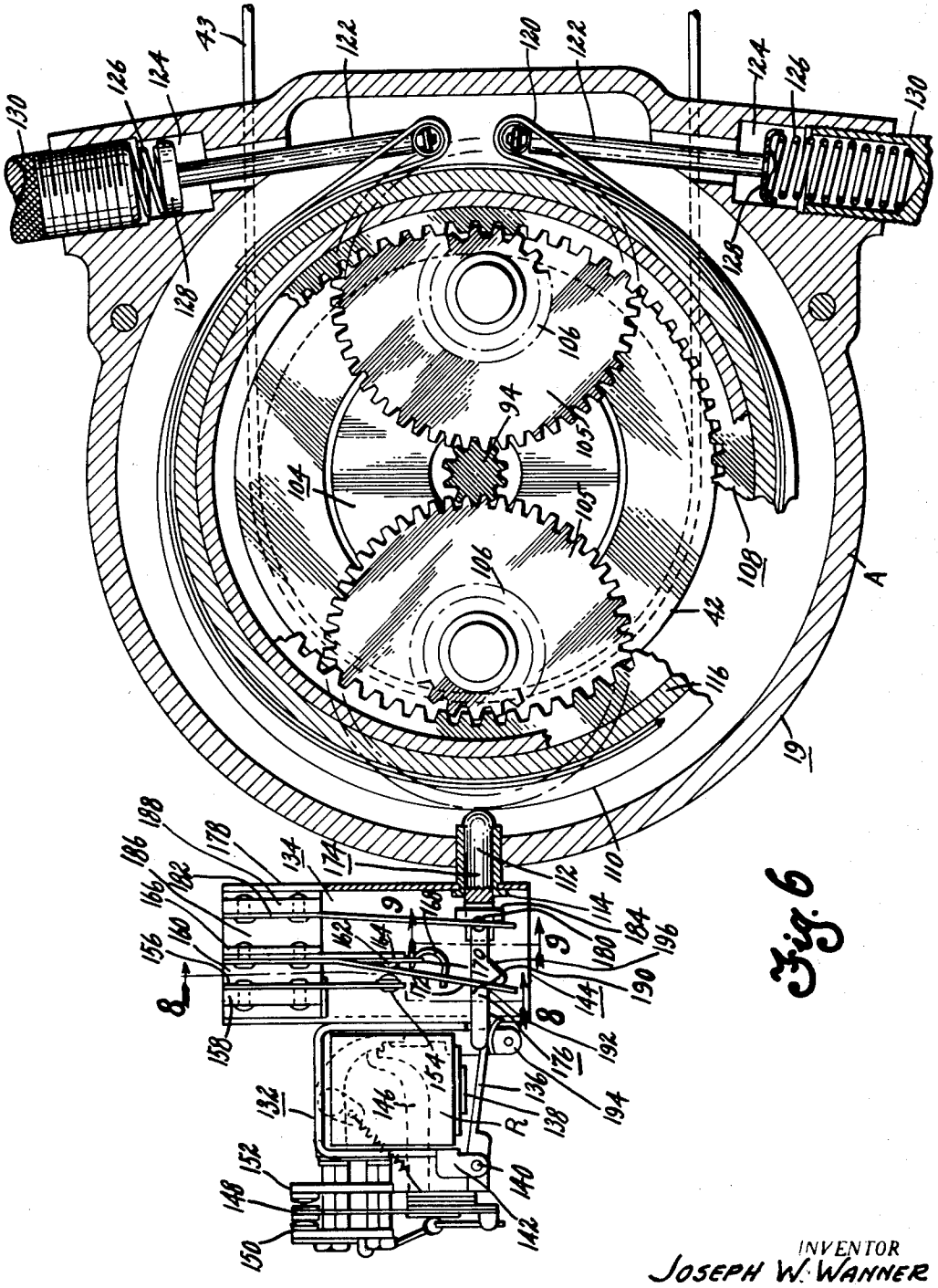


Fig. 6

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DOOR OPERATING MECHANISM

Original Filed June 22, 1955 4 Sheets-Sheet 4

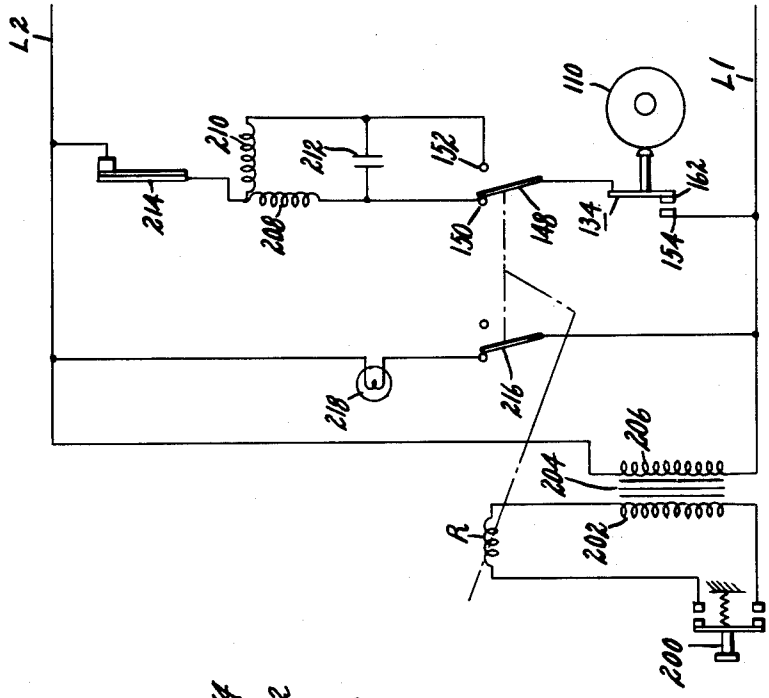


Fig. 10

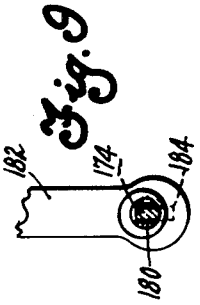


Fig. 9

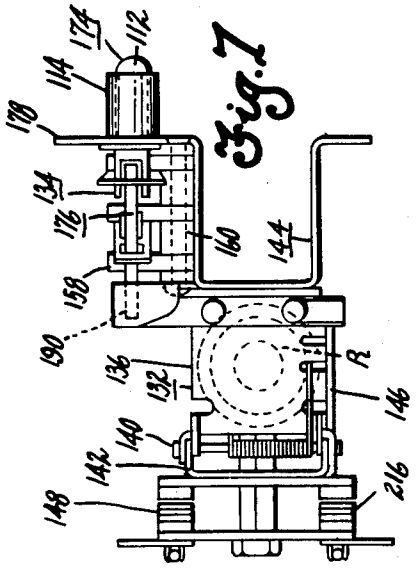


Fig. 7

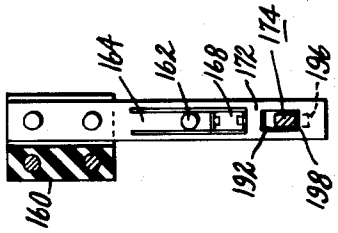


Fig. 8

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United States Patent Office 3,254,699 Patented June 7, 1966

3,254,699

DOOR OPERATING MECHANISM

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Continuation of application Ser. No. 35,559, June 13, 1960, which is a division of application Ser. No. 517,198, June 22, 1955, now Patent No. 2,992,819. This application Mar. 26, 1965, Ser. No. 442,983
4 Claims. (Cl. 160—193)

This is a continuation of application, Serial No. 35,559, filed June 13, 1960, and now abandoned which is a division of Serial No. 517,198, filed June 22, 1955, now Patent No. 2,992,819.

This invention relates to power operated mechanisms for operating closures and particularly closures of the operating type.

It is an object of this invention to provide a power operating mechanism for operating sliding closures and the like which includes a carriage slidably mounted on a longitudinal support operatively connected to a closure whereby a reciprocating movement of the carriage is operative to move the closure between open and closed positions and an electric motor operated means which reciprocably drives the carriage and actuates a control means when the closure encounters an obstruction to its movement.

