Feb. 25, 1958 H. L. STAVENAU ET AL 2,824,735

CLOSURE OPERATOR IMPROVEMENTS

Filed April 5, 1956 5 Sheets-Sheet 1

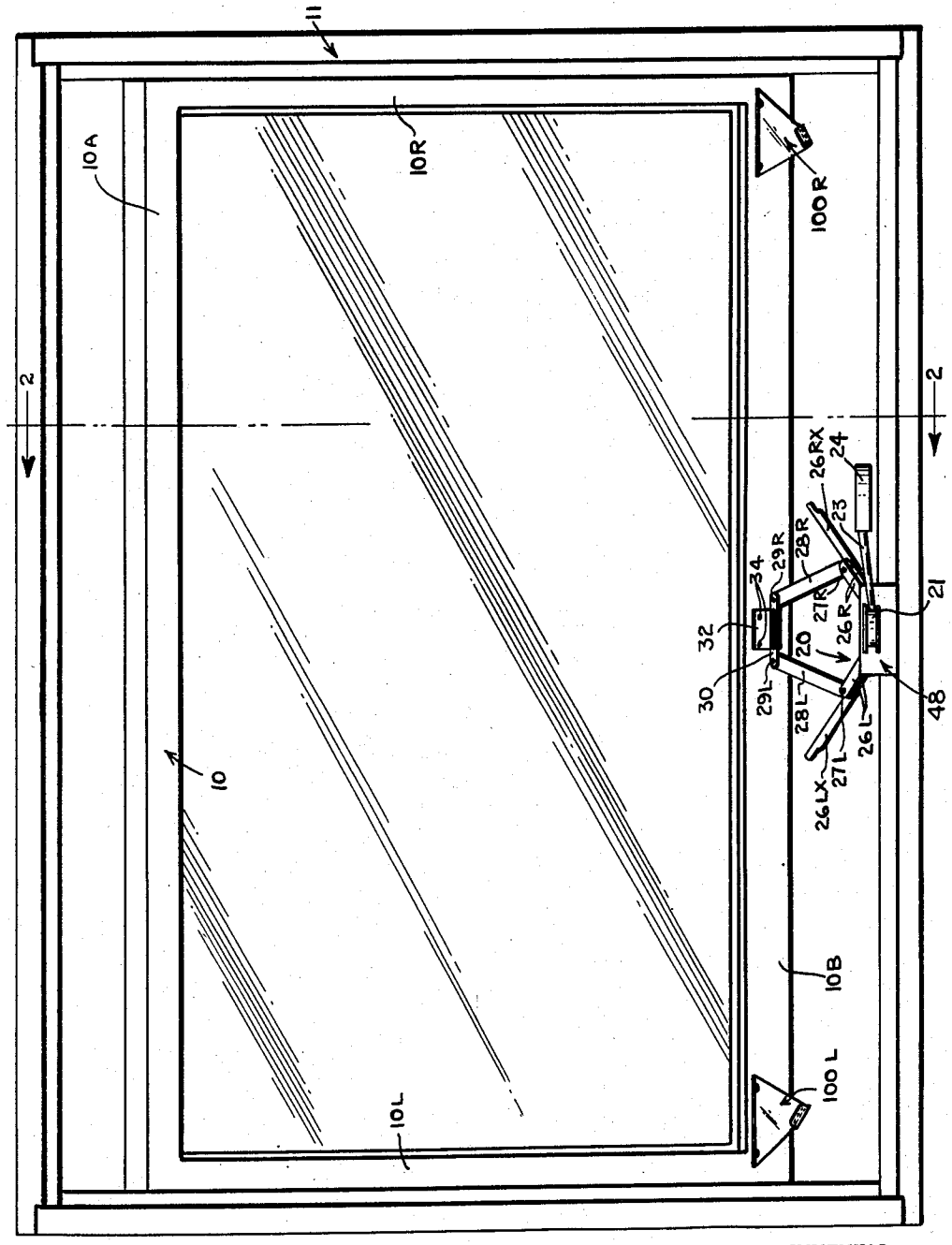


FIG. 1

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CLOSURE OPERATOR IMPROVEMENTS

