Jan. 21, 1930. C. E. SPENCER ET AL 1,744,341

CASEMENT WINDOW OPERATOR

Filed April 23, 1927

Fig. 1

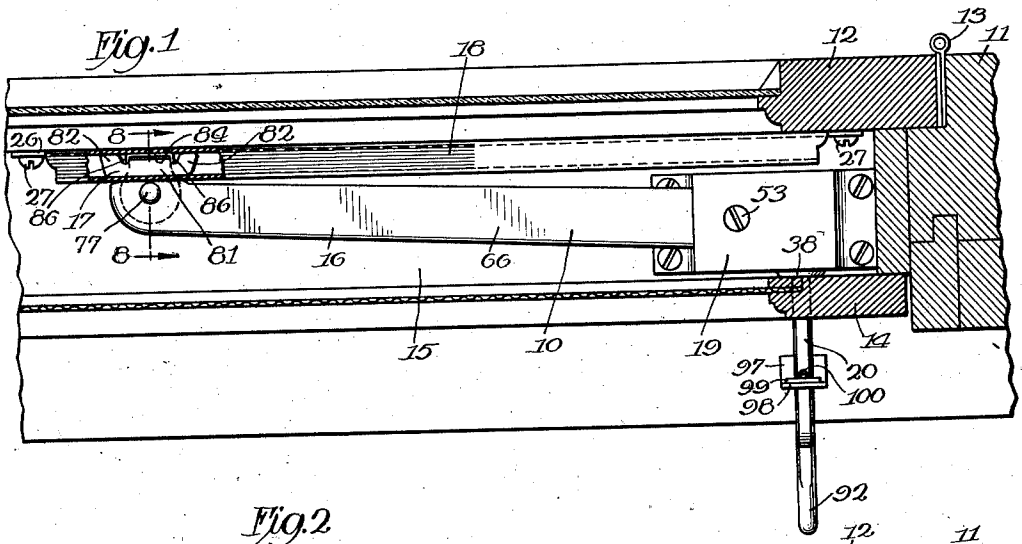


Fig. 2

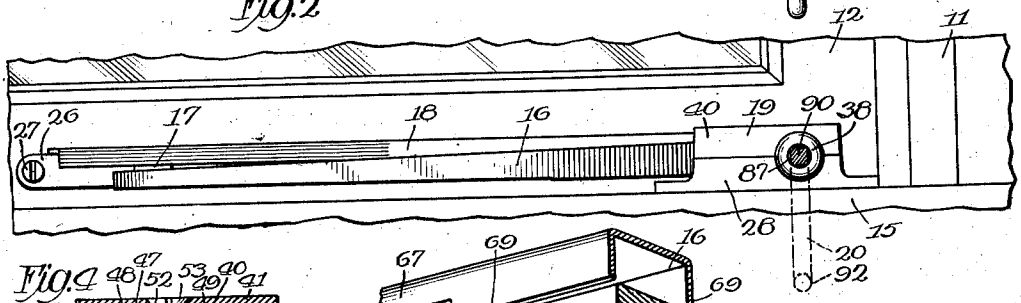


Fig. 4

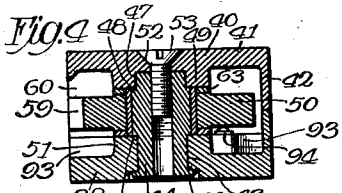


Fig. 7

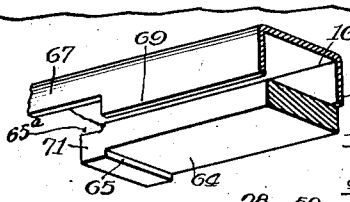


Fig. 6

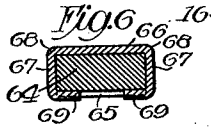


Fig. 3

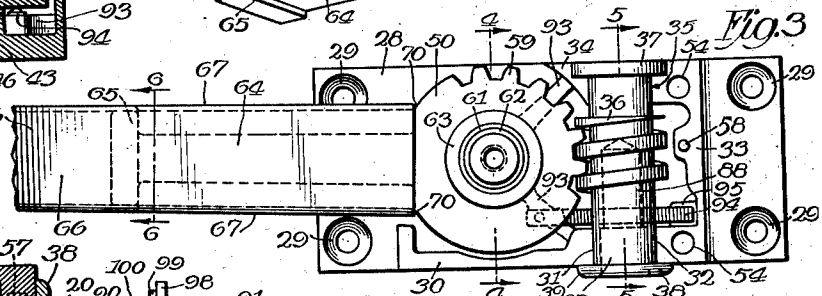


Fig. 5

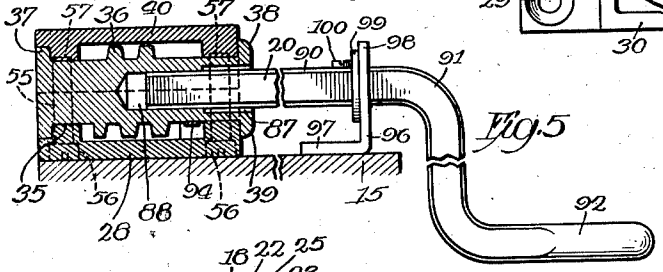


Fig. 9

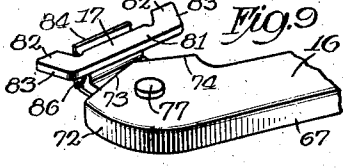
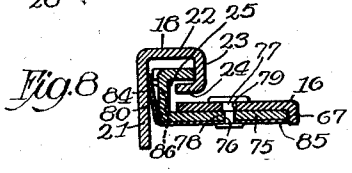


Fig. 8



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UNITED STATES PATENT OFFICE

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CASEMENT-WINDOW OPERATOR

Application filed April 23, 1927. Serial No. 185,982.

Our invention relates to casement window operators, being more particularly concerned with that type of casement window operator in which an operating lever having sliding engagement with the window is actuated by a worm and gear.

One of the objects of our invention is the provision of a casement window operator of the class described, having a channelled operating arm of simple and cheap construction which is firmly affixed to its gear without the use of rivets, bolts or other fastening means and which may be cheaply manufactured and easily assembled.

Another object of our invention is the provision of a casement window operator which is adaptable to windows of all types and in which the actuating crank may easily be made of any desired length during installation.

Another object of our invention is the provision of an operator of the class described including positive braking means for the worm so that the window cannot be opened from the outside under any conditions and having a novel and efficient slider construction which is cheaply manufactured from sheet metal.