It is another object of this invention to provide an electric motor operated means adapted to reciprocably move a carriage on a longitudinal support operative to open and close sliding doors and the like which includes a power transmission mechanism having a pulley for driving the carriage and a cam, operatively connected to an electric reversible motor driven pinion, wherein the cam is placed under a predetermined brake load whereby the pinion normally drives the pulley and when the load imposed on the pulley exceeds the load imposed on the cam, the pulley stalls and the cam is rotated to actuate a control means.

It is a further object of this invention to provide a power operated mechanism for operating closures of the sliding type which includes a carriage slidably mounted on a longitudinal support adapted to be reciprocably driven by a rope having ends thereof attached to the carriage to form an endless rope drive and including a link pivotally connecting the carriage to the closure, wherein the cable ends are cushioned with respect to the carriage and the link includes shock absorbing and spring means, whereby the closure may be moved between open and closed positions in a relatively noiseless and smooth manner and whereby the closure is constantly spring urged in a closed position.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is a side elevation view of the door operating mechanism including a fragmentary section of an adjacent wall and door to which it may be applied and showing in cross section a portion of a shock absorbing chamber and a manually detachable connection.

FIGURE 2 is a front elevation view in cross section taken along lines 2—2 in FIGURE 1 of the manually detachable connection.

FIGURE 3 is a side elevation view in cross section taken along line 3—3 in FIGURE 2 which is also shown in FIGURE 1.

FIGURE 4 is a top view of the door operating mechanism of FIGURE 1 showing portions of a carriage in cross section.

FIGURE 5 is a side elevation view in cross section taken along line 5—5 showing the transmission portion of a motor and control means.

FIGURE 6 is a cross sectional view of the transmission portion of a motor and control means having a portion of a ring gear broken away and a switch means which may be used therewith.

FIGURE 7 is a bottom view of the switch means shown in FIGURE 6.

FIGURE 8 is a cross sectional view taken along lines 8—8 in FIGURE 6.

FIGURE 9 is a cross sectional view taken along line 9—9 in FIGURE 6.

FIGURE 10 is a schematic circuit which may be used with the mechanisms of the present invention.

While the present invention may be used with a variety of sliding closures and particularly with closures which slide from a closed position in one plane to an open position in another plane, the preferred embodiment is described herein and shown in FIGURE 1 as a power operating mechanism for operating a door of the type which is moved in tracks 22 upwardly from a closed vertical position in a doorway to an open horizontal position above the doorway as is well known in the art.

The apparatus is illustrated generally in FIGURES 1 and 4 of the drawings. It includes a motor and control unit A, preferably attached to a ceiling by means of a support member 16 which includes a reversible motor, an electrical switch means shown in detail in FIGURES 6, 7, 8 and 9, a power transmission mechanism shown in detail in FIGURES 5 and 6 and a drive sheave pulley 42 of FIGURE 5. It further includes a mechanism B which includes a tube member 14 mounted horizontally over a doorway 12 and perpendicular thereto, a carriage 36 slidably mounted on tube 14, an idler pulley 30 and a drive pulley 42 of the power transmission unit A disposed at the other end of tube 14, and a cable 43 disposed about the pulleys and attached to carriage 36 whereby movement of drive pulley 42 causes a longitudinal movement of carriage 36 along tube 14. It also includes a shock absorbing, manually releasable link C for operatively attaching carriage 36 to door 10, the manually releasable feature of which is shown in detail in FIGURES 2 and 3.

The drive mechanism

Referring to FIGURES 1 and 4, a tube 14, disposed horizontally over a doorway 12 and perpendicular thereto, is held on one end to bracket member 16, integrally attached to a gear head 18 of motor and control unit A by bolt 20, the bracket member 16 also serving as a means for securing motor and control unit A to a support, as, for example, a ceiling. The other end of tube 14 is held by a support member 23 having cylindrical portions 24 engaging internal surfaces of tube 14, a collar or abutment 26 holding tube 14 against longitudinal movement, and a longitudinal projecting portion 28 which rotatably supports a sheave idler pulley 30 and is secured to wall 13 above doorway 12 by means of bracket 32 and bolt 34. A tubular carriage 36 is slidably mounted about tube 14 and has its longitudinal movement thereon limited in one direction by abutment 26 and in the other direction by an adjustment abutment consisting of a sleeve 38 of metal or preferably resilient material such as rubber, held in position by a clamp 40. Tubular carriage 36 is fitted with fiber cylindrical bearings internally and on each end thereof, suitably attached thereto, to provide a smooth and noiseless movement of carriage 36. Disposed within gear head 18 as may be seen in reference to FIGURE 5, is a sheave drive pulley 42 in aligned relation with respect to idler pulley 30. A cable 43 of steel or other suitable material is disposed about drive pulley 42 and idler pulley 30, and the ends thereof are looped and attached by

