United States Patent

Mason

[15] **3,638,358**

[45] **Feb. 1, 1972**

[54] WINDOW-OPERATING APPARATUS

[72] Inventor: **Gordon A. Mason,** 41 Lamont Ave., Agincourt, Ontario, Canada

[22] Filed: **Apr. 30, 1970**

[21] Appl. No.: **33,194**

[52] **U.S. Cl.** **49/325,** 74/89.18

[51] **Int. Cl.** **E05f 11/00**

[58] **Field of Search** 49/325, 356, 324; 74/89.18, 74/89.19, 89.20

[56] **References Cited**

UNITED STATES PATENTS

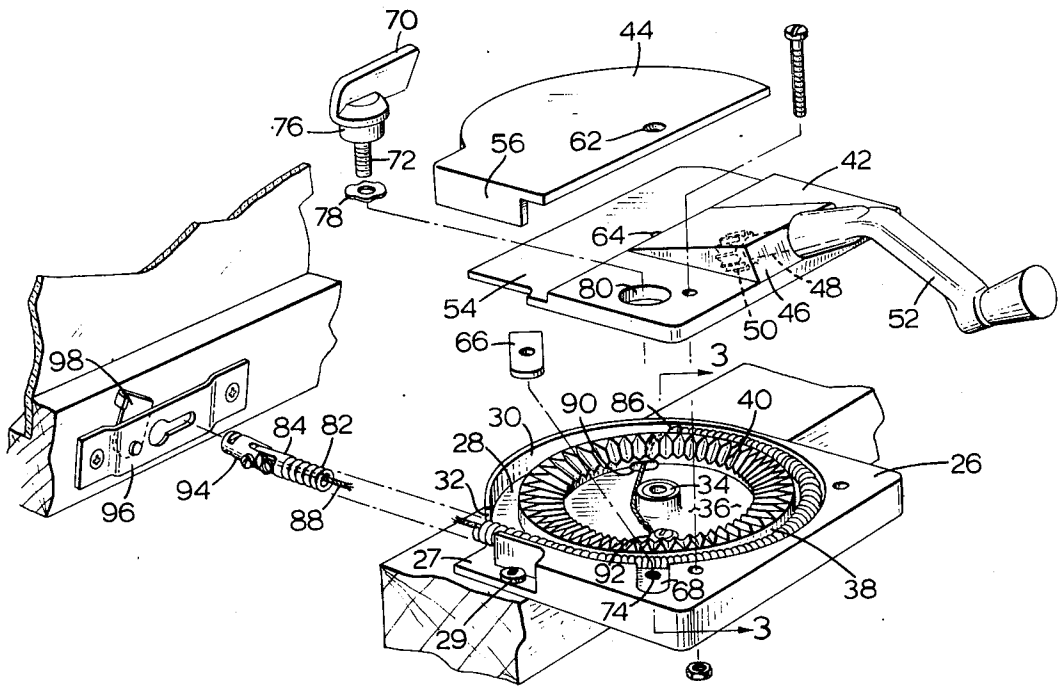
2,599,760	6/1952	Hanson et al.	49/325 X
2,832,590	4/1958	Youngberg	49/325

Primary Examiner—Kenneth Downey
Attorney—Fetherstonhaugh & Co.

[57] **ABSTRACT**

A push-pull actuator device for opening and closing windows and the like. The actuator device consists of a housing having a winding drum rotatably mounted therein and a flexible extensible member mounted on the winding drum. The flexible extensible member is in the form of a tightly coiled spring which may be stored within the housing by winding it on to the winding drum or it may extend from the housing in a straight line to open a window and hold the window in the open position.