Other objects and advantages of our invention will appear more fully from the following description and from the accompanying drawings in which similar characters indicate similar parts throughout the several views.

Referring to the drawings, Figure 1 is a plan view of our casement window operator showing a cross-section of the window to which it is applied.

Figure 2 is a front elevational view of the same.

Figure 3 is a full sized detail view of the interior structure with the cover of the casing removed.

Figure 4 is a cross-sectional view taken on the the lines 4—4 of Figure 3.

Figure 5 is a cross-sectional elevational view taken on lines 5—5 of Figure 3.

Figure 6 is a cross-sectional view taken on the lines 6—6 of Figure 3.

Figure 7 is a detail view in perspective of the connection between the operating arm and geared lever.

Figure 8 is a detail cross-sectional view of the guide and slider taken on the lines 8—8 of Figure 1.

Figure 9 is a detail view in perspective of the slider and end of the operating arm.

Referring to Figures 1 and 2, 10 indicates in its entirety our casement window operator which has been illustrated in conjunction with the window frame 11, and a casement window 12 supported by the hinges 13 for outward pivotal movement. The window frame 11 may be provided with a screen frame 14 upon the inside of the frame and our closure operator 10 is preferably located upon the sill 15 between the inner screen and the outer casement window.

The casement window operator comprises an operating arm 16 having a slider 17 pivotally supported at its extremity for sliding movement in a guide 18 which is supported horizontally along the inner and lower side of the casement sash 12. The opposite end of the operating arm 16 is pivotally supported within a casing 19 which also contains operating mechanism, further to be described, which may be actuated by means of the crank 20 passing through the screen frame 14 into the casing 19.