means of clamps **44** to stem portions of "T" shaped members **46** which in turn are disposed in apertures provided in opposed portions of outwardly extending bracket **48** of carriage **36**. A tension spring **50** connects head portions of "T" members **46** to provide cable tension between idler pulley **30** and drive pulley **42** whereby carriage **36** is caused to move longitudinally of tube **14** between abutments **26** and **38** in accordance with the direction of rotation of drive pulley **42**. Rubber bumpers **52** and **53** are interposed between head portions of "T" members **46** and bracket member **48** to absorb starting shock of cable **43**.

In the arrangement shown, with the idler pulley adjacent wall **13**, a shock absorbing link C is pivotally attached to carriage **36** and door **10** which will be hereinafter fully described, and the position of carriage **36** in contact with abutment **26** corresponds to door **10** being in a fully closed position while the position of carriage **36** in contact with adjustable abutment **38** corresponds to door **10** being in an open position as desired. As may be readily seen, abutment **38** may be moved in either direction to allow carriage **36** to move in the direction of drive pulley **42** to open doors of various heights to a desired open position.

Shock absorbing link mechanism

Referring to FIGURE 1, a shock absorbing link mechanism C is pivotally attached to carriage **36** and door **10**. It includes a shock absorbing mechanism of conventional construction including cylinder **54**, piston **56** operable therein in a well-known manner and a piston rod **58** connected to piston **56** and extending externally of cylinder **54**. Cylinder **54** has an eye member **61** pivotally attached to bracket **66** by means of bolt **65**, which, in turn, is bolted to bracket **64** and door **10** to form a pivotal connection between link C and door **10**. The opposite end of link C is pivotally attached to carriage **36** by manually detachable means including bracket or dog **68** having an aperture and internal thread portions receiving threaded portions of rod **58** locked thereto by nut lock **60**, bracket **72** mounted on carriage **36** and carrying pin **78**, and slidable pin **82**, the details of which will be clearly described hereinafter. Link C further includes a compression coil spring **76** disposed about external portions of piston rod **58** and interposed between cylinder **54** and collar **62**, adjustably mounted on piston rod **58** by means of set screw **63**. The parts are dimensioned and adjusted so that when carriage **36** is positioned against abutment **26**, in a door closed position, a line X passing through the axis of pin **78** and bolt **65** in a vertical plane is substantially parallel to the vertical axis of door **10**, or preferably, the axis of pin **78** is located over center with respect to bolt **65** or on the door side of a line passing through the axis of bolt **65** and is parallel to the vertical axis of door **10**, whereby a toggle action is effected which locks the door even though the operating mechanism is capable of free wheeling. When the parts are so adjusted, compression spring **76** is operative to urge and maintain door **10** in a fully closed position.

The manually releasable pivotal connection between link C and carriage **36** may be more clearly seen by reference to FIGURES 2 and 3. Bracket **72** attached to carriage **36** consists of a pair of spaced downwardly depending members carrying therebetween a horizontally disposed pin **78**. Bracket or dog **68** has a laterally slotted portion **80** which defines a latch for receiving pin **78** and a latch pin **82** having an enlarged head portion slidably disposed in aperture **84** disposed normal to slot **80** and having a reduced diameter lower portion, for locking the carriage pin **78** within latch slot **80**. A compression spring is disposed about pin **82** within recess **84** between shoulder **83** of the enlarged portion of pin **82** and shoulder **85** of reduced diameter portion of recess **84** for normally maintaining pin **82** positioned across slot **80**, in a closed position. A cord **88** is provided for manually retracting latch pin **82**.