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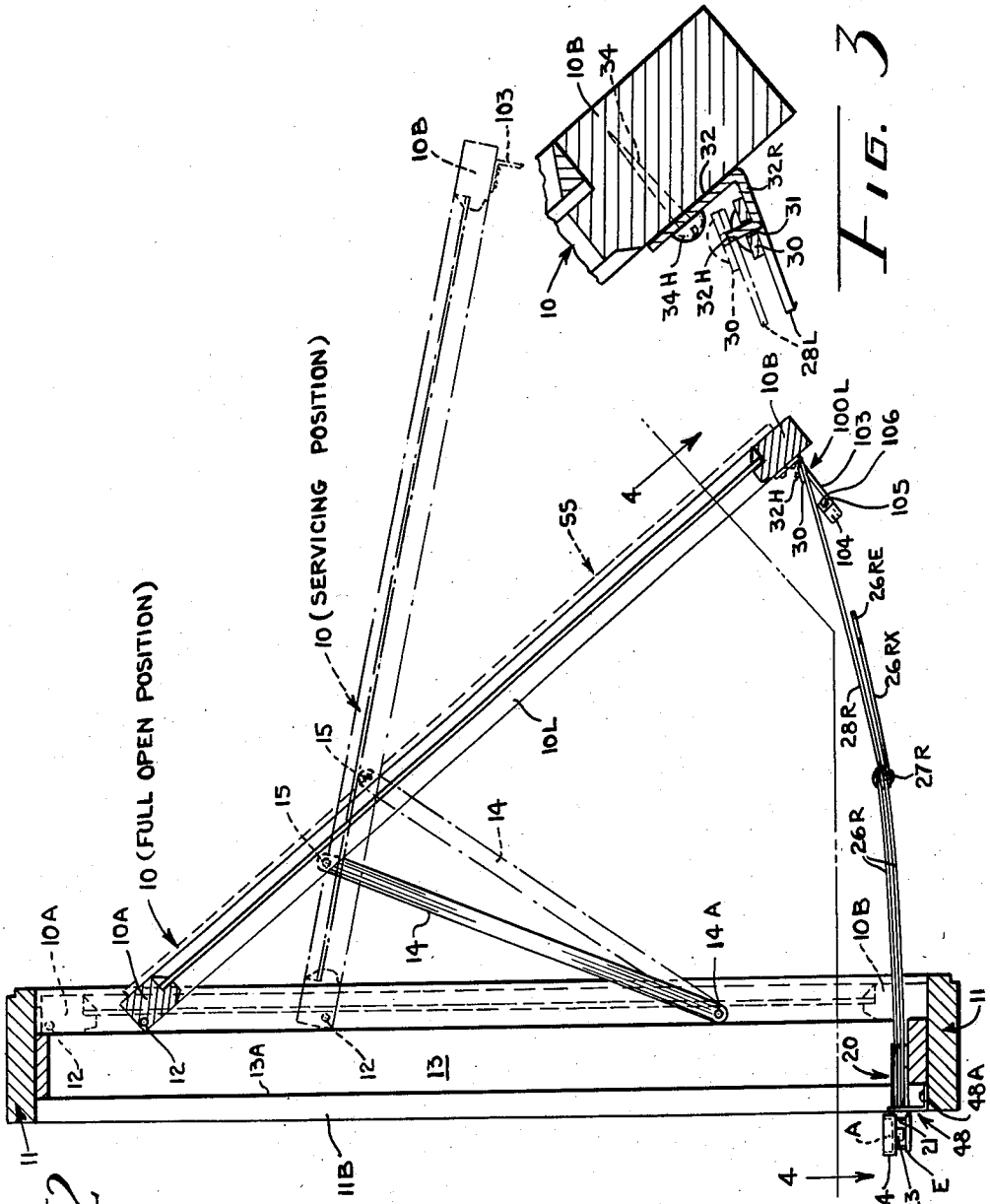


FIG. 2

FIG. 3

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CLOSURE OPERATOR IMPROVEMENTS

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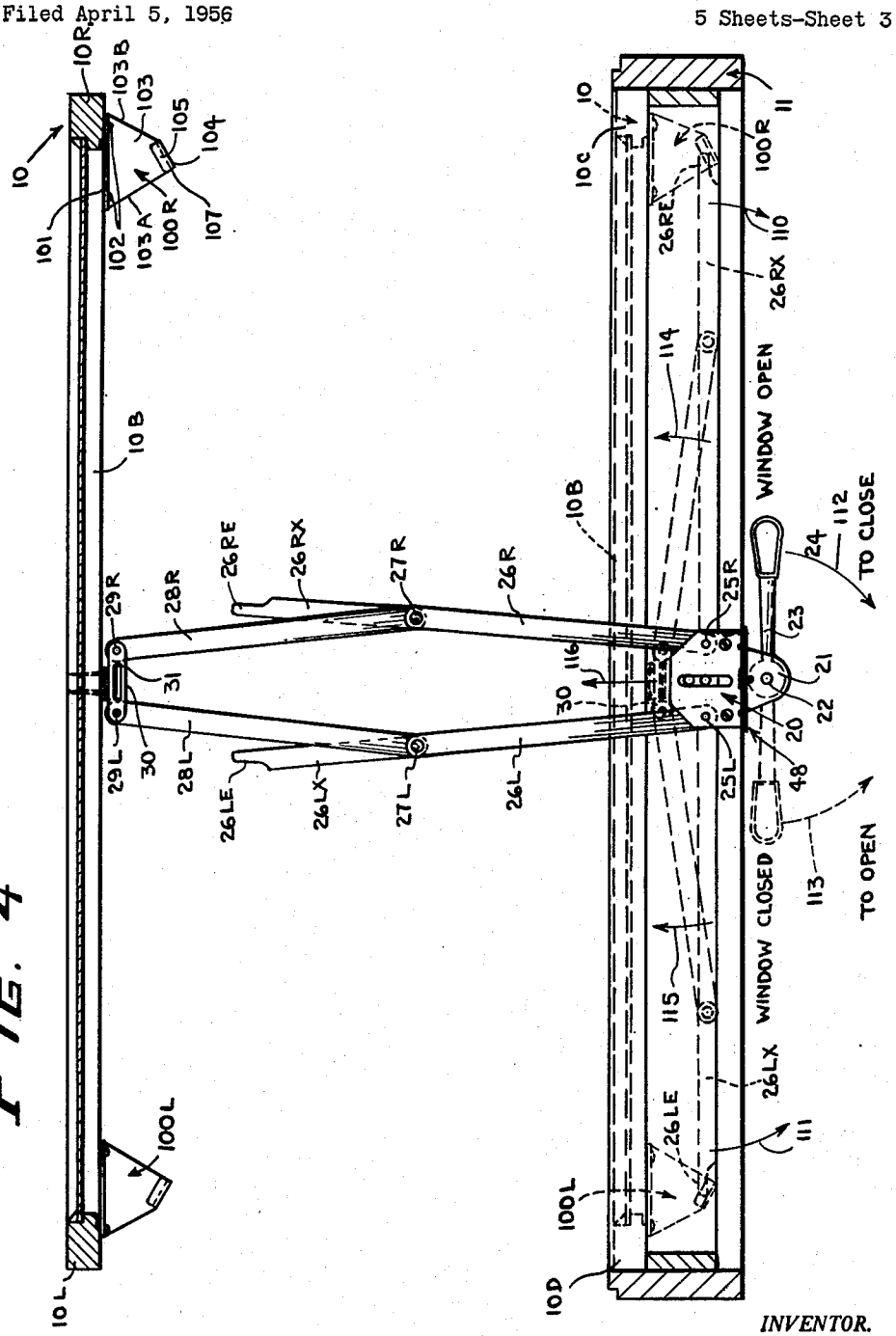