The guide 18 comprises a sheet metal member having a vertical attaching flange 21, a horizontal flange 22, a downwardly turned flange 23 and an inwardly turned flange 24, thereby providing a tubular member of substantially rectangular cross-section having an open slot 25 along its base adjacent the attaching flange 21. In order that the fastening screws may not interfere with the movement of the slider the attaching flange 21 may be extended at each end as at 26 provided with apertures to receive the screws 27 by means of which the guide is attached to the casement window sash. It will thus be observed that we have provided a simple and inexpensive guide presenting a smooth channelled upper surface which may be painted or otherwise finished to harmonize with the wood-work, while the slot for the slider is concealed beneath the guide and any operat-

ing parts used therein are likewise concealed.

The casing 19 of the closure operator comprises a base member 28 which may be made of metal such as brass or iron, having a substantially flat lower side and provided with a plurality of countersunk apertures 29 for the reception of attaching screws to fasten the same to the sill 15. The base 28 is provided upon the front side with an upwardly extending wall 30 having a semicircular groove 31 which is adapted to form half of a bearing for the shaft 32. The right side of the base 28 is likewise extended with an upwardly extending wall 33 and the rear side, with an upwardly extending wall 34 which is provided with a semicircular groove 35 forming a second bearing for the shaft 32 aligned with the bearing 31.

The shaft 32 comprises a substantially cylindrical member having a worm 36 formed thereon and having annular flanges 37 and 38 projecting radially at each end to form thrust bearings. At the rear side the wall 34 may be shaped with a counter-bore so as to house the flange 37 flush with the outer surface of the wall, while at the forward end the flange 38 may bear upon the outer surface of the wall 30 and in order to provide a finished appearance the flange may be rounded off as at 39.

The upper section or cover member 40 for the casing 19 may consist of a complementary member having a flat upper surface 41, a downwardly projecting wall 42 on its front side, and a similar wall upon the right and rear, the front and rear walls being likewise formed with semicircular grooves 31 and 35 to complete the bearings for the shaft 32. The length of the walls upon the cover member 40 is such that when this member is assembled with the base member 28 the front, right, and half of the rear of the casing are closed, the cover and base fitting snugly together to form bearings for the shaft 32 and house the same within the casing, leaving only the projecting end of the shaft exposed.

The base 28 may be provided with a counter-bored aperture 43 adapted to receive the reduced end of a tubular pivot post 44. The pivot post 44 may be provided with an annular shoulder 45 and when the post has been inserted in the aperture 43 until the shoulder 45 strikes the top of the base 28, the lower end of the pivot post 44 may be riveted over as at 46, thereby permanently assembling these parts. The counter-bore of the aperture 43 enables this riveting operation to be completed without forming any projections upon the flat bottom of the base 28.

The upper end of the pivot post 44 may likewise be reduced as at 47 forming another annular shoulder 48 and the cover member 40 may be formed with an annular depending boss 49 which is adapted to receive a reduced end 47 of the pivot post and to provide thrust bearings for the gear sector 50 which is journalled upon the pivot post 44. The base 28 may likewise be formed with an upwardly extending annular boss 51 forming a lower thrust bearing for the gear sector 50 and the cover 40 may be provided with a countersunk aperture 52 adapted to receive a screw bolt 53 extending through said aperture and threaded into the pivot post 44 to serve as part of the fastening means for holding said cover upon the base 28.

The base 28 may also be provided with a pair of bores 54 extending upwardly within the wall 33 and adapted to receive the screw bolts 55 threaded into the wall of the cover 40. The bores 54 may be enlarged as at 56 to receive the heads of the screw bolts 55, thereby preserving the flat bottom surface of the base 28. In order to align the bores 54 with the threaded apertures 57 in the cover 40 the wall 33 may be provided with an upwardly extending pin 58 which is adapted to receive an aperture in the depending complementary wall of the cover 40, thereby accurately aligning the bores 54 and the complementary parts of the bearings 31 and 35.