Motor and control mechanism

Referring to FIGURES 5 and 6, the motor and control mechanism A (FIGURE 4) includes a motor rotor, not shown, suitably mounted in a motor housing **19** (FIGURE 1) for vertical positioning having a shaft **92** and pinion **94** fixed thereto projecting into gear head **18** which consists of an outer wall **96** and an inner wall **98**. Drive pulley **42** is in the form of a ring having an annular portion **100** riding in a groove provided between annular shoulder **102** of circular retaining member **104** bolted to outer gear head wall **96**. Rotatably mounted on drive pulley **42** are a pair of oppositely disposed sun gears **105** meshing with pinion **94** and having reduced diameter gear portions **106** meshing with internal ring gear **108**. Internal ring gear **108** has a cam or eccentric outer surface **110** engaging an actuating plunger **112** reciprocably slidable in guide sleeve **114** disposed in wall **98** and forming part of a switch mechanism, which may be used with the present invention, to be described hereinafter, and circular projection **116** journalled on flange **118** of inner gear head wall **98**. The outer surface of circular projection **116** is substantially encircled by clutch or brake band **120**, the ends of which are suitably attached to inner ends of plungers **122** which, in turn, are disposed in apertures **124** of gear head portion **98** substantially tangentially to circular projection **116**. Plungers **122** are urged toward each other by compression spring **126** disposed between flanged ends **128** of plungers **122** and adjustable retaining plugs **130** whereby gear ring **108** is placed under a predetermined load by brake band **120**.

In operation, pinion **94** drives sun gears **105**. The load imposed by clutch or brake band **120** on gear ring **108** is sufficient to cause sun gears **105** to drive the drive pulley **42** which, in turn, causes longitudinal movement of carriage **36**, FIGURE 4. When carriage **36** reaches the limit of its travel in either direction, engaging abutments **38** or **26**, the load imposed thereby on drive pulley **42** overcomes the load imposed by brake band **120** on ring gear **108** and sun gears **105** drive ring gear **108** which actuates switch plunger **112** by means of the rotating cam surface **110** to stop the motor as will be hereinafter described more fully.

As indicated above and shown in FIGURE 1, door **10** is in a fully closed position when carriage **36** engages abutment **26** and is in an open position when carriage **36** engages abutment **38**. To open and close the door by means of an electric motor driven carriage **36**, it is desirable that the electric motor be of the reversible type and to control the electric motor by means of a reversing switch adapted to reverse the flow of current through the electric motor alternately each time the control switch is operated. It is also desirable that there be provided a main line control switch in series with the reversing switch to control the starting and stopping of the motor in response to carriage **36** reaching either abutment **26** or **38**. The main line control switch is also operationally connected with the reversing switch so that actuation of the reversing switch will also effect actuation of the main line control switch to provide for closing of electrical circuit through the reversing switch and thereby permit operation of the electric motor in the direction of rotation established by the position of the reversing switch. The switches are related in such a manner that when the main line control switch has been actuated by the reversing switch in initiating operation of the motor, the reversing switch may thereafter be actuated any number of times without causing any actuation of the main line control switch whereby the movement of carriage **36** may be reversed any time it is situated between abutments **26** and **38**.

Referring to FIGURES 6 and 7, the reversing switch is generally designated as **132** and connected in series therewith is the control switch generally designated as

134. This switch mechanism is the subject matter of United States Patent No. 2,826,658, issued March 11, 1958, to George W. Jackson, and assigned to the assignee of the present invention.

Reversing switch **132** includes a solenoid relay coil R having associated therewith an armature **136** attracted by core **138** when energized. Armature **136** is pivotally mounted on pivot pin **140** carried on bracket **142** which supports relay coil R and which is supported on a "U" shaped base **144**.

The armature **136** is adapted to actuate the reversing mechanism **146** by which contact member **148** is alternately disposed between contacts **150** and **152** each time relay coil R is energized to thereby reverse the flow of current through the motor to cause it to rotate alternately in an opposite direction.

The mechanism constituting switch mechanism **132** is relatively standard reversing switch adapted for reversing electric circuit to an electric motor.

