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A. LANG

2,214,280

CASEMENT WINDOW OPERATOR

Filed Sept. 13, 1938

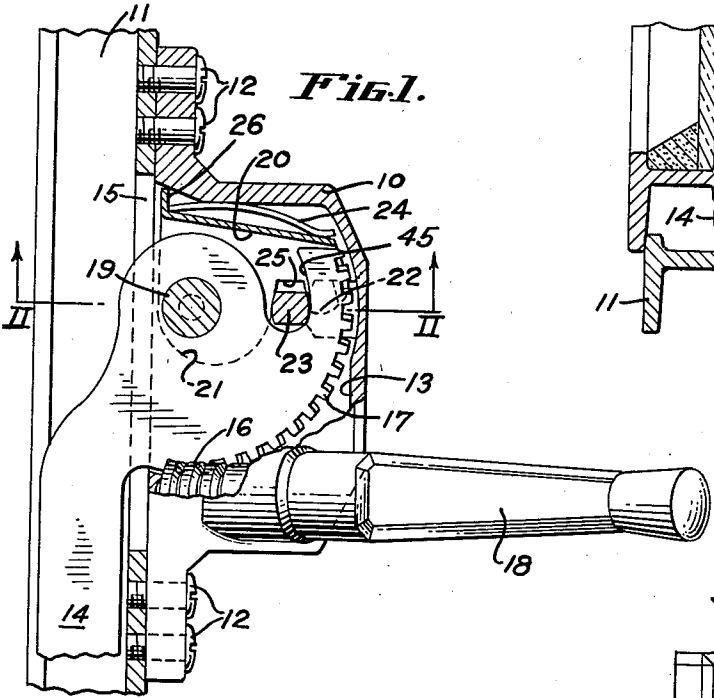


Fig. 1.

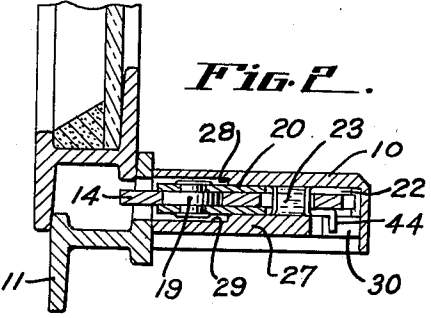


Fig. 2.

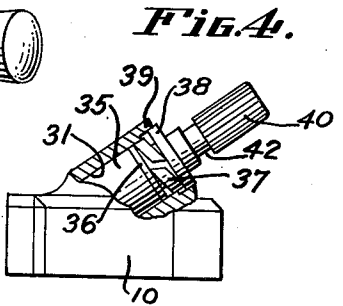


Fig. 4.

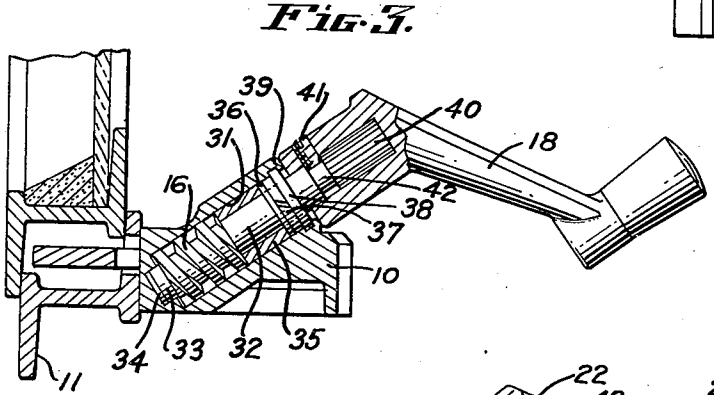


Fig. 3.

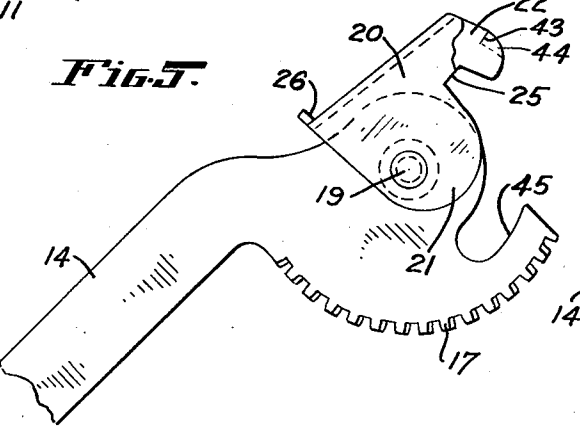


Fig. 5.