The gear sector 50 comprises a substantially circular member which may be made of metal, being provided with a series of teeth 59 which are adapted to mesh with the worm 36 and the number of teeth 59 is sufficient to permit the worm 36 to actuate the gear sector 50 throughout the entire range of movement which is provided by the slot 60 formed between the base 28 and the cover 40 at the rear and left sides of the casing 19. In order to provide a bearing for the gear sector 50, this member may be provided with a central aperture 61 which is lined with a tube 62 of bearing metal and the tube 62 may project upon each side of the gear sector 50 sufficiently so that the ends of the tube are flush with the brass washers 63 which are supported upon each end of the tube. The tube 62 and the washer 63 may be retained in place by a tight frictional fit between these parts and between the tube and aperture 61 and when the casing is in assembled relation with the gear sector and its parts, the tube 62 and washers 63 are adapted to provide a smooth and durable bearing for the gear sector on the pivot post 44.

The gear sector 50 may be provided with a flat projecting arm 64 of substantially rectangular cross-section and slightly tapered toward its end. The arm 64 is provided with a downwardly projecting shoulder 65 extending across its base adjacent the end of the arm for the purpose of attaching the channelled operating lever 16 further to be described.

The channelled operating lever 16 comprises a pressed metal member preferably of sheet metal, having an upper web 66, downwardly extending flanges 67 on each side with

rounded corners 68 and the operating lever is preferably tapered from the gear sector toward the other end to correspond in cross-section at any point to that required to provide the necessary strength. The end of the operating lever 16 toward the gear sector 50 is also provided with the downwardly projecting flanges 69 upon each side corresponding in length to the distance between the shoulder 65 and the shoulders 70 formed by the gear sector 50. The shoulder 65 may be formed by stamping or pressing the end as at 65a.

The depth of the arm 64 of the gear sector 50 at its end 71 corresponds substantially to the width of the flanges 67 while the depth of the balance of the arm 64 extending from the shoulder 65 to the gear sector 50 is diminished by the thickness of the metal which composes the flanges 69. The width of the arm 64 is substantially equal to the width of the inside of the channel 16 so that the arm 64 may be placed within the channel 16, fitting therein with the ends of the channel 16 against the shoulders 70 formed by the gear sector 50. The flanges 69 may then be bent over at right angles as shown in Figure 6 and firmly clamping the channelled operating lever 16 and the arm 64, the ends of the flanges 69 exactly fitting inside the shoulder 65. It will thus be observed that the operating lever 16 is thereby firmly attached to the arm 64 of the gear sector 50, being held against removal or axial movement by the cooperation of the shoulders 65 and 70 with the flanges 69 and the flanges 67 respectively. At the same time the finished operating lever presents a smooth outer and upper surface of sheet metal having rounded corners and no screws, bolts or rivets or other fastening means are required to assemble these members.

The opposite end of the operating lever 16 may be formed as shown in Figure 9, the flange 67 being continued by the rounded end 72 and cut away at the rear edges 73 and 74 to provide an opening for the slider 17. The slider 17 comprises a sheet metal member having a substantially circular attaching flange 75 with a central aperture 76 and the slider 17 may be attached by this flange to the operating lever 16 with a rivet 77, said rivet permitting free pivotal motion. In order to assure free pivotal motion of the slider 17 the rivet 77 may be provided with a reduced lower end 78, thereby forming an annular shoulder 79 so that the circular flange 75 may be riveted between the shoulder 79 and the lower end of the rivet, sufficient space being provided between the shoulder 79 and the head of the rivet so that the rivet and plate 75 may turn freely upon the operating lever 16.

The slider 17 is also provided with an integral upwardly extending flange 80 and horizontally extending flange 81, and the flange 80 should be of sufficient width so that the flange 81 may be received within the guide 18 without interference between the flange 24 and the operating lever 16. The upper flange 81 is preferably formed with backwardly extending legs 82 which are adapted to contact with the attaching flange 21 of the guide 18 while the forward edge of the flange 81 bears against the inside of the flange 23. It will thus be observed that the legs 82 and flange 81 are adapted to maintain the flange or web 80 midway within the slot 25, the friction of movement being taken by the ends of the legs 82 and the edge of the flange 81.

The ends of the flange 81 may be bevelled as at 83 to provide an edge which will ride over any obstructions which may occur within the guide 18.