The main line control switch **134** includes a contact **154** carried on rigid arm **156** supported between electrical insulating blocks **158** and **160** carried on base **144**. A second contact **162** is carried upon a resilient contact arm **164** which is supported between electrical insulating blocks **160** and **166**. Resilient contact arm **164** is adapted to move contact **162** into and out of engagement with contact **154**. Response to snap acting movements is effected upon resilient arm **164** by means of a "U" shaped leaf spring **168** carried between end **170** of arm **164** and an actuating member **172**. As the actuating member **172** moves inwardly and outwardly of the motor housing **19** as hereinafter described, the points of engagement of spring **168** with the actuating member and with arm **164** effects a toggle action on arm **164** to move contacts **162** toward and away from contact **154** in a manner well known in the art.

The actuating member **172** is operated by means of actuator **174** which comprises a plunger **112** which engages cam surface **110** and a second portion **176**. The plunger **112** is reciprocally slidable in guide sleeve **114** carried in wall **178** of base **144**. The actuation portion **176** is carried on plunger **112** by means of a pivot pin **180** which provides for oscillation of actuator portion **176** relative to the axis of plunger **112**. Further, actuator portions **112** and **176** are in substantial alignment so that reciprocation of plunger **112** is transmitted to the actuator portion **176**.

The actuator portion **176** is disposed normally in generally axial alignment with plunger **112** by means of a leaf spring member **182** which engages a ledge **184** provided in actuator portion **176**. The ledge **184** is generally angularly shaped in the plane of leaf spring **182** whereby the normal position of actuator portion **176** is coaxial of the axis of plunger **112**. The leaf spring **182** is carried between insulating blocks **186** and **188** supported on the base **144**.

The actuator portion **176** has a finger **190** which extends through an opening **192** in actuator member **172** and is adapted to be engaged by an arm **194** projecting from armature **136** of solenoid relay coil R. The actuator portion **176** is also provided with a ledge **196** adapted to engage actuating member **172** on the forward edge **198** of slot **192** to hold the actuating member **172** in the position shown in FIGURE 6.

The position of the switch mechanism shown in FIGURE 6 is the normal position attained when carriage **36** is in contact with abutments **26** or **38**.

FIGURE 10 shows schematically an electric circuit for causing operation of the motor to effect opening and closing of a garage door. In the circuit, a manually operated push button control **200** which closes an electric circuit through secondary coil **202**, of a transformer **204**, the primary coil **206** thereof being connected to power lines L_1 and L_2, closing the circuit by push button **200** or other means as, for example, radio remote control, energizes solenoid R which, in turn, through operation of armature **136** effects actuation of reversing mechanism **146** of switch mechanism **132** whereby contact carrying arm **148** is moved alternately between contacts **150** and **152**. The contacts **150** and **152** are in series circuit with windings **208** and **210** of an electric motor, a capacitor **212** being provided to effect starting of the motor in a well-known manner. When switch arm **148** is in the position shown in FIGURE 10, the motor will operate in one direction of rotation and when arm **148** engages contact **152** the motor will operate in a reverse direction of rotation. A thermal overload switch **214** is provided in series with the motor to break the circuit in event of an overload condition.

In series circuit with arm **148** of switch mechanism **132** there is provided the contacts **154** and **162** of switch mechanism **134** adapted to be opened and closed by the cam member **110** when it is rotated.

A second contact carrying arm **216** may be provided on switch mechanism **132** to effect closing of an electric circuit to a lamp **218** when the carriage **36** is moved toward abutment **38** and to break the circuit to lamp **218** when carriage **36** is moved toward abutment **26** of tube **14**. To this end contact carrying arm **216** is interconnected with contact carrying arm **148** to operate concurrently therewith and is on the opposite side of switch mechanism **132** as shown in FIGURE 7.

Operation

FIGURE 1 shows carriage **36** and link C in a door closed position. Carriage **36** engaging abutment **26** has reached a limit of travel in a door closed direction. Link C is pivotally mounted to the door **10** a vertical distance from its base to effect a full door closure. However, to secure a closure of a desired degree of snugness, link C may be lengthened or shortened by variation of the depth to which piston rod **58** is screwed into bracket **68**. Further, the longitudinal position of collar **62** may be varied to increase or decrease the distance to which spring **76** will force connecting rod **58** out of cylinder **54** and thus vary the effective length of link C.