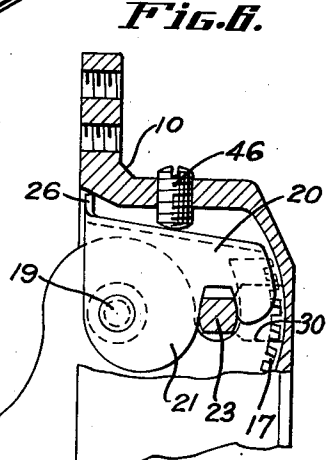


Fig. 6.

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2,214,280

CASEMENT WINDOW OPERATOR

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11 Claims. (Cl. 268—119)

This invention relates to casement window operators of the type in which a pivotally mounted window controlling lever is actuated by a crank operated worm gear that engages a worm gear sector carried by the window operating lever and more particularly the invention relates to an improvement in such operators that will provide a tight anti-rattling engagement between the crank operated worm and the worm gear sector upon the window operating lever and also compensate for wear during the life of the operator.

An object of the invention is to provide a casement window operator of new, novel and practical construction.

Another object of the invention is to provide a window controlling device of the crank operated type employing a worm and worm gear sector having improved means for maintaining the worm and worm gear sector in tight fitting and wear compensating relation with each other.

Another object of the invention is to provide a new and improved construction for casement window operators of the type employing a crank operated worm and worm gear sector in which the operating parts are movably supported upon wear resisting bearings of new and novel design.

A further object of the invention is to provide a new and improved assembly for mounting a crank operated worm in a die cast housing of relatively softer metal.

Another object of the invention is to provide a new and novel mounting of a casement window controlling lever by means of which the window operating lever may be conveniently and expeditiously assembled in cooperating relation with a crank operated worm carried by a supporting housing.

Other objects and advantages of the invention will be in part evident to those skilled in the art and in part pointed out hereinafter in connection with the accompanying drawing, wherein there is shown by way of illustration and not of limitation, preferred embodiments thereof.

In the drawing, wherein like numerals refer to like parts throughout the several views;

Figure 1 is a fragmentary, sectionalized plan view showing an assembled operator constructed in accordance with one aspect of the invention,

Figure 2 is a vertical, sectional view taken along line II—II of Figure 1 looking in the direction of arrows, and showing a portion of a window,

Figure 3 is a side elevation in section taken along the axis of the crank operated worm, and also showing a portion of a window,

Figure 4 is an end elevation partially in section showing the manner of mounting the crank operated worm upon the housing,

Figure 5 is a fragmentary view showing a pre-assembly of the window operating lever and its bearing forming member, and

Figure 6 is a fragmentary, sectionalized view showing details of a modified form of the invention.

In the art to which this invention pertains it has always been a problem to provide an operator for casement windows which will give positive control of the window in all positions whether opened or closed and which will, at the same time, be free of any rattling such as might be occasioned by a slight breeze, particularly when the window is slightly opened for ventilation. It has also been a problem in connection with window operators of the type employing a crank operated worm and worm gear sector to provide means to compensate for wear such as occurs between the crank operated worm and the worm gear sector that is customarily provided upon the window controlling lever. One prior attempt at the solution of the above difficulties is evidenced by United States Patent No. 1,539,549 to Edward H. Ellison, in which there is shown the combination of a crank operated worm and a lever operating worm gear sector in which the crank operated worm is loosely mounted in the supporting housing and is biased into close fitting engagement with the worm gear sector by means of a spring that exerts a sidewise thrust upon the worm. This arrangement is open to the objection that since the crank operated worm must exert its operating force in a small radius or lever arm, a mounting thereof in accordance with the teaching of the above patent, provides an impractical mechanical construction which cannot effectively prevent rattling in the operator. In other words if a rattling of the window is to be avoided, it will be apparent that the window controlling lever arm must cooperate with an immovable worm as it is at the worm where any rattling motion imparted to the window operator lever arm must be stopped.

As distinguished from the above, the present invention contemplates a mounting of the window controlling lever arm upon a movable support which may be permanently adjusted so as to bring the gear sector carried thereby into close fitting, anti-rattling relation with the crank operated worm or be resiliently mounted so as to maintain this close fit and at the same time automatically compensate for wear between the

lever arm operating gear sector and the crank operated worm during the life of the operator.

