Aug. 5, 1969 F. H. CARY 3,460,018

POWER STOP IN RESPONSE TO OVERLOAD

Filed Oct. 10, 1966

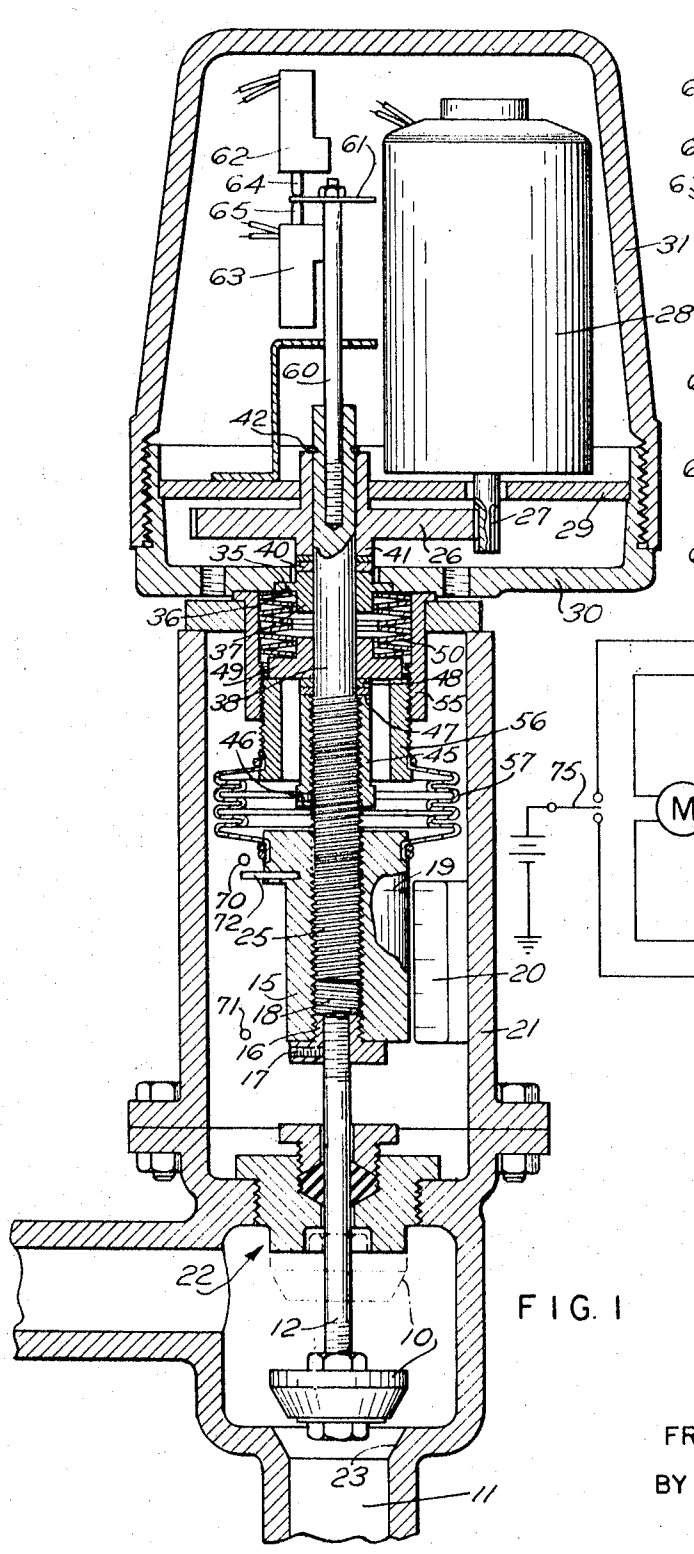


FIG. 1

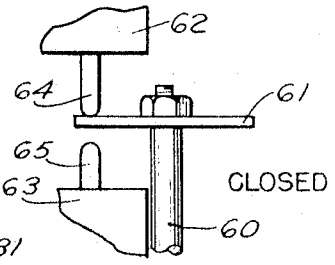


FIG. 3

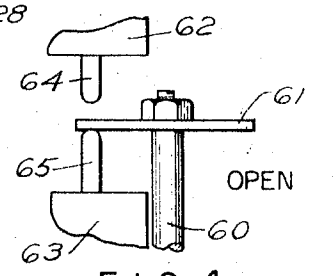


FIG. 4

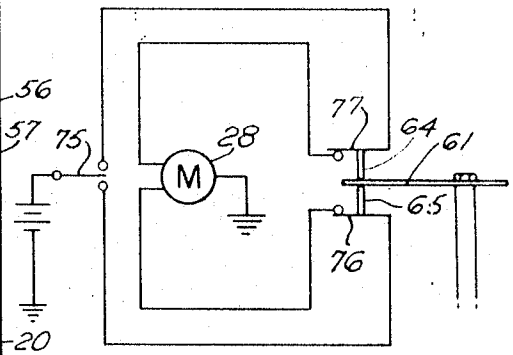


FIG. 2

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POWER STOP IN RESPONSE TO OVERLOAD

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U.S. Cl. 318—475 2 Claims

ABSTRACT OF THE DISCLOSURE

A motor driven actuator wherein the power means is made inoperative after the moved part has been brought into its desired position and wherein the actuator will cut off the power means not only at either end of the full stroke, but also during the stroke in either direction if any obstruction interferes with the normal motion of the moved part, and wherein the actuator has means which yields after the part has been brought into a desired position against the stop and the utilization of a single yieldable means permitting the power means to operate for a short period of time thereafter in either direction against the single yieldable means without placing an undue strain upon any of the parts and assuring that the part which has been moved will consistently be brought into its required position at either end of a stroke in opposite directions.

This invention relates to a power operated device which may be connected between a support and a member which is to be moved back and forth relative to said support between selected positions of operation and which may be operated to perform the function of moving some part positively and consistently into the positions which have been predetermined therefor. Although the invention is of general utility for the moving of mechanical parts, it is especially adapted for the movement of a valve from open to closed position.

The invention provides a device wherein a part may be moved forwardly and rearwardly between two positions predetermined by stops wherein the power means is deactuated after the moved part has reached either of the stops, there being incorporated therein a yieldable element which yields during the operation of the power means after the moved part has engaged either of the stops, in association with the control for the power means which operates after yielding of the yieldable means has occurred.