FIG. 4

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CLOSURE OPERATOR IMPROVEMENTS

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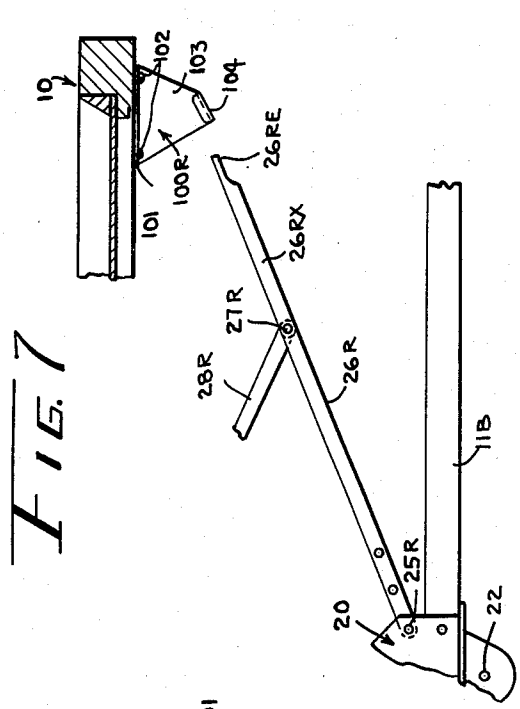


