Aug. 14, 1956 A. C. SANFORD ET AL 2,758,834

OPERATING MEANS FOR CLOSURE DEVICE

Filed Nov. 5, 1954 4 Sheets-Sheet 1

Fig. 2

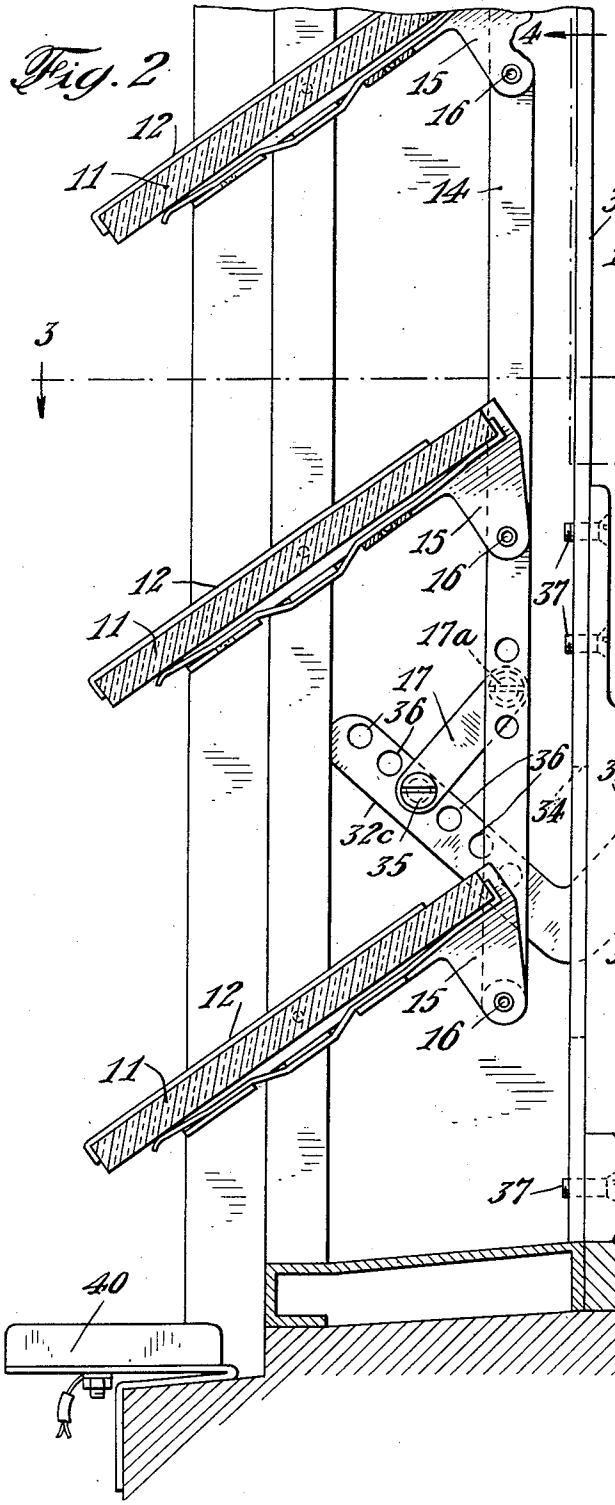
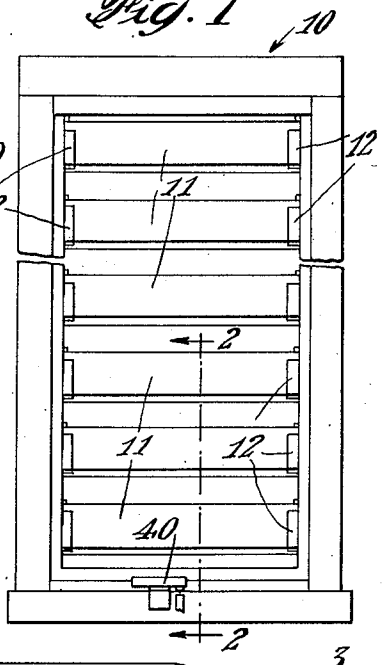