It is an object of this invention to provide a single yieldable means or unit which may be actuated in either direction; that is, it may be moved in one direction when one stop is engaged or may be moved in the other direction when the other stop is engaged, the arrangement being such that a duplication of yieldable means may be avoided.

Another object of this invention is to provide a motor driven actuator wherein the power means is made inoperative after the moved part has been brought into its desired position and wherein the actuator has means which yields after the part has been brought into a desired position against the stop and the utilization of a single yieldable means permitting the power means to operate for a short period of time thereafter in either direction against the single yieldable means without placing an undue strain upon any of the parts and assuring that the part which has been moved will consistently be brought into its required position at either end of a stroke in opposite directions or at any desired intermediate position.

With reference to the drawings:

FIG. 1 is a schematic sectional view of my invention employed for the opening and closing of a reciprocating valve;

FIG. 2 is a diagrammatic view of the circuitry involved for the control of the electric motor; and

FIGS. 3 and 4 are elevations of a fragmental portion of FIG. 1 showing closed and open positions of the valve.

In FIG. 1 of the drawings, a valve plug **10** is shown in a duct **11** with a valve stem **12** extending therefrom. The valve is illustrated in partly open position in full lines and in full open position in dotted lines when the valve stem is up. Closed position will be when the valve stem is down and the plug **10** closses the duct **11**.

The valve stem **12** is connected to a first threaded member **15** by means of a collar **16** and set screw **17**, the collar **16** being threaded into the internal threads of bore **18** in the first threaded member **15**. This first threaded member **15** is mounted so that it cannot rotate but may move axially of the bore **18**. Its position may be indicated by arrow **19** movable along an indicator **20** which is fixed to a support **21** which in this case is one of the legs which supports the upper casing.

The valve stem extends thru a gland and bonnet **22** preventing fluid in conduit **11** from entering the operating parts of the apparatus and serving as a stop for the full open position of the plug **10** as shown in dotted lines. The closed position of the plug engaging seat **23** would serve as a stop for the closed position of the plug.