10 Claims, 3 Drawing Figures



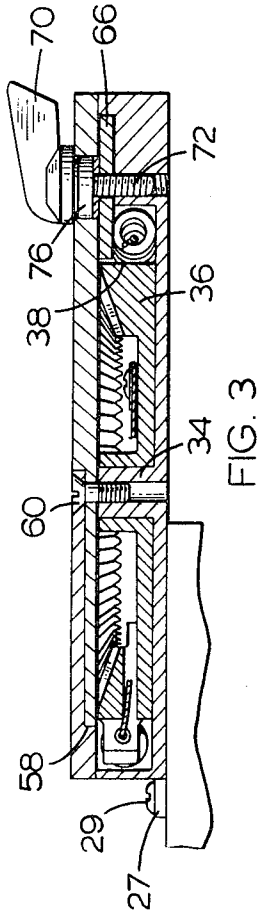


FIG. 3

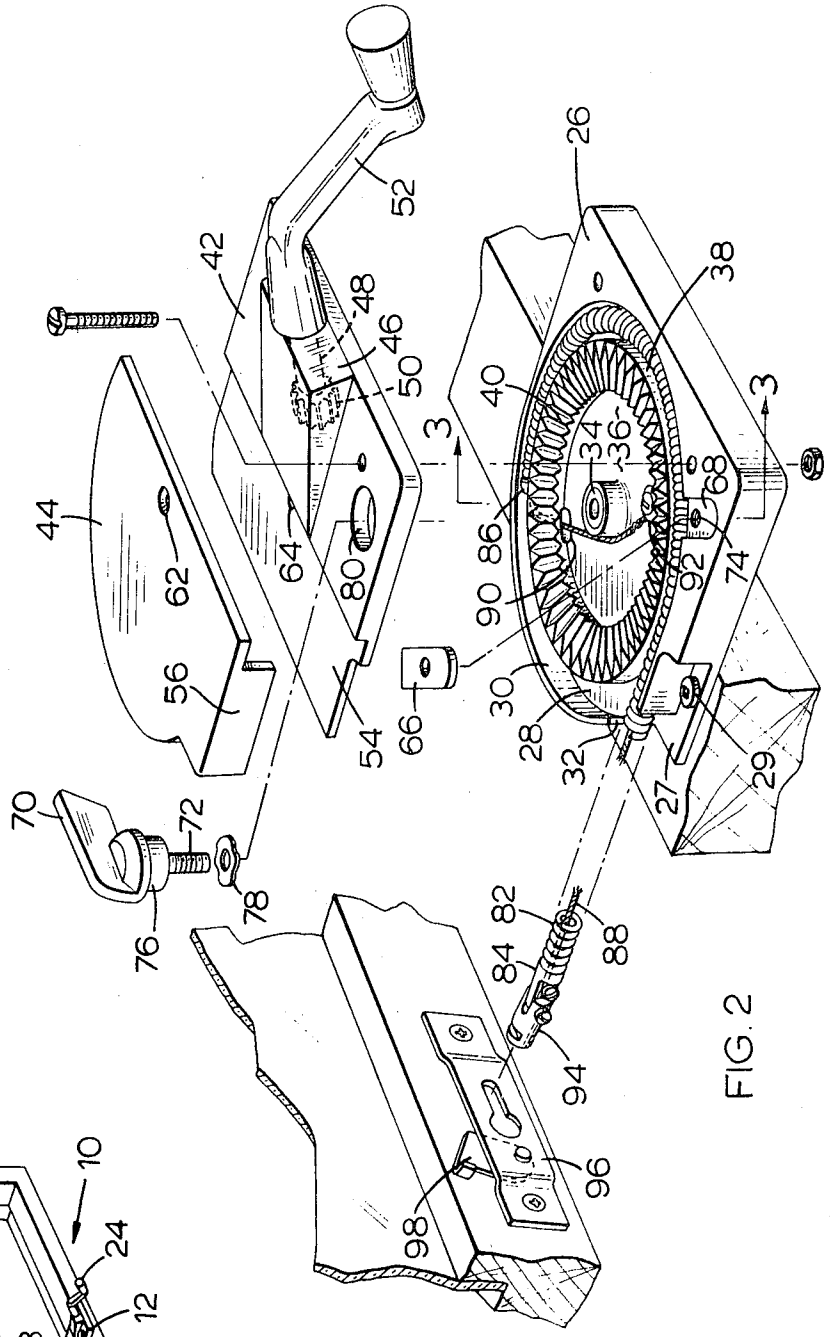


FIG. 2

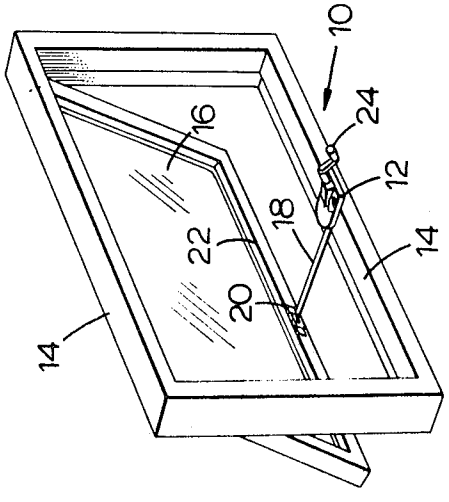


FIG. 1

INVENTOR.
GORDON A. MASON
BY Fetherstonhaugh & Co.
ATTORNEYS

WINDOW-OPERATING APPARATUS

FIELD OF INVENTION

This invention relates to a push-pull actuator device. In particular, this invention relates to a simple and inexpensive push-pull device which is suitable for opening windows which are pivotally mounted for rotation about either a horizontal or a vertical axis, or slidably mounted to open horizontally or vertically.