FIG. 7

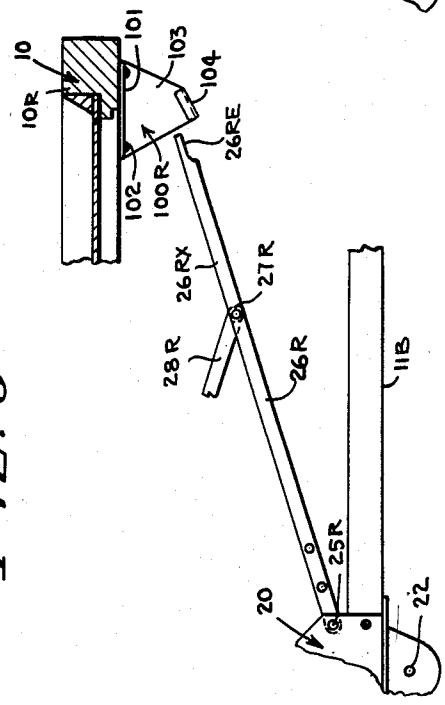


FIG. 6

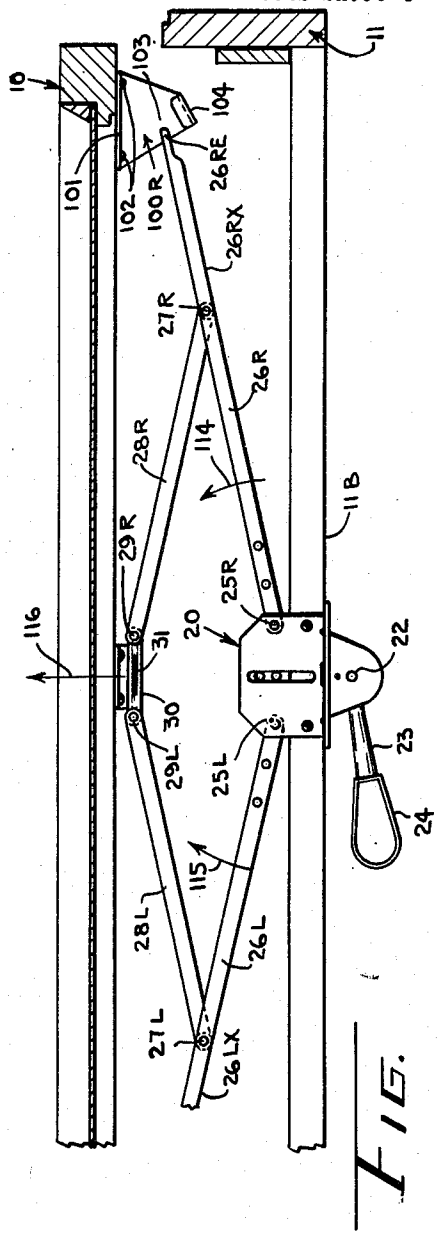


FIG. 5

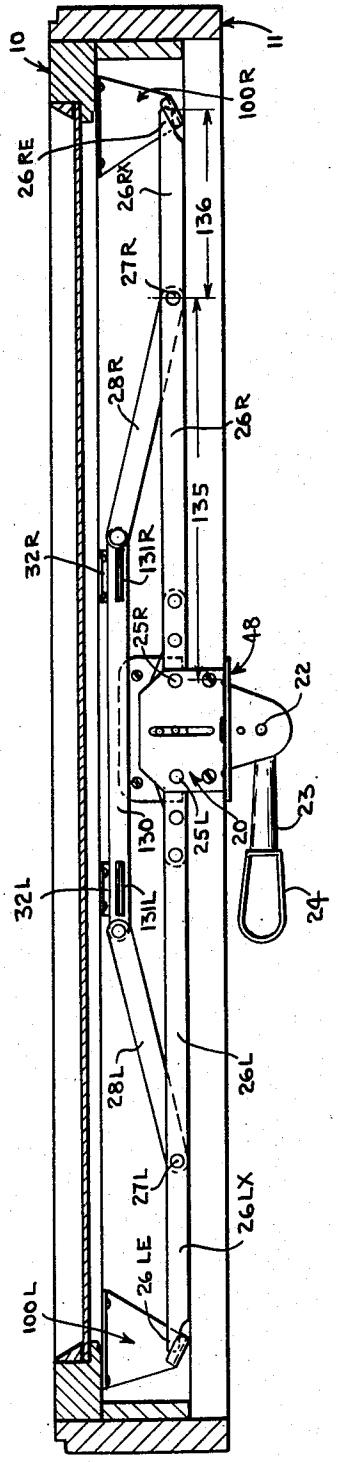
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CLOSURE OPERATOR IMPROVEMENTS

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FIG. 8



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United States Patent Office 2,824,735 Patented Feb. 25, 1958

2,824,735

CLOSURE OPERATOR IMPROVEMENTS

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Application April 5, 1956, Serial No. 576,435

14 Claims. (Cl. 268—104)

This invention relates to improved closure operators and more especially to manual operators for opening, closing and latching windows, doors, hatchway closures and the like where the primary purpose of the opening is ventilation rather than access. A principal field of usefulness of the invention is as a window operator for canopy and the similar outwardly opening casement windows of dwelling houses, offices and industrial buildings whether swinging on horizontal or vertical or floating pivots. The invention hereof is particularly useful for operation of latching of windows having a relatively great dimension along the free edge and in which the window sash has some inherent flexibility and deflection occurs, particularly when the closing force is applied at one region along the relatively long free swinging window dimension (whether height or width) and/or in any size window, where deflection of the sash is encountered due to pressure exerted by weatherstripping.

It is an object of the invention to provide a closure operator wherein final closure and retaining force is distributed at several points along the free swinging edge of the sash.

It is a further object of the invention to provide a closure operator having a compound action for closing a sash and then automatically latching the same at one or more additional places.

It is another object of the invention to provide a closure operator wherein closing force is applied at one or more places along the free swinging edge of the sash and then to apply automatically a final closure and latching force at several additional spaced places along the same side of the sash.

It is a specific object of the invention to provide an improved closure operator for window sashes and the like wherein a mechanism is provided and attached at a central place to a free edge of the sash for manipulating the sash while the same is swung free of the frame and to provide automatically for engagement of said mechanism with said frame at spaced points at either side of said central place when the sash is drawn to closed position for applying distributed closing and retaining force to said sash.

Other and further objects are those inherent in the invention herein illustrated and described and will be apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain embodiments of the invention, these being indicative however, of but a few of the various ways in which the principles of the invention may be employed.

The invention is illustrated in the drawings in which the same numerals refer to corresponding parts and in which:

Figure 1 is an elevational view illustrating a modern canopy-type window, shown from the inside and shown with the sash and operator in the "open" position;

Figure 2 is a vertical sectional view of the window and operator of the present invention, taken along the line and in the direction of arrows 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary vertical sectional view of a portion of the apparatus shown in Figure 2, namely the attachment between the window operator and the window sash;

Figure 4 is a generally horizontal sectional view of the window and operator, taken along the line and in the direction of arrows 4—4 of Figure 2;

Figures 5, 6 and 7 are related views, similar to Figure 4, except that they show the position of the window operator and the window as thru a succession of opening stages, to wit: In Figure 5, as the sash has just begun to open; in Figure 6, as the opening has proceeded, and in Figure 7 still further advanced toward the fully opened position. It is noted, parenthetically, that these views relate to and should be considered with Figure 4, which in dotted lines shows the "closed" positions and in full lines shows the "open" position. Figures 5, 6 and 7 are all fragmentary views;

Figure 8 is a horizontal sectional view, similar to Figure 4, but illustrating a slightly modified form of the invention.