When the motor is energized to open the door, the initial impact of cable **43** on carriage **36** will be cushioned by bumper **52** giving the motor an opportunity to gain momentum before receiving a load and subsequent impact on door **10** will be absorbed by the shock absorber of link C in a well-known manner to further enable the motor to attain its speed before receiving the full load of the door. When the door reaches its open position, the impact of carriage **36** on abutment **38** will be cushioned by the resilient nature of abutment **38** and by cushion **52**, and the momentum of the moving door will be cushioned by the shock absorber of link C in a well-known manner. When the motor is energized to return the door to a closed position, initial starting impact is absorbed by a bumper **53** and the impact of carriage **36** against door **10** through link C is cushioned by the shock absorber of link C and spring **76**, if necessary, to enable the motor to gain momentum before receiving the full load. As the door is being closed, piston rod **58** is forced into cylinder **54** against compression spring **76** as it cushions the impact, and as the door reaches a fully closed position, the impact of carriage **36** engaging abutment **26** or the door meeting an obstruction, is taken by bumper **53** and the shock absorber including spring **76**. As previously mentioned, spring **76** also serves to hold the door in the fully closed position.

As previously noted, cable **43** is maintained in tension about the pulleys by spring **50**. Under nonoperating conditions, "T" members **46** and spring **50** are loosely held within bracket **48** of carriage **36**. On energization of the motor to cause rotation of drive pulley **42** in either direction, the appropriate "T" member engages carriage bracket **48** through the corresponding bumper to result in a

firm connection while spring member **50** takes up any slack in the rope drive.

In describing the operation of the switch mechanism, relative movement of the switch parts will be indicated as moving inwardly or outwardly of the motor housing **19**. The mechanism shown in FIGURE 6 is in a position attained at the end of the movement of garage door **10** upon either the opening or closing thereof. The cam surface **110** has effected inward movement of actuator **174** to cause the ledge **196** thereof to move actuator member **162** of switch mechanism **134** inwardly to effect opening of contacts **154** and **162** and thereby stop operation of the motor in response to carriage **36** having reached either abutment **26** or **38** whereby drive pulley **42** has been stalled so as to cause the motor to rotate cam **110**.

When the garage door is to be moved in an opposite direction, the push button switch **200** is closed energizing the solenoid relay coil R of switch mechanism **132**. Energization of relay coil R attracts armature **136** toward core **138** and thereby actuates mechanism **146** to move contact carrying arm **148** either inwardly or outwardly depending on its previous setting to set up the circuit to motor windings **208** and **210** for reverse rotation from that effected just prior to the previous stopping of the motor.

When armature **136** moves against core **138** of relay coil R, the actuator portion **176** is oscillated in a clockwise direction about its pivot **180** to thereby release actuator member **172** from the ledge **196** of the actuator portion **176**, the opening **192** allowing the actuator member **172** to move downwardly over ledge **196** as the actuator portion **176** is moved in the clockwise direction.

When the actuator member **172** moves outwardly, the spring member **168** effects a snap action of the contact carrying arm **164** to close contact **162** upon contact **154** and thereby close electric circuit to the electric motor to start the same.

After actuating member **172** has been released from ledge **196**, armature **136** may thereafter be moved toward relay coil **138** by its energization to reverse the direction of rotation of the motor and thereafter reverse the direction of movement of carriage **36** without effecting the now closed position of contacts **162** and **154**, the inner end **190** of actuator portion **176** being free to oscillate on its point **180**, sufficient clearance being provided in the opening **192** for this purpose. The spring member **182** will return actuator portion **176** as shown in FIGURE 6 whenever the relay coil is de-energized by opening of push button **200**. Thus, the actuator portion **190** is always reset to the active position irrespective of the number of times the relay coil R may be de-energized after initial actuation of the relay coil which has effected closing of contacts **154** and **162** to start the motor.