A second screw member **25** threadedly engages the first screw member **15** by reason of its external threads engaging the internal threads of member **15**, and this second screw member is rotated by means of a gear **26** fixed on the second screw member or shaft **25** against axial movement along the shaft although the shaft while generally axially fixed is subject to slight movement axially thereof. The gear **26** is driven from a pinion **27** operated by electric motor **28** supported on a platform **29** mounted in casing **30** and is enclosed by a screw cover **31**. Casing **30** is supported on the legs **21** heretofore mentioned. This casing is provided with a downwardly facing shoulder **35** against which the flange **36** of the collar **37** engages. Collar **37** embraces a non-threaded portion **38** of the screw shaft **25**. This collar is held against rotation with shaft **25** and is essentially slidable along the shaft portion **38**. A thrust bearing **40** is engaged by a shoulder provided by the lower portion **41** of the hub of the gear **26** positioned between the collar **37** and the lower portion of this gear, while a snap ring **42** on the upper side of the gear hub holds the gear snugly against this bearing so there is no play between the gear and collar.

A nut **45** is fixed to the threaded portion **25** of the second screw member by a set screw **46** and provides an abutment shoulder **47** at its upper end upon which there is mounted a thrust bearing **48** to engage a second collar **49** surrounding the non-threaded portion **38** of the screw shaft and essentially slidable therealong. These collars **37** and **49** are hold against rotation with the shaft and between these collars there is provided a resilient means consisting of concave and convex washers **50** oppositely positioned but which may be compressed and will at all times tend to spread the collars **37** and **49** along the shaft **38** against thrust bearings **40**, **48** and against shoulders **41** and **47**. These collars and resilient means **50** are contained within a depending housing **55** and **56** extending downwardly from the lower portion of the casing **30**, while a protective glove **57** extends from this housing to a first threaded or screw member **15** to porvide a clossure of some of the vital mechanism of the device.

The spindle **60** extends upwardly from the upper end of the screw shaft or second screw member **25** and is provided with a radially extending arm or disc **61** at its upper end, which projects between normally closed switches **62**

and 63 as seen in FIG. 1 having plungers 64 and 65 on opposite sides of this radial arm 61.

If it is desired to move the valve stem 12 upwardly, switch 75 (FIG. 2) would be thrown downwardly to place motor 28 in circuit so as to rotate the shaft 25 in a direction to move the first threaded screw member 15 upwardly. When the first screw member has reached the limit of its upward motion by engagement of the valve plug 10 with the valve bonnet, there would be a reaction by reason of this screw member not being able to move any further upwardly, and therefore there would be a tendency or movement of the shaft 25 downwardly, there being a compression of the resilient means 50 by movement of this shaft downwardly and a pressure of the radial arm 61 on the plunger 65 as seen in FIG. 4 so as to open the circuit at 76 causing the motor to stop. If, however, it was desired that the valve stem 12 be moved downwardly, then the switch 75 would be thrown upwardly and a rotation of the screw 25 in a direction to move the first threaded member 15 downwardly. When the plug 10 engages the valve seat 23, it would be blocked from further movement, and consequently there would be a movement of the shaft 25 upwardly so as to force the plunger 64 upwardly as in FIG. 3 and open the switch at 77, thus stopping the motor 28.

The switches 76 and 77 will also operate to stop the motor if any obstruction interferes with the movement of the valve in any intermediate position between wide open and tightly closed.

In case the mechanism is used for some other operation than control of a valve, stop 70 may be used to have the same effect as the use of the bonnet 22 as a stop, and stop 71 may be used to have the same effect as the use of the valve seat 23 as a stop in conjunction with the traveling abutment 72 as above explained.

I claim:

1. In an actuator for moving a part to a prescribed position, a first screw member having connection to said part, a second screw member engaging the first screw member so that relative rotation of said screw members will produce operative movement of said first screw member, said second screw member provided with spaced opposed shoulders, means supporting said second screw member so that it may have rotary and axial movement, power means for rotating said second screw member, yieldable thrust means between and acting against said shoulders and resisting axial movement of said second screw member under normal load applied thereto, collars on said second screw member engaging said shoulders, said yieldable thrust means acting on said collars, said thrust means permitting axial movement of said second screw member when an overload is applied thereto in either direction as a result of the said part reaching its prescribed position and means actuated by the axial movement of said second screw member to stop the operation of said power means.

2. In an actuator as in claim 1 wherein said collars are axially slidable and held against rotation with said second screw member.

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U.S. Cl. X.R.

318—477

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(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,460,018 Dated August 5, 1969

Inventor(s) Francis H. Cary

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading, Column 1, Line 4, after 02857 insert the following, --assignor to General Signal Corporation, a corporation of New York. --

SIGNED AND
SEALED
FEB 24 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents