June 11, 1957 K. S. RODAWAY 2,795,413

WINDOW OPERATOR

Filed Dec. 28, 1953

FIG. 1.

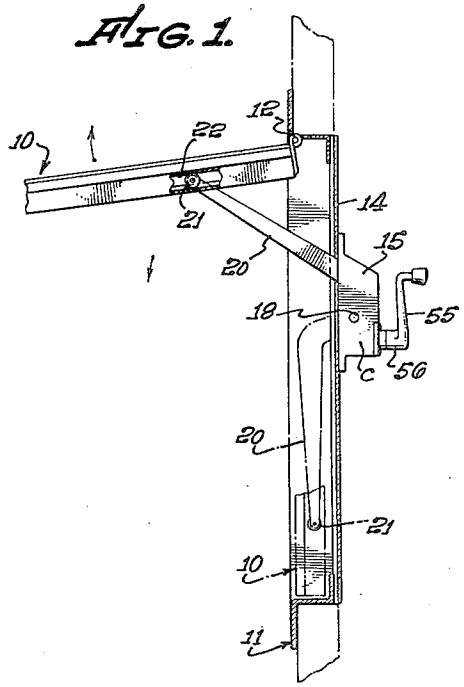


FIG. 2.

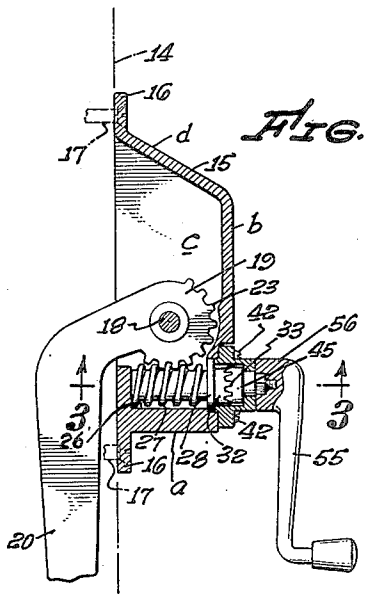


FIG. 3.

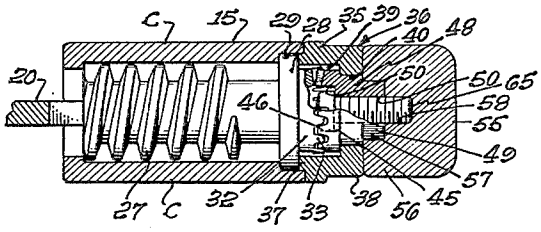


FIG. 4.

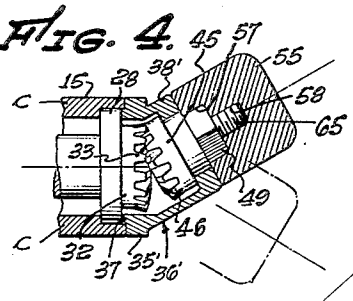


FIG. 5.

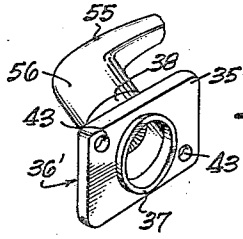
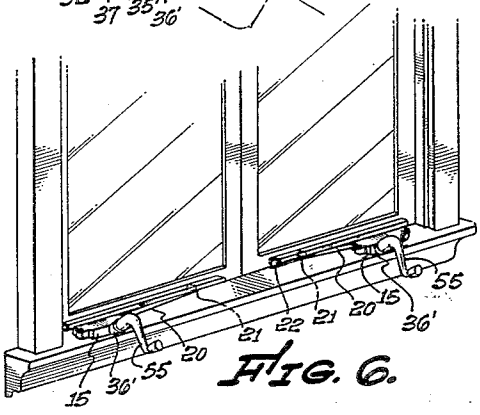


FIG. 6.



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WINDOW OPERATOR

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2 Claims. (Cl. 268—105)

This invention relates generally to window operating devices and particularly to a device designed for use in connection with pivoted windows for opening and closing the same.

An object of the invention is to provide an improved window operating device which is highly practical and efficient in operation and one which has particular utility when used in connection with casement and similar pivoting windows, such as may be found in homes and house trailers.

Another object of the invention is to provide an improved window operating device which is designed for use in connection with metal windows and frames and which includes a rotary, manually-operable, actuating means located at the inner side of the window frame and an operating gear means for converting the rotary movement to pivotal movement of an arm operatively connected to the window for pivoting the latter on its hinge.