PRIOR ART

Manually operable devices for opening and closing pivotally mounted windows are well known. Most of these devices, however, employ a complicated system of pivotally connected levers to achieve the desired opening and closing. The cost of manufacturing and installing the known pivotally mounted lever deices is quite substantial. In addition, it has been found that considerable wear occurs in the area of the pivot pins which connect the levers of the known devices with the result that they very frequently become jammed or sufficiently loose to permit the assemblies to vibrate.

SUMMARY

The present invention provides a simple and inexpensive device for opening windows or the like without the use of pivotally connected lever arms.

According to an embodiment of the present invention, a device for opening and closing a window or the like comprises a housing adapted to be mounted on a window jamb or the like and a semirigid actuator member mounted in said housing and adapted to be moved into and out of said housing to open and close the window, as required in use. The semirigid actuator member is substantially rigid under tension and compression while also being adapted to be coiled upon itself for storing. The inner end of the actuator member is movably mounted within the housing and the outer end of the actuator member is adapted to be secured to a window frame. The actuator member is movable in the housing between a withdrawn position wherein a major portion of the actuator member is storably coiled within the housing and an extending position wherein a major portion of the actuator member extends outwardly from the housing. The device also includes drive means for driving the actuator member between the extended and the withdrawn positions.

A further feature of the device, according to the present invention, is the provision of an annular passage formed within the housing to receive the actuator member in a free-sliding relationship while restraining the actuator member against uncontrolled flexing.

PREFERRED EMBODIMENT

The invention will be more clearly understood after reference to the following detailed specification read in conjunction with the drawings, wherein,

FIG. 1 is a pictorial view of a window-opening device according to the present invention installed in a typical installation;

FIG. 2 is an exploded view of a device according to an embodiment of this invention; and

FIG. 3 is a sectional view of an assembled device taken along the line 3—3 of FIG. 2.

With reference to FIG. 1 of the drawings, it will be seen that the device of the present invention, which is generally indicated by the reference numeral **10**, includes a housing **12** which is mounted on the lower jamb **14** of a window frame. The window **16** is pivotally mounted to the upper jamb **14**. An actuator member **18** extends outwardly from the housing **12** to be connected at its outer end to a bracket **20** mounted on the sash **22** of a window. By turning the crank arm **24**, the actuator member **18** is wound into and out of the housing **14** to open or close the window, as required in use. It will be understood that, while in FIG. **1** of the drawings the actuator device is mounted to pivotally move a window which is pivoted in a horizontal plane, the device is equally applicable for use in opening and closing a window which is pivoted in a vertical plane.

Referring to FIG. **2** of the drawings, it will be seen that the housing includes a main body portion **26** which is formed with a circular chamber **28** which has an annular sidewall **30**. An opening **32** is formed in the sidewall **30** to provide access to the central chamber. The main body **26** has mounting flanges **27** which are adapted to be secured to the jamb **14** by mounting screws **29**. As shown in FIGS. **2** and **3**, the housing has a centrally located boss **34** extending upwardly from the plane of the bottom wall of the chamber **28**. The upper end of the boss **34** is threaded. A winding drum **36** is mounted for rotation on the boss **34**. The winding drum **36** has an annular winding surface **38** arranged in a spaced parallel relationship with respect to the annular wall **30** of the chamber **28** so as to define a passageway therebetween. Bevelled gear teeth **40** are formed on the upper surface of the winding drum **36**. The top cover for the housing consists of a backplate **42** and a front plate **44**. The backplate **42** has a projection **46** extending upwardly therefrom. A shaft **48** is rotatably mounted in the top plate and extends through the projection **46**. A gearwheel **50** is secured to the lower end of the shaft in a position to drivingly engage the gear teeth **40** of the drum **36**. A crank handle **52** is mounted on the outer end of the shaft **48**. The backplate **42** has a lip portion **54** extending outwardly at the front edge thereof to provide a recess of a depth substantially equal to the thickness of the front top plate **44**. The front top plate **44** has a sidewall **56** which projects downwardly therefrom. A shoulder **58** is formed adjacent the outer end of the front cover **44** to abut the outer end of the lower cover plate **42**, as shown in FIG. **3**. The covers **42** and **44** are secured to the housing **26** by a countersunk screw **60** which extends through the openings **62** and **64** to threadably engage the threaded boss **34**. A locking device in the form of a locking plate **66** mounted in a recess **68** formed in the housing **26** is actuated by a thumbscrew **70** which has a threaded stud **72** at the lower end thereof passing through the plate **66** and threadably mounted within the opening **74** of the housing. The thumbscrew **70** has a collar **76** at its upper end and a spring washer **78** mounted between the collar **76** and the locking plate **66**. The collar **76** is adapted to rotate freely within the opening **80** formed in the top cover **42**.