Figures 1, 2 and 4 in full lines, show the window "open" to its maximum condition of opening that is achieved through the operation of the window operator. It is noted however, that the window operator may, according to the present invention, be disconnected from the sash to permit further opening to a limiting position (shown in dot and dash lines in Figure 2) for cleaning, servicing of storm windows and the like.

Referring to the drawings, and particularly Figures 1–7, it may be stated that the window operator of the present invention may be utilized for the operation of the modern canopy window, or casement windows whether swung on horizontal or vertical axis. It is illustrated with reference to a modern canopy type window swung on a (floating pivot type) horizontal axis, but it will be understood that the operator may be used equally well with canopy type windows swung on a fixed axis or with casement type windows swung on either fixed or floating pivots.

Referring particularly to Figures 1, 2 and 4, the window sash generally designated 10, consists of the usual sash having a glass pane in it. This window is manufactured and usually sold with a frame 11 in which the window is mounted as a sales unit. The frame 11 forms a surround for the window and is built into the building structure when the window is installed. In the form of windows shown, the sash 10 is mounted by means of a floating pivot 12 at opposite ends of the upper sash rail 10A. The pins 12 extend outwardly beyond the sash a slight distance at either side and operate in a vertical track, not illustrated, in the vertical side portions of the frame 11. The window is also provided with a radius rod 14 at each side of the window. The radius rod 14 is attached by means of a pivot 14A to the window frame 11 and is attached by pivot 15 to the side portions of the sash 10. As a result the window sash 10 may be moved from the dotted line position shown in Figure 2, (which is the closed position), through the full line position, (which is the full open position), as achieved by the window operator, and then after the window operator is unhooked from the window sash, as herein explained, the window may be moved a further distance to the limiting position shown in dot-dash lines, (which is the servicing position). In the latter position the window may be cleaned or the storm sash, SS may be installed or removed from the exterior surface of the window sash without going outside of the building. This is one usual form of modern canopy window. When the window is in the fully closed position, as shown in

dotted lines in Figure 2, it closes against a molding **13** which is a part of frame **11** and forms an abutment running completely around inside the frame. The molding **13** has an inner edge **13A** as shown in Figure 2 which also forms an abutment for the installation on the inside of the building, of the usual insect screen not shown.

For the operation of this kind of window, there is provided according to this invention, a window operator which is generally of the type shown and described in application Ser. No. 520,555 filed July 7, 1955 and application Ser. No. 540,671 filed October 17, 1955, which are incorporated herein by reference. The present invention forms improvements on the window operator shown in such prior applications.

In general it may be stated that the window operator is composed of a mechanism generally designated **20** which may be constructed according to the aforesaid prior applications. This window operator is mounted by means of a bracket generally designated **48** which has a horizontal portion **48A** that is inturned and is screwed down to the exposed lower surface of the window frame **11**. The particular shape of the bracket **48** may be varied according to the dimensions of the window to which the operator is applied. The particular form of window operator herein illustrated, and generally designated **20** has inwardly projecting upper and lower plates A and E between which there is pivoted a drum like member **21** which has stub shafts **22** at the top and at the bottom that extends thru apertures in the plates A and E and is pivoted therein. The drum **21** has an outwardly extending handle **23**, which in this particular exemplification slants slightly upward and terminates in the hand piece **24**. The handle **23—24** and drum **21** operate as a unit and may be swung approximately 180° clockwise (to close) or counterclockwise (to open), from the full line position which represents the window open position to the dotted line position which is the window closed position, all in Figure 4. The arrow **112** shows the direction of swinging movement of handle **23—24** for closing the window and arrow **113** shows the direction of swinging movement for opening the window.

The drum **21** carries a crank pin (not shown) which is moved arcuately as the actuator handle **23—24** is moved from its full line to its dotted line position and vice versa, the said crank pin (not shown) being thus moved to over-center positions which are slightly more than 180° apart, as the actuator handle is moved. The said crank pin (not shown) is connected by leverages and/or cam surfaces for actuating the arms **26R** and **26L** thru their arcuate swinging paths of motion.

Upon the window operator mechanism **20** there are pivotally mounted a pair of primary arms **26R** and **26L** which are pivoted to the frame of the operator mechanism at the pivot point **25R** and **25L**. Within the mechanism **20** there are suitable mechanical components interconnecting the drum **21** and arms **26R** and **26L** so that as the drum **21** is rotated by movement of handle **23—24**, the primary arms **26R** and **26L** will be swung simultaneously but in opposite directions so as to move them from the full line position to the dotted line position of Figure 4. Several forms of mechanical linkage for achieving such motions are specifically illustrated in the aforementioned applications which are incorporated herein by reference and need not be further referred to here. Each of the arms **26R** and **26L** is actually composed of an upper and lower component and these are provided with pivots at **27R** and **27L** which are in the form of rivets. The upper component of each arm **26R** and **26L**, terminates at (slightly beyond) the pivot **27R** or **27L**, but the lower components of the arms extend at **26RX** and **26LX** as shown in Figure 4. These extending portions terminate as a narrowed end **26RE** and **26LE** rescpectively which are shaped to engage a window retaining locking bracket as will later be described.

From the pivots **27R** and **27L** there extends other links as at **28R** and **28L** and these two links converge together as shown in Figure 4 and are joined at the pivots **29R** and **29L** to a clip bracket **30**, which as shown in Figure 4 is relatively short and lies parallel to the lower portion **10B** of the window sash **10**. The link **30** is provided with a slot **31**. Referring to Figures 2, 3 and 4 particularly, it will be observed that the slot **31** in the link **30** hooks over the upwardly extending portion **32H** of a bracket **32**. The bracket **32** has a portion which is attached by the screws **34** to the inside of the lower part **10B** of the sash **10** and the head **34H** of the screw **34** are of such height that when the window is closed, the front edge of the link **30** will hit against the head if an attempt is made to raise the link **30** directly upward and slightly forward off of the hook portion **32H**, which slants toward the sash. However, the inherent resiliency of the arms **26R—28R** and **26L—28L** (right and left) is sufficient to permit them to bend as shown in Figure 2 so as to allow the arms to follow the upward swing of the free edge **10B** of the sash and this resiliency also allows the arms and link **30** to be raised a little farther to the dotted line position shown in Figure 3, in which position the under side of the link **30** will clear the tip of the hook **32H** without the front edge of link **30** engaging screw head **34H** and the link may thus be disengaged so as to permit the window to be swung manually to the servicing position shown in Figure 2. After servicing the window is brought back manually to the full line position shown in Figure 2 and the link **30** is re-engaged and is held engaged by the natural resiliency of the arms and links **26R—28R** and **26L—28L** (right and left). The operation of the arms as previously described moves the window from the dotted line position to the full line position and vice versa, in Figures 2 and 4, for normally closing and opening the window. It may be stated that the swinging movement of the lever **23—24** is sufficient for moving the window from the fully opened position as shown in Figures 2 and 4 to the fully closed position shown in dotted lines in Figures 2 and 4 and vice versa.

In the foregoing description, the components **26R—27R—28R** and **26L—27L—28L** have been denoted "arms" and "links" but it will be recognized that they may also be denoted "toggles" wherein the operating force is provided by swinging one link, of each (i. e. by swinging links **26R** and **26L**), and this nomenclature is also adopted herein. The pivots **27R** and **27L** are, under this momenclature, "toggle-pivots."

Referring to Figures 2 and 4, it will be noted that all of the force for pushing the window outward to the open position or for pulling it inward to closed position is concentrated at the connection between link **30** and the bracket **32** on the sash. In some forms of windows, which have as long dimension along the piece **10B**, it has been found that some deflection will take place in the member **10B** and permit the side rails of the window sash at **10R** and **10L** to come to rest at positions a slight distance outward in respect to the window frame **11**. This effect is noted particularly where the window, for tight closure, is drawn firmly home against a springy weatherstripping which applies pressure against the inner side of the sash **10** or against its edges. Considerable force is necessary to bring the window sash **10** home to fully closed position when a spring-type weatherstripping is used since this required deflection for effective sealing action.

According to the present invention, there are provided two additional clips at **100R** and **100L**. These clips are similar except that one is a "right" and the other is a "left" and therefore only one need be described. Thus referring to the clip **100R**, Figure 4, it is composed of a flange **101** which is seated against the inner surface of the lower portion **10B** of the sash **10** and is held in place by the screws **102—102**. The flange **101** extends downwardly and there is an integral inwardly extending

flat portion 103 which presents a horizontal upper surface when the window is closed. It will be noted that this portion has inwardly converging edges 103A and 103B which are joined together by an upwardly extending flange 104 which rises slightly above the level of the upper surface of the portion 103 and then continues inwardly as inturn flange 105. As a result of this configuration, a space is provided at 106, see Figure 2. It will be noted that the edge 107 of this clip is spaced outwardly in respect to the junction of the edge 103 with the portion 101, as measured from the centerline of the window operator (to the right for clip 100R, Figure 4).

The purpose of the clips 100R and 100L is to provide a detent or catch into which the ends 26RE and 26LE of the window operator arms, may swing and engage as the window operator draws the window to fully closed position and in so engaging, to apply a closing force on the freely moving portion of the window, which is the side 10B. This operation is illustrated in the sequence of views Figures 4–7. It will be noted that in Figure 4, the window sash is shown closed in dotted lines and in this position the front surface of the flange 104 of each clip (100R and 100L) is engaged by the tip end 26RE for the clip 100R and 26LE for the clip 100L of the window operating arms. In this position the window arms are tensioned by movement of the window operating lever 23—24 for producing a strong force in the direction of arrows 110—111 and in so doing, the lever arms 26RX and 26LX in engaging the surfaces 104 of the clips 100R and 100L produce a strong inward pull on the lower corners of the window 10. At the same time the link 30 is being pulled inwardly by the operator and exerts a strong inward pull at the center of the lower sash element 10B. This is very desirable because the closing force is thus distributed along the free-swinging side of the window sash and accordingly malfunctioning due to the deflection of side 10B is greatly minimized. When it is desired to move the window to the open position the window operating lever 23—24, which is then in the dotted lines as shown in Figure 4 is moved in the direction of arrow 113 and in so doing the primary arms 26R and 26L are swung in the direction of arrows 114 and 115, with the result that the plate 30 is moved outwardly in the direction of arrow 116, causing the window to open. At the same time the tip end 26RE and the corresponding tip end 26LE also swing in the direction of arrows 114 and 115 respectively and move at a rate which is equal to or which slightly exceeds the rate of movement in the opening direction of clips 100R and 100L. In this way the tips 26RE and 26LE do not constitute a restraining force during any portion of the opening movement once opening is started. As the opening movement proceeds, the window reaches the position shown in Figure 5 where it will be seen that the tip 26RE is well clear of the surface 104 of the clip 100R and as the motion then continues the tip 26RE gradually swings inwardly thru the position shown in Figure 6 (where it has cleared the clip 100R) and then through the position shown in Figure 7 and finally to the "window open" position shown in full lines in Figure 4. The swinging motion of the primary arms 26R and 26L towards window open position has the effect of retracting the tips 26RE and 26LE from engagement with the upper surface 103 of the clips 100R and 100L respectively, and the window 10 is accordingly entirely free of such engagement of clips when the opening movement has progressed to or beyond the position shown in Figure 6.

As the window is closed from the position shown in full lines in Figure 4, through the position shown in Figure 7, and then through the position shown in Figure 6, the clips 100R and 100L gradually swing into a position such that the tips 26RE and 26LE will overlie the surfaces 103 of the clips. This is illustrated in Figure 5. When this occurs and as the closing motion is continued through the position shown in Figure 5 to the dotted line position shown in Figure 4 the tips 26RE and 26LE again will engage the surfaces 104 of the clips and draw the window home solidly as the operating lever 23—24 is moved in the direction of arrow 112, to the "closed" position shown in dotted lines in Figure 4. It will be noted from an examination of Figure 2 that as the window swings to the fully opened position shown in full lines that the lever arms 26R—28R and 26L—28L are slightly bowed upwardly but this is permitted by the inherent resiliency of the materials. The tip end 26RE will be slightly downward from the bowed position of the link 28R but will still be sufficiently elevated so that as the window frame moves from the position shown in Figure 6 to the position shown in Figure 5, the tip will be slightly above and overlie the level of the surface 103 and will thereafter be guided in by that surface in moving to the fully closed position of the window.

Referring to Figure 8, in this figure there is shown a slightly modified form of the invention which is identical in all particulars to that previously described except that the link 30 is replaced by one which is longer in the direction of window width. This greater length link is shown at 130 in Figure 8, and is provided with two slots 131R and 131L which engage with two properly located clips generally designated 32R and 32L fastened to the free-swinging side 10B of the sash. By providing such extended link 130, the force for moving the window open and closed is distributed at several spaced locations, i. e. the location of the clips 32R and 32L. This is an advantage and together with the retaining clips 100R and 100L, serves to distribute to four points along the free edge of the window the restraining force for holding the window closed. It will be noted in respect to Figure 8 that the dimension of the links 28R and 28L is slightly less than the lengths of the dimension 135, which is the distance from the pivot 27R to the pivot 25R on which the primary arm 26R swings. A similar dimension obtains for the linkages at the left side of the operator. Similarly the dimension 136 from the pivot 27R to the tip end 26RE is somewhat less than the corresponding dimension of the form shown in Figure 4.

While we prefer, for greatest rigidity to provide left and right toggles 26R—27R—28R and 26L—27L—28L, simultaneously operated, it is perfectly feasible, particularly for narrow casement windows to dispense with one of them, using either the right or left, depending upon the hand of the window. Such forms may be regarded as illustrated for a right hand, in Figures 6 and 7, it being understood that figures also serve as fragmentary illustrations of the form shown in Figures 1–4. In either the right-left (double) or right or left (single) forms the interlocking action of the primary arm (26R or 26L) upon the clip (100R or 100L) is retained according to this invention.

It is apparent that many modifications and variations of this invention as hereinbefore set forth may be made without departing from the spirit and scope thereof. The specific embodiments described are given by way of example only and the invention is limited only by the terms of the appended claims.

We claim as our invention:

1. An operator for closing and opening windows, covers, doors and the like closures which are mounted for hinged swinging motion for moving said closure to its open, closed and intermediate positions and in so doing for translating a free-swinging edge of the closure which is opposite the hinged edge, toward and away from the cooperating edge of the opening comprising an operator frame having a manually movable actuator thereon, an arm pivotally mounted at a frame pivot on the operator frame for swinging movement in a normal plane generally perpendicular to the plane of the opening, said arm being connected to the actuator so as to be swung thereby from a first position generally parallel to and

slightly inside the plane of the opening to a second position approaching one generally normal to the plane of said opening, said closure being provided with a clip surface which extends into the opening when the closure is closed, said clip surface being positioned so as to be engaged by said arm as it is swung to its first position for drawing the closure to closed position, and a link connected by a toggle pivot to the arm and connected to a point on the closure which is remote from said clip surface for actuating the closure, said arm and link forming a toggle.

2. The apparatus of claim 1 further characterized in that said arm and link are pivotally connected as a toggle and are composed of material sufficently resilient to permit deflection of the arm and link toggle out of said normal plane.

3. The apparatus of claim 1 further characterized in that said arm is composed of a short arm piece extending from said frame pivot to said toggle pivot and a long arm piece extending from said frame pivot to and beyond said toggle pivot and terminating with a tip for engaging said clip surface.

4. The apparatus of claim 3 further characterized in that said link is laid between the short arm piece and the long arm piece at said toggle pivot.

5. The apparatus of claim 1 further characterized in that said actuator is a pivotally movable lever having a crank pin thereon movable between overcenter positions slightly more than 180° apart.

6. An operator for the closure of an opening such as a window, door or the like, wherein the closure is mounted for hinged swinging movement to and from a position in which it closes the opening, thru intermediate positions to an open position in which the closure is in a plane at an angle to the plane of the opening and during such movement translates a free-swinging edge of the closure, which is opposite the hinged edge, toward and away from a cooperating seating edge of the opening, comprising an operator frame adapted to be mounted inside the opening adjacent said seating edge, first and second arms each pivotally mounted on the operator frame for swinging movement to and from an open position where they are swung close to each other and extend outwardly thru the opening, to a closed position where the arms are swung away from each other and extend in opposite directions from said operator frame and adjacent and along the freeswinging edge of the closure inside the opening, detent surfaces on the inside of the closure located so as to be engaged by the ends of the arms as they swing from the open towards the closed position for drawing the freeswing edge of the closure firmly against the seating edge when the arms are brought to their closed position, an operator pivot connection adapted to be mounted on said freeswing edge first and second links each pivotally connected at one end to said operator pivot connection and pivotally connected at their other ends to the first and second arms respectively, and manually operable means on the operator frame and connected to said arms for simultaneously swinging said arms to and from said open and closed positions.

7. The apparatus of claim 6 further characterized in that said manual operator comprises a hand lever pivoted on the operator frame for movement for swinging movement to and fro thereon.

8. The apparatus of claim 6 further characterized in that said links are pivotally connected to said operator pivot connection at a central location along said free swinging edge.

9. The apparatus of claim 6 further characterized in that said links are separately pivotally connected to said operator pivot connection at a central location along said free-swinging edge.

10. The apparatus of claim 6 further characterized in that said links are separately pivotally connected to said operator pivot connection at spaced locations along said free-swinging edge.

11. The apparatus of claim 6 further characterized in that the pivotal connection between said links and said operator connection is separable for detaching the free-swinging edge therefrom.

12. The apparatus of claim 6 further characterized in that the arms and links are composed of material which is sufficiently flexible to permit them to be deflected out of their plane of free swinging movement.

13. An operator for the closure of an opening such as a window, door or the like, wherein the closure is mounted for hinged swinging movement to and from a position in which it closes the opening, through intermediate positions to an open position in which the closure is in a plane at an angle to the plane of the opening and during such movement translates a free-swinging edge of the closure, which is opposite the hinged edge, toward and away from a cooperating seating edge of the opening, comprising an operator frame adapted to be mounted inside the opening adjacent said seating edge, first and second arms each pivotally mounted on the operator frame for swinging movement to and from an open position where they are swung close to each other and extend outwardly through the opening, to a closed position where the arms are swung away from each other and extend in opposite directions from said operator frame and adjacent and along the free-swinging edge of the closure inside the opening, a pair of releasable connections adapted to be mounted in spaced relation in said free-swinging edge and a pair of links one connected to each connection and extending to one of the arms.

14. An operator for the closure of an opening such as a window, door or the like, wherein the closure is mounted for hinged swinging movement to and from a position in which it closes the opening, through intermediate positions to an open position in which the closure is in a plane at an angle to the plane of the opening and during such movement translates a free-swinging edge of the closure, which is opposite the hinged edge, toward and away from a cooperating seating edge of the opening, comprising an operator frame adapted to be mounted inside the opening adjacent said seating edge, first and second arms each pivotally mounted on the operator frame for swinging movement to and from an open position where they are swung close to each other and extend outwardly through the opening, to a closed position where the arms are swung away from each other and extend in opposite directions from said operator frame and adjacent and along the free-swinging edge of the closure inside the opening, means on the frame and connected with the arms for simultaneously swinging said arms to open and closed positions, a pair of links of equal length pivotally connected, one to each arm at points on said arms which are equal distances from the points of pivotal connection of said arms on said operator frame a bar extending along said free-swung edge and having spaced pivotal connections with the ends of said links and a pair of spaced connections between the bar and said free swung edge and each disposed adjacent one of said pivotal connections, whereby to identically move spaced portions of said free swung edge.

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