Another object of the invention is to provide a window operating device which is installed against the inner side of the lower horizontal section of the window frame, and has an operating handle rotatable on an axis which may slope inwardly and upwardly away from the plane of the window so as to locate the handle in a position where it may be conveniently operated.

Another object of the invention is to provide a device of the type indicated in which the driving and driven gears have ring gear teeth on their adjacent faces, the teeth being arranged radially so that intermeshing of the teeth is possible when the axes of these gears are angularly related, said teeth also being positively engaged, each within a tooth space of the other gear when the axes of the gears are arranged coaxially.

A further object of the invention is to provide a device of the class specified which is adapted for economical manufacture, the main elements lending themselves to mass production as die-castings requiring little, if any, machining.

Another object of the invention is to provide a window operator, of the character referred to, in which the operating handle embodies a driving or operating gear which meshes with a similar, driven gear, the driving gear and handle being rotatable on a bearing block or mounting element detachably secured to a housing which encloses the driving mechanism. By employing such a detachable mounting arrangement, bearing blocks having bearing axes extending either coaxially with the driven gear or at an angle thereto may be employed. Consequently, by utilizing an appropriate bearing block, the axis of rotation of the operating handle may be extended in one direction or another from a plane normal to the plane of the window to suit the convenience of the user. According to the invention, this is made possible by providing a bearing block or mounting element having angularly-related bearings for the driving and driven gears, said block being mountable against the housing in either of two opposite positions so as to cause the axis of the operating handle to always slope relative to the axis of the driving gear. Also, by this provision, it is possible to employ a mounting element having coaxial bearings for the driving and driven gears so that the operating handle may rotate about an axis.

Further objects of the invention will appear from the following description and from the drawing, which is intended for the purpose of illustration only, and in which:

Fig. 1 is a sectional vertical view of a metal window frame and window hinged thereto and showing the present improved window operator device applied to use therewith;

Fig. 2 is an enlarged vertical view of the window operator with certain portions broken away to disclose the internal operating parts;

Fig. 3 is a further enlarged cross-sectional view, taken on line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 3, showing an alternative, angular mounting means for the operating handle;

Fig. 5 is a perspective view of the angular mounting means of Fig. 4, and

Fig. 6 is a perspective view of a casement window employing the invention.

Referring to the drawing, the present improved window operating device is shown as applied to use in connection with a metal window **10** and rectangular window frame **11**, the window being shown as hinged to the frame along a top horizontal axis **12**. The window is thus adapted to pivot outwardly and upwardly to the open position shown by full lines and inwardly and downwardly to the closed position indicated by broken lines in Fig. 1. The metal frame **11** is conventional, having horizontal upper and lower sections and vertical sections of substantially **Z** cross-sectional shape and a rigid cross-bar **14** intermediate the sides thereof for supporting the window operating device.

The window operating device includes an oblong housing **15** of substantially rectangular box shape which is disposed against the inner surface of the cross-bar **14**. As shown, the housing **15** has flanges **16** which are secured against the side of the frame **11** by means of screws **17**. It will be noted that the cross-bar **14** and the longitudinal axis of the housing **15** are disposed perpendicular to the pivot axis **12**.

The housing **15** carries a vertical pin **18** which extends through the side walls of the housing. Rotatable on the pin **18** is the hub portion **19** of an actuating arm **20**. The outer, free end of the arm **20** carries a roller **21** which is slidable in a guide **22** secured to the window **10** (Fig. 1). The hub **19** is provided with a worm wheel segment **23**.

The housing **15** is provided with a semicircular recess **26** within the lower side thereof and rotatable in said recess is a worm **27** which meshes with the worn wheel segment **23**. The worm **27** has a circular flange **28** which is disposed within a counterbore **29** formed in the front side of the housing **15**. The worm also has an axial extension **32** which projects outwardly from the counterbore **29**, said extension being in the nature of a driven gear provided with radial gear teeth **33** in its end face.

Secured against the side of the housing **15** within a depression thereof is the platelike portion **35** of a mounting element or bearing block **36**, the element having an annular pad **37** fitting within the outer end of the counterbore **29**. The mounting element has a boss **38** which, in the embodiment of the invention disclosed in Figs. 1 to 3, extends coaxially with the axis of the worm **27**. The element **36** has an axial recess **39** and reduced bore **40**. The plate portion **35** is secured against the outer surface of the housing **15** by means of screws **42** which pass through diagonally opposite spaced holes **43** in the

plate portion (Fig. 5) and which are screwed into threaded holes in the housing.