Fig. 1

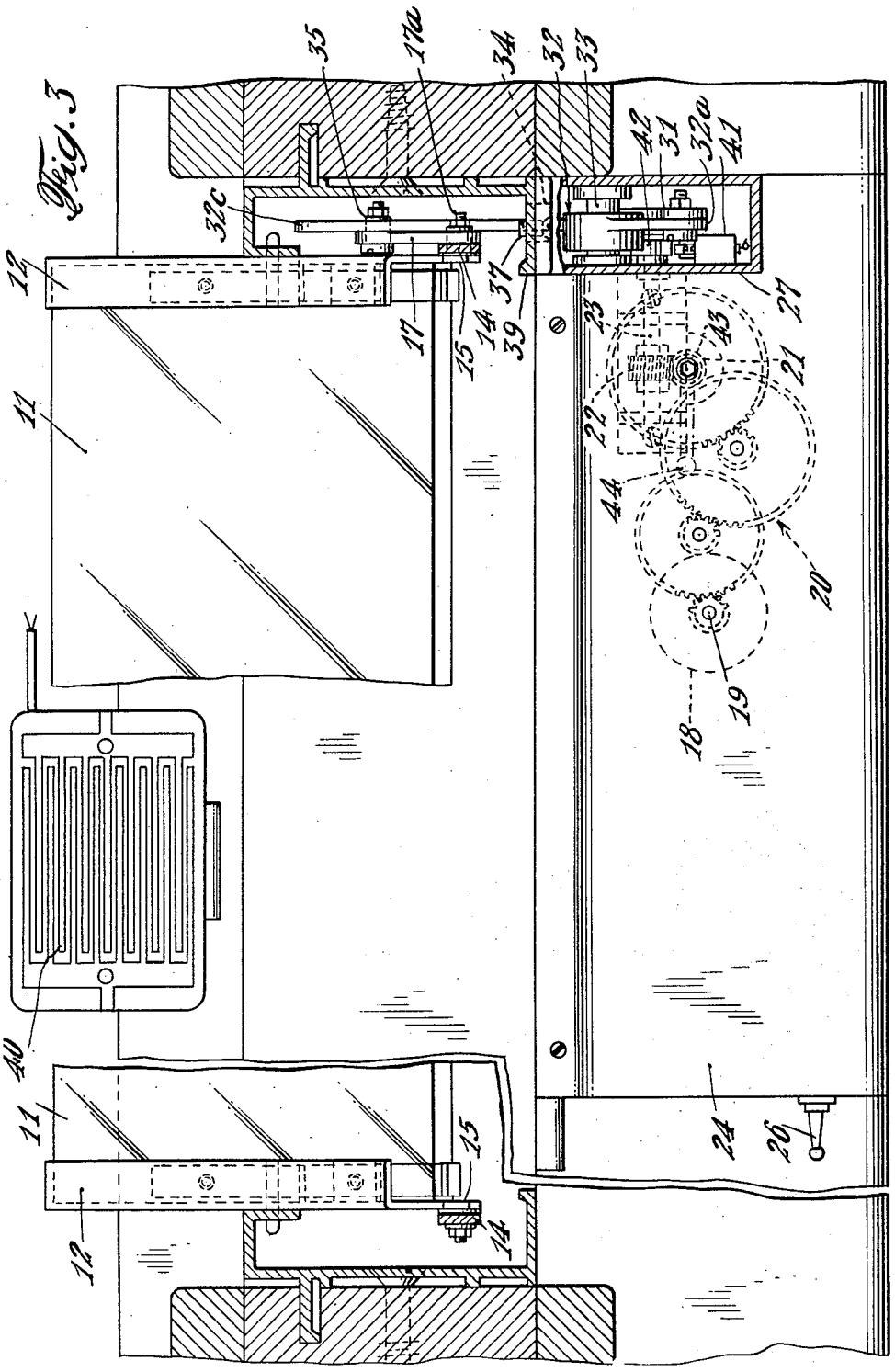


Aug. 14, 1956 A. C. SANFORD ET AL 2,758,834

OPERATING MEANS FOR CLOSURE DEVICE

Filed Nov. 5, 1954 4 Sheets-Sheet 2

Fig. 3

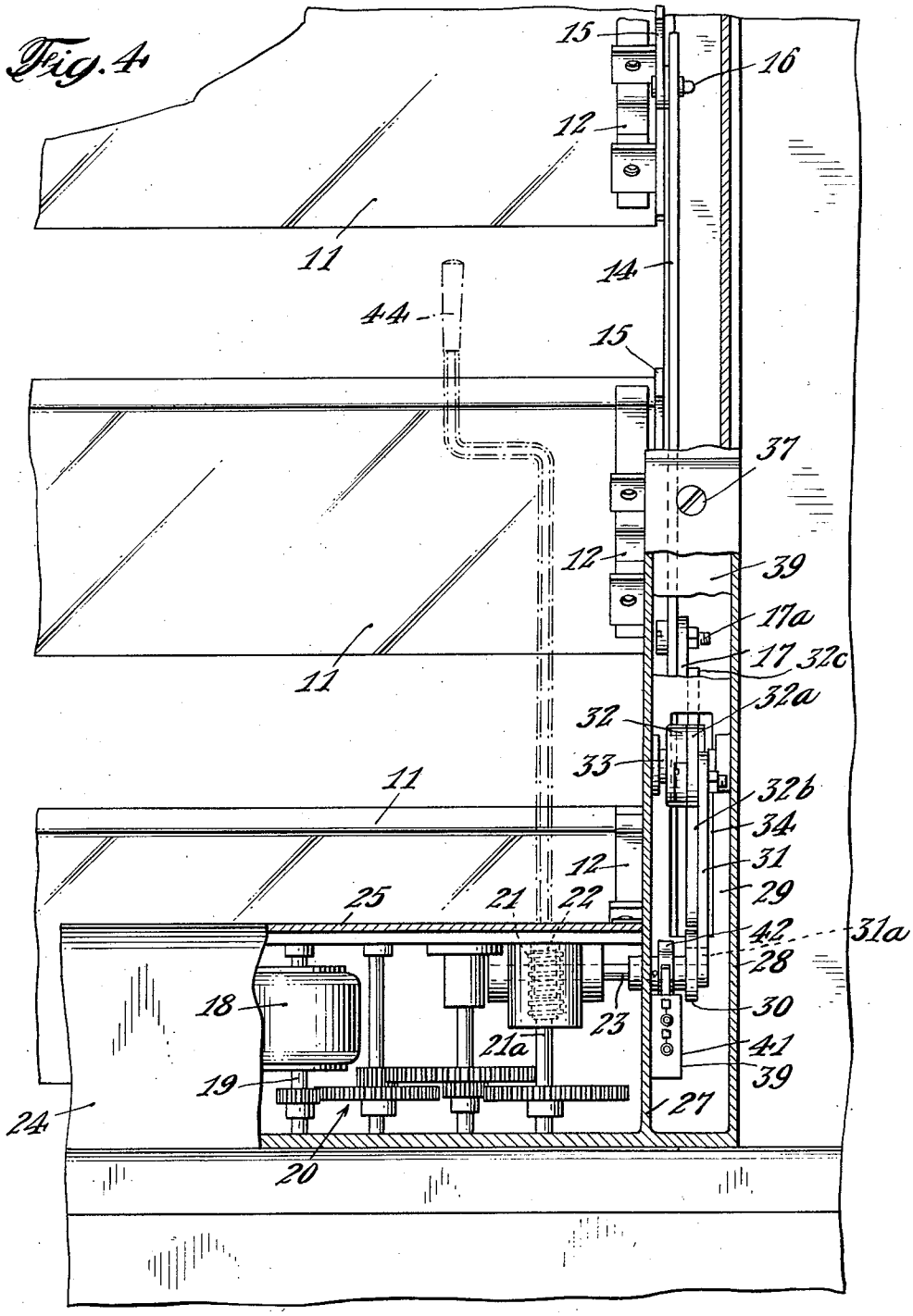


Aug. 14, 1956 A. C. SANFORD ET AL 2,758,834

OPERATING MEANS FOR CLOSURE DEVICE

Filed Nov. 5, 1954 4 Sheets-Sheet 3

Fig. 4



Aug. 14, 1956 A. C. SANFORD ET AL 2,758,834

OPERATING MEANS FOR CLOSURE DEVICE

Filed Nov. 5, 1954 4 Sheets-Sheet 4

Fig. 5

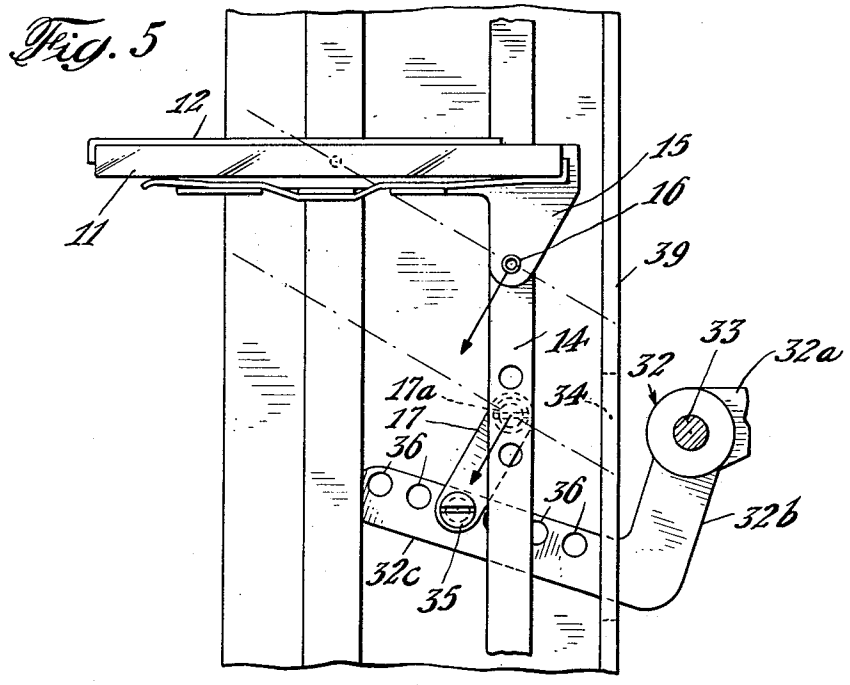
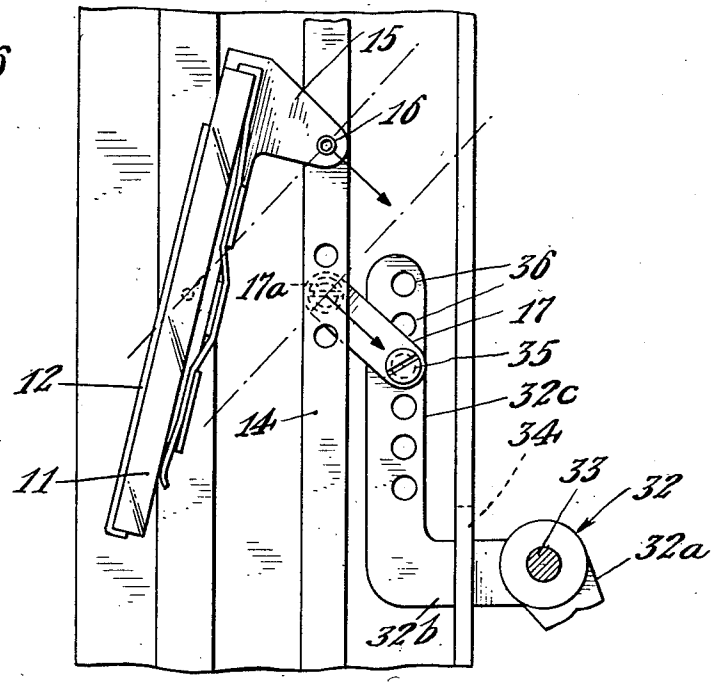


Fig. 6



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2,758,834

OPERATING MEANS FOR CLOSURE DEVICE

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Application November 5, 1954, Serial No. 467,036

4 Claims. (Cl. 268—23)

This invention relates to operating means for closure devices and more particularly to operating means for opening and closing windows especially well suited for operating jalousie or louvre type windows.

Numerous attempts have heretofore been made to provide a suitable apparatus for operating closure devices such as windows. Such apparatus may be manually or power operated and, in some cases, is intended to be at least partially automatic in operation. That is to say, the arrangement may be such that upon the occurrence of a given condition, such as rain, the apparatus may be automatically energized to shut the closure member. It is desirable that such apparatus be equally applicable to a wide variety of installations without the necessity of making any or, at least, no substantial changes therein. However, there is even a wide difference between the requirements of different types of window installations which may include casement, awning, double hung, sliding, jalousie, or other types. While it is possible to provide apparatus having a power output sufficient to meet the demands of any installation, it is obvious that such an expedient entails certain serious disadvantages. One objection would reside in the fact that all installations would be substantially equally costly, even though a particular one would neither require nor demand such an expenditure.

On the other hand, if advantage is taken of the fact that the requirements of one installation may be substantially less than others, it has heretofore been necessary to make substantial changes and modifications in the apparatus. This precluded the possibility of standardizing the equipment utilized and eliminated the possibility of using high speed mass production methods, with a consequent increase in unit costs.

In addition to the fact that the requirements may vary from installation to installation, there is also the fact that in certain installations the power requirement may vary substantially over the operating cycle. In particular, this is true of jalousie type windows which are normally counterbalanced so that if left free they swing shut. Because of this, as well as other reasons, substantially greater power is necessary during portions of the opening cycle than during the closing cycle. Heretofore it has been customary in such installations to provide a power supply capable of meeting the maximum demand even though the power required is not uniform throughout the entire operating cycle.

It is also important that such apparatus be compact and unobstrusive in order that it might be placed in close operating relationship with the window or device to be actuated thereby without detracting from the appearance or utility thereof. This is also important in connection with new constructions, i. e., new buildings or vehicles or the like which incorporate in their original construction window operating apparatus. This is the case since such apparatus should preferably be capable of being incorporated within the walls of the structure adjacent the window.

It is therefore a principal object of this invention to provide operating means for opening and closing windows having a substantially constant power input at a substantially constant time rate while having a varying power output with varying time rate so that the maximum power demands of a given installation are satisfied as required.

Another object is to provide such an apparatus in which the linkage between the load and the power source is arranged to minimize the power demand on the source.

A further object is to provide such an apparatus which is applicable to a wide variety of installations with substantially little or no change in construction.

Other objects as well as advantages of this invention will be apparent from the following description when read in conjunction with the drawings, in which:

Figure 1 is a front elevational view of a jalousie type window installation broken away for convenience;

Figure 2 is a sectional view through the line 2—2 of Figure 1 on an enlarged scale;

Figure 3 is a sectional view through the line 3—3 of Figure 2;

Figure 4 is a sectional view through the line 4—4 of Figure 2, and

Figures 5 and 6 are views similar to Figure 2 but partially diagrammatic showing the substantially fully open and closed positions respectively.

Turning now to the drawings, a jalousie type window installation is indicated generally by numeral 10 in Figure 1 and is shown as viewed from the front or outside of the structure. Window 10 comprises a plurality of parallel spaced panes 11 each mounted to rock about a horizontal axis. Each of the panes 11 is supported by two brackets 12 which are in turn rotatably mounted in the window frame members 13.

It may be well to point out here that, while the present invention is especially well suited for use in conjunction with jalousie or louvre type windows and is so illustrated and described, it is to be understood that the invention is highly useful in connection with other types of closure devices and in particular with other types of window constructions.

It is the usual practice in such installations to counterbalance the panes or panels in one way or another so that if left free they will swing shut. It is apparent, then, that somewhat more power is required to open than to close such windows. In order to facilitate the opening and closing of the panes included in a particular window, such as window 10, one or more substantially vertical elongated actuator bars 14 has heretofore been pivotally joined to the inner end portions of each of the panes 11. Actuator bar 14, when urged generally upwards, serves to simultaneously close each of the panes 11. When actuator bar 14 is urged downward, panes 11 are opened. As shown, each of the panes 11 has secured thereto a connector 15 each of which is in turn pivotally secured, as at 16, to actuator bar 14. An operating link 17 is pivotally secured adjacent one end thereof to actuator bar 14 at 17a and adjacent its other end is connected by means of a linkage to a drive means which may be manually or power driven, as desired.

The drive means includes a unidirectional motor 18, shown diagrammatically, having a drive shaft 19 connected through step-down gear train 20 to an input worm 21 on shaft 21a which meshes with output worm gear 22 mounted on rotatable shaft 23. As shown in Figures 3 and 4, motor 18, gear train 20, as well as worm gears 21 and 22, are mounted within a housing 24 and are secured to the base or side walls thereof, leaving the cover 25 of the housing free of encumbrances. Motor 18 is connected to a source of electrical power by means of circuit members which include three-posi-

tion switch 26, as indicated most clearly in Figure 2, where the three positions are designated as On, Off and Auto or Automatic.

Output shaft 23 extends adjacent one extremity of housing 24 and is journalled through a partition 27 which together with end wall 28 forms a vertically elongated and relatively narrow compartment 29. The outer extremity of output shaft 23 has secured thereto a crank 30 which is rotatable therewith and which in turn is connected to one end of an elongated connecting link 31, the other end of which is pivotally secured to the power arm 32*a* of rocker lever 32. Rocker lever 32 is rotatably mounted on a pin 33 rotatably secured between the opposed vertically extending walls 27, 28 adjacent to a slot 34 formed in the window jamb 39. The weight arm of lever 32 is substantially in the form of a right angle having one portion 32*b* terminating at the pivot 33 and another portion 32*c* extending at right angles thereto through slot 34 and removably secured to the end portion of operating link 17 by means of pivot 35.

An important feature of this invention resides in the arrangement of the linkage which interconnects actuator bar 14 with unidirectional motor 18. It will be observed that due to the rotation of panes 11 about their axes, actuator bar 14 is displaced in a horizontal sense when actuated to open or close panes 11 although its major movement is in a vertical sense. This horizontal and vertical oscillation of actuator bar 14 imparts a circular motion to any point along the bar, such as pivot points 16 and 17*a*, with each point describing an arc of a circle having its center located in a line joining the axes of the several associated panes 11. The pivot 17*a* at which operating link 17 is secured to actuator bar 14 follows or oscillates along a circular path having the same radius as that of each of the points 16 but about a different center. Furthermore, the tangents to each of these arcs drawn through the pivot points are parallel one with the other and may be taken as extending in the sense of the resultant tangential force vector of the force imparted to panes 11 by the actuator bar. As a consequence, the maximum or most favorable transfer of energy between operating link 17 and panes 11 through actuator bar 14 will take place when link 17 extends parallel to the tangential force vector which extends along the tangent through pivot point 17*a* to the circle of which the path of pivot point 17*a* forms a part.

As shown, operating link 17 and rocker lever 32 are arranged and operating link 17 may be installed so that at all times during the operating cycle it extends substantially parallel with the tangent to the arcs described by points 16 drawn through those points. As the weight arm of rocker lever 32 rotates, pivot 35 describes an arc extending to either side of actuator 14. When pivot point 35 is at the midpoint of its travel panes 11 are half open, operating link 17 is substantially vertical and parallel with the tangential force vector which also extends vertically for this position whether the panes are being opened or closed. As viewed in Figure 2, the apparatus is shown with panes 11 a little more than half way open and operating link 17 is therefore shown making a small angle with the vertically disposed actuator 14. The positions of the actuator 14, operating link 17 and rocker lever 32 corresponding to the horizontal position of panes 11 are shown in Figure 5 while those corresponding to when panes 11 are fully closed are shown in Figure 6. Portion 32*c* of rocker lever 32 is provided with holes 36 one of which provides for connection of operating link 17 for maximum power transfer as just described. However, if movement of panes 11 through a greater arc is desired, pivot 35 may be shifted to one of the outer holes 36 but this will result in some loss of power. On the other hand, if greater power with less movement of panes 11 is desired pivot 35 may be shifted to one of the holes 36 closer to portion 32*b*.

Referring once again to motor 18, gear train 20 and the linkage system connected thereto, it is seen that several important advantages are obtained. As previously indicated, motor 18 is nonreversible and may be run in either one direction or the other, depending upon its design, and, as is usually the case with unidirectional motors, may not be reversed. While crank 30 and connecting link 31 serve to convert the rotary motion of the output shaft 23 to an oscillatory back and forth motion, they also have the further advantage of varying the power and rate of motion imparted to actuator bar 14 through rocker lever 32. Referring once again to Figure 2, it is seen that the tangent through pivot point 31*a* at which connecting link 31 and crank 30 are joined is substantially perpendicular to connecting link 31 for each of the extreme positions of panes 11. In other words, when pivot point 31*a* reaches substantially the bottom of its fall along the circle described by the end portion of crank 30, panes 11 are fully closed. Continued rotation of crank 31 on shaft 23 starts pivot point 31*a* upward to reverse the direction of movement of connecting link 31 in the vertical sense thereby starting the opening cycle. Assuming that the apparatus is energized at the time described with panes 11 fully closed, it is apparent that actuator bar 14 is moved at minimum speed but with maximum power. It is believed clear that the maximum power demand upon the apparatus will occur at this point in the operating cycle when the windows are closed and are to be opened. It is further apparent that the apparatus is constructed and arranged to produce maximum power at the time required, while at other times in the operating cycle the windows are moved with greater speed but with less power.

Crank 30, connecting link 31, and rocker lever 32 are so related that portion 32*c* of the rocker lever weight arm extends substantially vertically, as viewed in Figure 2, when panes 11 are closed and substantially horizontally when the panes are wide open. Thus, here again, substantially maximum power transfer is effected between lever 32 and link 17 when the window is fully closed and requires maximum power to be delivered for opening the same.

Circuit closer 40 (Figures 1–3) does not form a part of the present invention but is described in detail in the application of H. C. Inman Serial Number 285,810, filed May 2, 1952, and entitled "Moisture Actuator Circuit Closer." It is mounted so as to be exposed to the atmosphere outside of the window 10 and is part of an electrical circuit (not shown) which is connected to the source of electrical power when switch 26 is thrown to its Auto or Automatic position. A microswitch 41 is also in circuit with circuit closer 40 and is actuated by a cam 42 fixed to and rotatable with shaft 23 adjacent crank 30. Cam 42 is so designed that, acting through microswitch 41, it may interrupt the circuit to bring the window panels to rest in predetermined positions.

A hexagonal or other type of recess 43 may be provided in the end of gear shaft 21*a* carrying input worm 21 to receive the end of a manual crank 44 (Figure 4) by means of which the apparatus may be manually operated in the case of power failure or as desired. It will be observed that whether or not the power is on, the arrangement is such that panes 11 are automatically locked or held in any position in which they may be left. The gear train and, in particular, the meshed worm and worm gear insure that the position of the window panels will not be shifted due to the effect of gravity, wind, or the like.

As has been previously indicated hereinabove, the present apparatus is primarily intended for use in old constructions and the various parts are so arranged to facilitate its use in a wide variety of installations. Here, the apparatus has been shown as installed on the sill of a window by means of bolts 37 in such manner that it does not interfere with the usual screening, storm sash, or blinds. Since existing louvre type window installations usually are provided with a jamb slot to permit lever or other op-

eration of the panels, housing 24 has an extended flat surface for the purpose of covering such a slot. The apparatus is shown installed on the window sill in the present instance for the purpose of illustration but it is not limited thereto since it may also be mounted in other locations. In particular, the apparatus may be mounted adjacent the upper end of a window and where drapery valances are utilized, the apparatus is particularly well suited for mounting along the top of the window where it will be hidden by the valance and be out of sight.

The terms and expressions which we have employed are used as terms of description and not of limitation, and we have no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. Operating means for a closure device having at least one panel member shiftable between open and closed positions, comprising a bilaterally movable actuator member adapted to be pivotally connected to said panel member with the pivot point at which said members are connected describing an arc when said panel member is shifted by said actuator member, a rocker lever pivotally mounted intermediate its ends and having a power arm and a weight arm on opposite sides of its pivot point, an operating link pivotally connected adjacent one end thereof to said weight arm and adjacent the other end thereof to said actuator member, said one end of said operating link being shiftable by said weight arm along a path extending on either side of said actuator member and maintaining said operating link parallel with a tangent to said arc through said first mentioned pivot point, and means connected to said power arm for pivoting said rocker lever.

2. Operating means for a closure device having a plurality of parallel panel members shiftable between open and closed positions, comprising a bilaterally movable actuator member adapted to be pivotally connected at pivot points to each of said panel members for simultaneously actuating the same with said pivot points describing parallel arcs when said panel members are shifted by said actuator member, a rocker lever pivotally mounted intermediate its ends and having a power arm and a weight arm on opposite sides of its pivot point, an operating link pivotally connected adjacent one end thereof to said weight arm and adjacent the other end thereof to said actuator member, said one end of said operating link being shiftable by said weight arm along a path extending on either side of said actuator member and maintaining said operating link parallel with a tangent to said arcs through said first mentioned pivot points, a unidirectional electrical motor adapted to be connected to a source of electric power, a rotatable output shaft, gear means connecting said motor to said shaft for rotating the same, a crank connected adjacent one end thereof to said output shaft and rotatable therewith, and a connecting link connected to said power arm and to the other end of said crank for pivoting said rocker lever.

3. Operating means for a jalousie type window having a plurality of parallel panes mounted between jambs and simultaneously swingable about their horizontal axes by means of a bilaterally movable actuator member pivotally connected to each of said panes with the pivot points at which said panes and actuator member are joined describing parallel arcs when said panel members are shifted by said actuator member, comprising a casing adapted to be mounted adjacent one of said jambs and having an

elongated portion extending along said one jamb, a rocker lever pivotally mounted intermediate its ends in said elongated casing portion and having a power arm and a weight arm on opposite sides of its pivot point, said weight arm extending toward said actuator through a slot formed in said one jamb, an operating link pivotally connected adjacent one end thereof to said weight arm and adapted adjacent the other end thereof to be pivotally connected to said actuator member, said one end of said operating link being shiftable by said weight arm along a path extending on either side of said actuator member for maintaining said operating link parallel with a tangent to said arcs through said first mentioned pivot points, a unidirectional electrical motor mounted in said casing and adapted to be connected to a source of electric power, a rotatable output shaft mounted in said casing and extending adjacent said elongated casing portion, a worm gear fixed to one end of said output shaft, gear means connecting said motor with said output shaft and including a worm engaging said worm gear, a crank fixed adjacent one end thereof to the other end of said output shaft and rotatable therewith, and a connecting link connected to said power arm and to the other end of said crank for pivoting said rocker lever.

4. Operating means for a jalousie type window having a plurality of parallel panes mounted between jambs and simultaneously swingable about their horizontal axes by means of a bilaterally movable actuator member pivotally connected to each of said panes with the pivot points at which said panes and actuator member are joined describing parallel arcs when said panel members are shifted by said actuator member, comprising a casing adapted to be mounted adjacent one of said jambs and having an elongated portion extending along said one jamb, a rocker lever pivotally mounted intermediate its ends in said elongated casing portion and having a power arm and a weight arm on opposite sides of its pivot point, said weight arm extending toward said actuator through a slot formed in said one jamb, said weight arm having two portions extending substantially at right angles to each other with one portion spaced from the rocker lever pivot by the other, said one portion of said weight arm having a plurality of holes spaced therealong, an operating link pivotally connected adjacent one end thereof to said one weight arm portion at one of said holes and adjacent the other end thereof to said actuator member, said one end of said operating link being shiftable by said weight arm along a path extending on either side of said actuator member for manitaining said operating link parallel with a tangent to said arcs through said first mentioned pivot points, a unidirectional electrical motor mounted in said casing and adapted to be connected to a source of electric power, a rotatable output shaft mounted in said casing and extending adjacent said elongated casing portion, a worm gear fixed to one end of said output shaft, gear means connecting said motor with said output shaft and including a worm engaging said worm gear, a crank fixed adjacent one end thereof to the other end of said output shaft and rotatable therewith, and a connecting link connected to said power arm and to the other end of said crank for pivoting said rocker lever.

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