Our slider 17 is preferably employed with spring means 84 for maintaining the edge of the flange 81 in engagement with the inside of the guide 18 but we desire it to be understood that the slider 17 may also be used without the spring if so desired. The spring means 84 comprises a flat, circular plate 85 of spring brass, phosphor bronze or other resilient, non-corroding material having an upwardly turned flange 84 and a pair of lateral flanges 86 on each side of the web 80 to prevent pivotal movement between the spring 84 and the slider 17. It will thus be observed that by the shoulders 86 the spring 84 is constrained to follow the slider in its pivotal movement and the spring 84 is always adapted to bear against the flange 21 of the guide 18 and maintain the slider 17 in contact with the opposite side of the guide, thereby preventing any rattling between these members.

The shaft 32 may be provided with a bore 87 in its forward end terminating in a reduced, squared aperture 88 for the reception of the squared end of a crank 20. The crank 20 comprises a rod of substantially square cross-section with rounded corners 90 and the aperture within the shaft 32 is preferably formed substantially square with rounded corners conforming to the shape of the crank end. The handle 92 of the crank may be made cylindrical with a rounded end as shown, or with a rotatable ferrule to be conveniently grasped by the hand. By making the cross-section of the crank 20 uniform from its end to the angle 91, we are enabled to provide a crank 20 of extra length which may easily be adjusted to correspond to the thickness of the wall during installation. That is, the end of the crank 20 may be cut off with a hack saw at any point to make the crank such length that the handle 92 will not project unduly from the edge of sill, but at the same time the severed end of the crank 20 will always fit within the aperture 88.

In order to strengthen the base 28 the base may be formed with a plurality of ribs 93 upon its interior and one of these ribs may be conveniently employed to support braking

means for a purpose further to be described. The handle 92 of the crank 20 being of metal, it has sufficent weight so that if the handle 92 were left in upper or horizontal position, the weight of the handle might be sufficient to overcome the friction of the shaft 32. The worm 36 and gear sector 59 ordinarily provide actuating mechanism which is operable only from one end, namely by actuating the worm, and the window cannot therefore be opened by pulling upon the window without turning the crank 20. This action is due to the inherent characteristic of the worm and gear which will not transmit motion in a reverse direction.

However, when the handle 92 of considerable weight is disposed in upper or horizontal position its weight may be sufficient to actuate the worm 36 until the handle is in the position shown in Figure 2. This movement might be aided by extreme force applied to the window such as the wind or where access is desired by unauthorized persons, thereby moving the window slightly from a position to which it has been adjusted. In order to positively prevent any possibility of the window being moved out of its adjusted position whether the handle be up or down, we provide our closure operator with braking means acting upon the worm 36. The braking means employed may consist of a flat, resilient spring 94 extending from one of the ribs 93 beneath the shaft 32 to a shoulder 95 and the spring 94 is flexed downward by the shaft 32 so that it acts as a brake against the shaft 32. The spring 94 may be riveted at either end to the rib 93 or the shoulder 95 but is preferably secured only at one end in order to allow free resilient pressure against the shaft 32. It will thus be observed that by providing this very simple spring brake upon the worm shaft 32 the braking action thereby secured is sufficient to fully utilize the one-way characteristic of the worm and gear under all conditions.

As the sill 15 may be of considerable width, we prefer to provide the crank 20 with an auxiliary bearing spaced from the shaft 32. This auxiliary bearing may consist of a metal bracket 96 having a flange 97 which may be attached to the sill by a screw and an upwardly extending flange 98 with an aperture to receive the shank of the crank 20. The crank 20 may be provided with a washer 99 and a screw bolt 100 may be threaded into the crank on the inside of the washer 99, thereby permanently retaining the crank 20 with its shank within the shaft 32. The provision of an extra bearing for the shank of the crank 20 greatly reduces the strain upon the fastening screws which secure the casing 19 to the sill 15 and supports the crank close to the handle 92 where the actuating force is applied thereto. This arrangement also permits the use of a single type of handle either for permanent or detachable use, thus standardizing the handle structure.

By means of the bracket 96 and screw 100 the cranks are retained permanently in their place so that they cannot become lost; but if desired it will be obvious that the cranks may be removed and a single crank used for all of the windows. While we have shown our casement window operator as applied to the top of the sill, it is obvious that the same may be employed beneath the sill if the casement window extends down this far on the outside and we do not limit ourselves to the use set forth.