Rotatable within the recess **39** of the mounting or bearing element **36** is a driving gear **45** having radial gear teeth **46** on its inner face. In the device shown in Figs. 1 to 3, the gears **32** and **45** are coaxial and the gear teeth **33** and **46** on their adjacent faces mesh completely so that the driving and driven gears are keyed for unitary rotation.

The driving gear **45** has a hub **48** which is rotatable in the bearing hole or bore **40** of the mounting element **36** and also is provided with an axially projecting square end or key **49**. The gear **45** has an axial hole **50** and a recess **51** at its inner end.

The device also includes an operating handle **55** by which the driving gear **45** may be rotated. The handle **55** has a hub **56** provided with a square socket **57** and a threaded hole **58**. The bearing element **36**, gear **45** and handle **55** constitute a sub-assembly or unit which is attachable to the housing **15** by means of the screws **42**. To assemble the unit **36, 45, 55**, the gear **45** is first placed within the mounting element **36** with its square end **49** projecting from the side of the element. The hub **56** of the handle **55** is next placed against the outer side of the element **36** with the square key **49** of the gear **45** entering the square socket **57**. A screw **65** is then inserted through the axial hole **50** of the driving gear **45** with the head of the screw located in the recess **51** thereof. By tightening the screw **65**, the parts **36, 45** and **55** are drawn together as shown in Fig. 3 to key the gear and operating handle together while allowing rotation of the gear within the mounting element. The operating unit **35, 45, 55** is then attached to the housing **15** by the screws **42**. With the unit so mounted, its gear **45** meshes with the driven gear **32**, as shown.

Assuming that the window **10** is in the open position illustrated in Fig. 1, when it is desired to close the window, the handle **55** is simply rotated in counterclockwise direction. Due to the positive driving connection provided by the teeth **46** and **33**, the driven gear **32** and the worm **27** are likewise rotated in counterclockwise direction. Such rotation of the worm effects counterclockwise rotation of the hub **19** so as to pivot the arm **20** from the position shown in Fig. 1 to that illustrated in Fig. 2. As the arm **20** is lowered, the roller **21** rides in the groove **22** of the window so as to close the later against the frame **11**.

To open the window, the above procedure is reversed, that is, the operating handle **55** is rotated in a clockwise direction to cause pivotal movement of the actuating arm **20** in a clockwise direction to swing the window to its open position.

It will be noted that the lower wall *a* of the housing **15** is horizontal, the rear wall *b* and side walls *c* are vertical, and that the upper wall *d* at the opposite end of the housing from the worm **27** is inclined to accommodate the operating arm in its open position. It will also be noted that the flanges **16** lie parallel to the rear wall *b* and are provided with holes having axes parallel to the worm **27**.

The present invention also contemplates an alternative mounting for the handle and associated operating elements to allow rotation of the handle about an axis that is inclined to the axis of the worm **27**. Such a modified mounting is shown in Figs. 4 and 5.

It will be observed that in Figs. 4 and 5 the mounting element **36'** is similar to the element **36** with the exception that its outer portion **38'** is arranged at an angle to the inner portion **35'**. By this variation in structure, the driving gear **45** and operating handle **55** are arranged angularly with respect to the driven gear **32**. The teeth of the gears **45** and **32** thus mesh only at a point offset from their axes to provide a driving engagement. With this arrangement, the axis of rotation of the handle **55** is inclined at an angle of, say, 30 degrees with respect to the vertical plane that is perpendicular to the pivot axis **12**.

As a particular feature of improvement, the angular mounting element **36'** is reversible so that it may be attached to the housing **15** in either of the positions shown by full lines or broken lines in Fig. 4, due to the diagonal location of the screw holes **43**. By this provision, the device may be installed in the position shown in Fig. 1 for convenient operation of a right-handed person, or inverted and installed at the opposite side of the window opening for convenient operation of a left-handed person. Thus, a single device of the type shown in Fig. 4 may be employed to be operated either by a left-handed person or a right-handed person. Furthermore, the window operating device may be installed in other arrangements in which it is located on a sill and may be conveniently arranged so that the handle is inclined upwardly away from the sill regardless of whether it is employed in a window in which the pivot axis, which is now vertical, is on the left side or the right side of the window opening. Such an arrangement is shown in Fig. 6.