For the purpose of illustration, the invention is shown as embodied in an all metal operator of the type commonly used with metallic casement windows and sashes, such as are formed from standard Z-bar stock. Devices of the type illustrated are generally used with casement windows having inside screens and they are, therefore, commonly referred to by the trade as underscreen operators.

Reference is now made to the drawing, wherein the operator is shown as having a housing, designated by the numeral 10, that is adapted to be permanently secured upon a casement window frame 11 by means of suitable screws 12. The operator housing 10 has an internal cavity 13 into which the pivotal end of a window operating lever arm 14 is adapted to extend. Adjacent the cavity 13 and under the housing 10 the casement window frame 11 is provided with a slot 15 through which the window operating lever 14 projects to engage the casement window. The operator housing 10 is shown as having an angularly disposed worm 16 journaled therein that engages a worm gear sector 17 formed upon and concentric to the axis of the window operating lever arm 14. At the outer end of the worm 16 there is a suitable crank 18 by means of which an operating force may be imparted thereto.

The window operating lever arm 14 is shown as pivotally mounted upon a stub shaft 19 that is carried independently of the housing 10 by means of a movable clevis-like bearing forming member 20. This bearing forming member has parallel extending ears 21 between which the stub shaft 19 and the pivotal end of the window operating lever arm 14 are secured. In addition to the ears 21 the clevis-like bearing forming member 20 also carries a pair of hook-like extensions 22 that are adapted to interlock with an abutment 23 carried by the housing 10. Associated with the bearing forming member 20 and interposed between it and an end wall of the housing 10 there is a relatively stiff leaf spring 24 that exerts a pressure upon the clevis-like bearing forming member 20 which will hold the hook-like extensions 22 thereof into interlocking relation with the abutment 23 and at the same time bias the bearing forming member 20 toward the worm 16 and thus hold the worm gear sector 17 of the window operating lever arm 14 into tight and anti-rattling engagement with the worm 16.

At this point it should be pointed out that the abutment 23 is provided with rounded opposite surfaces and that the undercut portion of the clevis-like bearing forming member 20, designated by the numeral 25, has tapering sides that will tend to maintain a tight interlocking fit between the abutment 23 and the clevis-like bearing forming member 20 in all of its adjustable positions. As a result of this latter feature the adjusting movements of the bearing forming member 20 will be in a short arc about the abutment 23. However, since these movements of the clevis-like bearing forming member 20 will be of small magnitude, the pivotal axis of the window operating lever arm 14 may be said to move substantially along a straight line transverse to the axis of the window operating lever arm 14.

In addition to the hook-like extension 22 the bearing forming member 20 is also provided with

an oppositely disposed extension 26 that is adapted to engage the end wall of the housing 10 where it will function to retain the leaf spring 24 in an operative position with respect to the bearing forming member 20 and at the same time act as a stop to prevent any extreme displacement of the bearing forming member 20 against the action of the spring 24 which might result in a disengagement of the worm 16 and the worm gear sector 17.

Before passing on to the remaining figures of the drawing, it should also be pointed out that the stub shaft 19 is provided with an intermediate portion of relatively large diameter upon which the window operating lever arm 14 is journaled. This provides a large bearing surface for the lever arm 14 and results in a long wearing life between these parts.

Upon referring to Figure 2 of the drawing, it will be seen that the housing 10 has an immediately spaced wall or partition 27 which together with the top wall thereof provides a pair of spaced walls between which the clevis-like bearing forming member 20 is adapted to freely slide. The top wall of the housing 10 and the intermediate wall or partition 27 are cut away as at 28 and 29 so as to provide clearance for the extending ends of the stub shaft 19. As shown in this figure of the drawing, the intermediate partition of the housing 10 also has an opening 30 immediately below the extending ends of the hook-like portions 22 of the bearing forming member 20. This opening 30 in the partition 27 permits a portion of one of the hook-like projections 22 to be bent, as will hereinafter appear, to more firmly secure the parts against accidental displacement due to any abnormal application of force either through the window operating lever arm 14 or the crank arm 18.