It will thus be observed that we have invented a casement window operator which is adaptable to be used with any width of sill, which includes braking means upon the actuating mechanism to prevent unauthorized opening of the window, and which comprises a novel assembly of elements which are easily assembled, cheaply manufactured and which present a finished appearance upon the sides exposed to public view. Our invention also includes a simplified construction of operating arm, slider and casing which renders the device efficient and easy to operate.

While we have illustrated and described a specific embodiment of our invention, many modifications may be made without departing from the spirit of the invention, and we do not wish to be limited to the precise details set forth, but desire to avail ourselves of all changes within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. In a casement window operator, the combination of an operating lever having a projecting shoulder on its lower side, and an extension arm comprising a channelled member having projecting lugs on both sides of one end, said lever being received in said channelled member with said lugs bent about the same, whereby said lever and said channelled extension are fixed together in a unitary structure.

2. In a casement window operator, the combination of a tapered operating lever having a projecting shoulder on its lower side, and an extension arm comprising a channelled member having projecting lugs on both sides of one end, said lever being received in said channelled member with said lugs bent about the same behind said projecting shoulder.

3. In a casement window operator, the combination of a casing member, an operating lever having a toothed sector journalled in said casing, a shaft having a worm in said casing meshing with said toothed sector, braking means for said worm, said shaft having a non-circular aperture axially located in the same, a crank having an elongated shank of uniform non-circular cross-section

complementary to said aperture and adjustable means for journalling said crank, spaced from said shaft.

4. In a casement window operator, the combination of a sheet metal guide having a vertical attaching flange and a tubular guide with a slot at its base, with operating means, comprising an actuating lever, and a slider pivotally supported on said lever, said slider comprising a flat metal plate, having an upwardly turned flange extending through said slot, and a transverse flange slidably received in said guide.

5. In a casement window operator, the combination of a sheet metal guide having a vertical attaching flange and a tubular guide with a seat at its base, with operating means, comprising an actuating lever, a slider pivotally supported on said lever, said slider comprising a flat metal plate, having an upwardly turned flange extending through said slot, and a transverse flange slidably received in said guide, and resilient means interposed between said slider and said attaching flange, comprising a flat spring mounted to pivot with said slider and having an upwardly turned flange to engage said attaching flange.

6. In a casement window operator, the combination of a casing member, an operating lever having a toothed sector journalled in said casing, a shaft having a worm in said casing meshing with said toothed sector, braking means for said worm, said shaft having a non-circular aperture axially located in the same, a crank having an elongated shank of uniform non-circular cross-section complementary to said aperture, means spaced from said shaft to journal said crank, and stop means to hold said crank in said aperture.

7. In a casement window operator, the combination of a base having attaching means and a casing wall extending upwardly therefrom, bearings formed in half by opposite walls, a shaft having a worm thereon journalled in said bearings and having terminal thrust flanges, a complementary casing member having depending walls to complete said bearings, and means to fasten said base and member together.

8. In a casement window operator, the combination of a base having a raised peripheral portion comprising a housing for a segment gear and worm, apertures in said portion to provide bearings for said worm, thrust collars on said worm, a cover member also provided with apertures to complete said worm bearings, securing means for said cover comprising a hollow bearing for said gear having a flange on one end and screw connection with said cover at the other end, and operating means actuated by said worm and gear to open and close a window.

9. In a casement window operator, the combination of a sheet metal guide having a vertical attaching flange and a tubular guide with a slot at its base, with operating means, comprising an actuating lever, and a slider pivotally supported on said lever, said slider comprising a flat metal plate, having an upwardly turned flange extending through said slot, and a transverse flange carried by said upwardly turned flange and slidably received in said guide.

10. In a casement window operator, the combination of a supporting casing, with thrust bearings for a shaft, a shaft rotatably mounted in said casing and having a worm, a gear carried by said casing and meshing with said worm and having an outwardly projecting arm, a channelled sheet metal window actuating member having a body and lateral flanges, said channelled member being fixedly clamped on said outwardly projecting arm, and operative mechanical connections between the end of said channelled member and a window.

In witness whereof, we hereunto subscribe our names this 20th day of April, 1927.

CHARLES E. SPENCER.
OWEN W. ROBERTS.