In the casement window illustrated in Fig. 6, two operators are employed to open and close corresponding right and left windows. The operators are of the same type as that described in detail above except that instead of being at the edges adjacent the mouth in which the levers **20** operate, the flanges **16** that are employed for mounting the housings **15** on the window sill are at the sides and the flanges are provided with screw holes that lie perpendicular to the axis of the worm instead of being parallel thereto.

Although only a limited number of forms of the invention have been specifically disclosed, it will be obvious that the invention is not limited thereto but is capable of being employed in other mechanical forms. Various changes, which will now suggest themselves to those skilled in the art, may be made in the material, form, details of construction, and arrangement of elements without departing from the invention. It is therefore to be understood that this application for patent is intended to cover all forms of the invention that come within the scope of the appended claims.

The invention claimed is:

1. A window operator device for use in connection with a window hinged for pivotal movement to open and closed positions relative to a window frame, comprising: a housing attachable to the frame and having an open side normally adjacent said frame when said housing is adhered thereto, said housing also having a wall at its opposite side provided with an opening remote from said frame; an arm pivoted within said housing and projecting from the open side thereof for pivotal movement in a pivot plane normal to the plane of the frame, the outer end of said arm being operatively connectible to the window for pivoting the same to its open and closed positions, said arm having a worm wheel segment concentric with its pivotal axis; a worm rotatable within said housing and meshing with said segment, said worm having its axis normal to the pivotal axis of said arm with one of said worms being disposed closely adjacent to said opening; a driven gear fast with said one end of said worm, said driven gear having radial teeth on an end face thereof located at said opening; a mounting element of elbow shape securable against said wall of the housing to cover said opening, said element having angularly-related, intersecting bores, one of which aligns with the axis of said driven gear to receive the same; a driving gear rotatable in the other bore and having radial gear teeth in an end face, said gear teeth of the driving and driven gears meshing at a point offset from their axes, said driving gear having an axial key projecting from said element; and an operating handle secured to said key, rotation of said handle being in a plane inclined with respect to the axis of said driven gear and effecting rotation of both

gears, said mounting element being securable to said housing in either of two opposite positions so as to cause the axis of the driving gear to assume either one of two corresponding oppositely inclined positions relative to said pivot plane, said driving gear being so located within said other bore of said mounting element that the axis of the driving gear intersects the axis of the driven gear adjacent the end faces of said gears in both positions of said mounting element, whereby said driving gear meshes at a first point on said driven gear when said mounting element is secured to said housing in one of its said two positions, and said driving gear meshes at a second point on said driven gear opposed to said first point when said mounting element is secured to said housing in the other of its said two positions.

2. A window operator device for use in connection with a window hinged for pivotal movement to open and closed positions relative to a window frame, comprising: a housing attachable to the frame and having an open side normally adjacent said frame when said housing is adhered thereto, said housing also having a wall at its opposite side provided with an opening remote from said frame; an arm pivoted within said housing and projecting from the open side thereof for pivotal movement in a pivot plane normal to the plane of said frame, the outer end of said arm being operatively connectible to the window for pivoting the same to its open and closed positions, said arm having a worm wheel segment concentric with its pivotal axis; a worm rotatable within said housing and meshing with said segment, said worm having its axis normal to the pivotal axis of said arm with one end of said worm being disposed closely adjacent to said opening internally of said housing; a driven gear directly attached to said one end of said worm, said driven gear having radial teeth on an end face thereof located at said opening; a mounting element of elbow shape securable against said wall of the

housing to cover said opening, said element having angularly-related, intersecting bores, one of which aligns with the axis of said driven gear to receive the same; a driving gear rotatable in the other bore and having radial gear teeth in an end face, said gear teeth of the driving and driven gears meshing at a point displaced from the intersection of their axes, said driving gear having an axial key projecting from said element, and having an axial hole; an operating handle having a socket receiving said key; and a screw extending through said other bore and screwed into a threaded hole in said handle to clamp the driving gear and handle together, rotation of said handle being in a plane inclined with respect to the axis of said driven gear and effecting rotation of both gears, said mounting element being securable to said housing in either of two opposite positions so as to cause the axis of the driving gear to assume either one of two oppositely inclined positions relative to said pivot plane, said driving gear being so located within said other bore of said mounting element that the axis of the driving gear intersects the axis of the driven gear adjacent the end faces of said gears in both positions of said mounting element, whereby said driving gear meshes at a first point on said driven gear when said mounting element is secured to said housing in one of its said two positions, and said driving gear meshes at a second point on said driven gear opposed to said first point when said mounting element is secured to said housing in the other of its said two positions.

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