The actuator member **18** consists of a closely wound coil spring **82** which has an end cap **84** secured at its outer end and an end cap **86** secured at its inner end. The end cap **86** is secured to the winding drum **36**. A wire **88** is secured at its outer end to the end cap **84** and extends longitudinally through the spring **82** and end cap **86** to extend inwardly of the winding drum **36** through the opening **90** to be secured by a clamping screw **92**. The spring member **82** is sufficiently flexible to wind around the winding drum **36** and it is proportioned to fit in a free-fitting sliding relationship within the passageway **38** formed between the winding drum and the annular wall of the cavity. The spring member **82** extends outwardly from the housing through the opening **32** and it is sufficiently rigid to extend outwardly from the housing in a substantially straight line while being sufficiently flexible to move with the window in use. A mounting pin **94** is pivotally secured to the end cap **84** and it is adapted to fit within the bracket **96**, which is mounted on the sash of the window. The bracket **96** has an opening formed therein to receive the pin **94** and a pivotally mounted releasable locking lug **98** serves to releasably secure the pin **94** to the bracket **96**.

In use, when the window is closed, the major portion of the actuator member is located within the housing. To open the window, crank handle **52** is rotated. This, in turn, rotates the gear **50** and winding drum **36**. As the winding drum **36** rotates, the actuator member **18** is moved outwardly from the housing to push the window to the open position. The rigidity of the actuator member is sufficient to ensure that the window may be pushed to an open position without any substantial flexing

of the actuator member. It will be noted, however, that in the opening of the window the lower edge of the window moves in an arc such that a rigid bar connected to the window would not be capable of moving the window beyond a very limited arcuate movement. With the spring actuator device of the present invention, it is possible to effect a very substantial opening of the window by reason of the fact that the spring is sufficiently flexible to accommodate the displacement of the connection with the window from the plane of the housing. When the window is opened to the extent required, the thumbscrew **70** is rotated to cause the clamping plate **66** to bear down upon the coil spring **82**. The coils of the spring **82** which are under the clamping plate **66** are compressed while the adjacent coils will remain uncompressed such that the uncompressed coils will form shoulders bearing against the side edges of the clamping plate **66** to further lock the spring in the preset position. It will also be noted that, even if the clamping screw is not applied, the gear reduction of the drive mechanism is such that the winding drum will not be readily wound under the influence of pressure supplied to the actuator device. Furthermore, by restraining the movement of the spring within the annular passage formed in the housing, it is not possible to effect a movement of the actuator device by flexing the spring within the housing.

When it is necessary to close the window, the crank handle is again rotated and the winding drum winds the actuator member **18** into the housing. When the window approaches the closed position, the spring **82** will become very slightly extended so as to be under a slight tension. This tension serves to retain the window in a closed position. The amount of tension which can be applied to the spring is limited by the substantially inextensible wire **88**. The wire **88** ensures that it is not possible to lever the window open by stretching the spring **82**.

When the window is in the closed position, the locking device is again applied to lock the window in a closed position. Again, it will be noted that the locking device bears down against the spring.

From the foregoing, it will be apparent that the present invention provides a simple and inexpensive device for opening and closing pivotally mounted windows. The housing and winding drum of this device may very readily be manufactured from molded plastic material or the conventional bronze metals used in the manufacture of window hardware.