With the switch mechanism in the position aforementioned effecting the initial starting of the motor, the motor will not stop unitl the garage door reaches an open or closed position and carriage **36** engages abutment **26** or **38** or meets an obstruction which prevents the door from reaching its full open or closed position as determined by abutment **26** or **38**. In either event, stopping of the garage door in its movement will cause drive pulley **42** to stop. As a result, the overload created thereby causes pinion **94** to drive sun gears **105** rotationally about their axes and thereby rotate ring gear **108** against the load imposed by brake band **120**. When this occurs, cam surface **110** rotates with ring gear **108** to allow the actuator **174** to move inward until plunger **112** engages the low side of the cam surface which is 180° opposed to the engagement of cam surface **110** with plunger **112** shown in FIGURE 6.

When actuator **174** reaches the low point of its reciprocation, the ledge **196** will be drawn downwardly through opening **192** in the actuating member **172** to reset ledge **196** in engagement with the forward edge **198** of opening **192**.

Continued rotation of cam surface **110** will cause an upward movement of plunger **112** as the cam surface is now rotating to the high point shown in FIGURE 6 so that actuator **174** moves upwardly, actuator member **172** will be carried by ledge **196** in an upward direction until spring **168** effects a snap opening movement of contacts **154** and **162** as shown in FIGURE 6, to again open the circuit to the motor. The switch mechanism is now reset to provide for actuation of the motor in the opposite direction on subsequent energization of relay coil R.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In an overhead door operating mechanism that includes an electric motor driven reciprocable carriage for opening and closing of a door, a link for connecting a carriage to a door comprising in combination, a hydraulic shock absorber including a cylinder having a piston reciprocable therein and a connecting rod connected at one end to said piston and having the other end extending externally of said cylinder, a first pivotal connection at the rod free end of said cylinder for connection with a door, an offset bracket connected at an end portion of said connecting rod, a second pivotal connection on said bracket for connection with a reciprocable carriage, a collar mounted on said piston rod between said cylinder and said pivotal connection on said rod, and a compression spring interposed between said collar and said cylinder urging said cylinder away from said collar to dispose said piston intermediate the ends of said cylinder to provide for extension of the shock absorber in one direction of movement and compression in the opposite direction of movement thereof on opening or closing of a door, said compression spring being axially aligned with said piston rod, said piston rod being axially aligned with said first pivotal connection, said offset bracket locating said end portion of said connecting rod inwardly of the door a greater distance than said first pivoted connection when the door is closed to locate the longitudinal axis of said shock absorber at a predetermined inclination with respect to the closed door, said spring being compressed between said collar and said cylinder when said shock absorber is at said predetermined inclination to apply a downward door closing force on the door through said second pivotal connection for biasingly positioning the door toward a fully closed position.

2. In the combination of claim **1**, said piston rod having an externally threaded surface, said collar being threaded on said surface for axial movement therealong to adjust the piston centering effect of said spring.

3. In an overhead door operating mechanism that includes an electric motor driven reciprocable carriage for opening and closing of a door, a link for connecting a carriage to a door comprising in combination, a hydraulic shock absorber including a cylinder having a piston reciprocable therein and a connecting rod connected at one end to said piston and having the other end extending externally of said cylinder, a pivotal connection at the rod free end of said cylinder for connection with a door, a bracket secured to and extending to one side of said other end portion of said connecting rod, pin means for pivotably connecting said bracket on a reciprocable carriage, a collar mounted on said piston rod between said cylinder and said bracket on said rod, and a compression spring interposed between said collar and said cylinder urging said cylinder away from said collar to dispose said piston intermediate the ends of said cylinder to provide for extension of the shock absorber in one direction of movement and compression in the opposite direction of movement thereof on opening or closing of a door, said compression spring being axially aligned with said piston rod, said piston rod being axially aligned with

said pivotal connection, said bracket locating said pin means in an overtoggle position with respect to said pivotal connection when the door is closed for locking the door in its closed position, said bracket and pivotal connection locating the longitudinal axis of said cylinder in a plane inclined inwardly of the door when the door is closed, said spring being compressed between said collar and cylinder when the door is closed to bias said cylinder downwardly against said pivotal door connection for producing a downwardly directed closing force on said door toward its closed position.

4. In the combination of claim 3, said piston rod having an externally threaded surface, said collar being threaded on said surface for axial movement therealong to adjust the piston centering effect of said spring.

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