Various modifications of this invention are possible without departing from the scope of the invention. For example, it would be possible to substitute a stem device of the type which is normally stored in a coiled flat stock configuration and which extends in a tubular configuration. While this substitution is possible, there are substantial advantages in cost and simplicity in the spring and coiler device of the present invention.

In a further modification, it may be possible to drive the spring relative to the housing by engaging the spiral recesses of the spring with a tangentially extending screw device to utilize the turns of the spring in the same manner as a screw thread.

It will also be readily apparent that this device may be used to move sliding windows relative to one another by screwing the housing to a window frame and securing the free end of the actuation member to the sliding window. In this arrangement, the actuator member will extend parallel to the plane of movement of the window.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A push-pull actuator device for moving one member of a pair of members relative to another comprising:

a. a housing adapted to be mounted on one of said members,

b. drive means mounted in said housing,

c. semirigid actuator means mounted for movement relative to said housing and consisting of a substantially inextensible cable member and a coil spring member, said coil spring member having a hollow interior passage extending longitudinally therethrough, said cable extending through said interior passage, the outer end of said cable being secured relative to the outer end of said coil spring and the inner end of said cable being connected to said drive means whereby said spring means may be driven inwardly relative to said housing by said cable in response to movement of said drive means, said drive means engaging said spring means such that the spring may be driven outwardly from said housing by said drive means to assume a substantially straight configuration projecting outwardly from said housing,

d. the outer end of said actuator means being securable to the other of said members to move said other member to-and-fro relative to said first-mentioned member.

2. A device as claimed in claim **1**, wherein said drive means includes:

a. a winding drum mounted for rotation in said housing, the inner end of said cable member being secured to said winding drum, the inner end of said coil spring engaging said drum, and

b. crank means drivingly engaging said winding drum to move said actuator means relative to said housing.

3. A device as claimed in claim **1**, wherein said drive means includes:

a. a winding drum mounted for rotation in said housing, the inner end of said cable being secured to said winding drum, said winding drum having gear teeth formed thereon,

b. crank means having complementary gear teeth formed thereon engageable with said teeth of said winding drum, said crank means being manually engageable to rotate said winding drum to move said actuator member between said extended and withdrawn positions.

4. A device as claimed in claim **1**, including locking means for locking said actuator member relative to said housing in any position between said extended position and said withdrawn position.

5. A device as claimed in claim **1**, wherein said main housing is formed with an annular passage adapted to receive said actuator means in a free-sliding relationship and to restrain said actuator member against uncontrolled flexing.

6. A device for moving a pivotably mounted window or the like to-and-fro between an open and a closed position, comprising:

a. a housing adapted to be mounted on a window jamb or the like,

b. said housing having a substantially circular chamber formed therein,

c. an opening formed in the annular wall of said chamber,

d. a winding drum mounted for rotation within said chamber and having an outer winding surface in spaced parallel relationship to said annular wall of said chamber to define an annular actuator receiving passage therebetween,

e. a semirigid actuator member which is substantially rigid under tension and compression while also being adapted to be coiled upon itself for storing,

f. said actuator member being adapted to fit within said actuator-receving passage in a close-fitting sliding relationship so as to slide freely therein while being restrained by the annular walls of said passage against uncontrolled flexing,

g. said semirigid actuator member consisting of a substantially inextensible cable member and a tightly coiled flexible spring member, said coil spring member having a hollow interior passage extending therethrough, said cable extending through said interior passage, the outer end of said cable being secured relative to the outer end of said coil spring and the inner end of said cable being secured relative to said drum whereby said actuator means may be drawn inwardly relative to said housing by said cable in response to movement of said drum,

h. said drum means engaging the inner end of said spring means to drive said spring means outwardly from said

passage through said opening in a substantially straight line in response to movement of said drum,

i. drive means for rotatably driving said winding drum to move said actuator means between said extended and withdrawn positions,

j. said outer end of said actuator member being adapted to be secured to a window sash in use.

7. A device as claimed in claim **6**, wherein said actuator member also includes an end cap mounted at the outer end of said coiled spring, said cable being connected at its outer end to said end cap.

8. A device as claimed in claim **1**, wherein said housing is formed from a molded plastic material.

9. A device as claimed in claim **6** wherein said main housing end and said winding drum are formed from plastic material.

10. A device as claimed in claim **6** including locking means for locking said actuator in any position between said extended position and said withdrawn position.

* * * * *