Reference is now made to Figs. 3 and 4 of the drawing, wherein another important aspect of my present invention is illustrated. These figures of the drawing show the manner in which the crank operated worm of the operator mechanism is secured upon and journaled in the operator housing 10. For this purpose the housing 10 is shown as provided with a diagonally disposed cylindrical bore 31 into which the worm 16 is adapted to be snugly fitted. It will be understood that the disposition of this bore may be at any angle. However, since the diagonal disposition has met with favor in the trade, it is here shown in the latter position. The teeth of the worm 16 are formed integrally upon a shaft 32 having a diameter corresponding to the root diameter thereof. At the inner end of the shaft 32 there is a short extension 33 that is adapted to extend into a recess at the end of the bore 31 where it engages a step bearing 34 which is of hard bearing metal. At the other end of the worm 16 and surrounding the shaft 32 there is a cylindrical sleeve 35 that is adapted to fit tightly in the bore 31 of the housing 10 and provide a hard metal bearing for the shaft 32 at this point. At its inner end the sleeve 35 contacts the end of the spiral teeth of the worm 16 and at its outer end it is engaged by a hard metal washer 36 which also surrounds the shaft 32. The washer 36 is engaged by an endwise pressure exerting means in the form of a spring washer 37 and at the outside of the spring washer 37 there is a second immovable washer 38 of somewhat larger outer diameter. This larger washer 38 is secured against an annular shoulder

formed at the outer end of the bore 31 by a peening over of the housing 10 as at the point 39. With this arrangement, it will be seen that the worm 16 will be firmly held in the bore 31 of the housing 10 between hard metal bearing surfaces formed by the step bearing 34 and the sleeve 35 and as a result the housing 10, which in its preferred form is constructed of a relatively softer die cast metal, will be protected against wear. At the outer end of the shaft 32 there is a splined portion 40 upon which the crank arm 18 is fitted. For securing the crank arm 18 upon the shaft 32 there is also shown a set-screw 41 the end of which is adapted to project into an undercut portion 42 of the shaft 32. In assembling the parts last above described, the worm 16 with the cylindrical sleeve 35 are placed in the bore 31 and the washers 36 and 38 together with the spring washer 37 are applied thereto as shown in Fig. 4 of the drawing. After the parts have been placed in the position here illustrated, pressure is applied to the washer 38 sufficient to compress the spring washer 37 and as a final operation the end 39 of the housing 10 is peened over as shown in Fig. 3 of the drawing.

As illustrated in Fig. 5 of the drawing, the window operating lever arm 14 and the removable bearing forming member 20 are adapted to be preassembled prior to their insertion into the cavity 13 of the operator housing 10. This pre-assembly consists in springing the ears 21 of the bearing forming member 20 over the reduced ends of the shaft 19 and a peening over of these ends so as to tightly secure the shaft 19 in the bearing forming member. When the parts are thus assembled and the bearing forming member 20 is positioned upon the operating lever arm 14 as shown, the outer end of the rack 17 of the lever arm 14 can first be placed in meshing relation with the worm 16 after which the member 20 with the spring 24 can be moved into the housing 10 to place the hook-like extensions 22 thereof into interlocking relation with the abutment 23. In this figure of the drawing, it will be noted that the lowermost hook-like extension 22 of the bearing forming member 20 has a small cut 43 that extends into its outer edge so that a small portion thereof designated by the numeral 44 may bent down into the cavity 30 as is clearly illustrated in Fig. 2 of the drawing. This bending down of the portion 44 on the ear 22 as described provides a further means which in conjunction with the opening 30 will function to secure the bearing forming member 20 against accidental displacement of the housing 10 after the parts are finally assembled.

At this point it will be noted that the arcuate worm gear portion of the operating lever arm 14 is provided with an undercut 45 that provides a clearance for the abutment 23 when the operating lever arm 14 is in its window closed position. As a result of this undercut 45 it will be seen that the overhanging portion of the arcuate worm gear sector 17 will also interlock with the abutment 23 and thus provide an additional factor of safety against the operating lever arm 14 being displaced from the housing 10 by the application of any abnormal force.

Reference is now made to Fig. 6 of the drawing, wherein a modification of the invention is illustrated. As shown in this embodiment the invention contemplates a substitution of an adjustable set-screw 46 for the resilient leaf spring 24 hereinabove described. With this embodi-

ment of the invention, the bearing forming member 20 will be of substantially the same physical construction as that previously described. However, it will be understood that the small cut 43 in the hook-like extension 22 of the bearing forming member 20 may be dispensed with as the set-screw 46 will effectively function to retain these extensions 22 in interlocking relation with the abutment 23. When the device is provided with a set-screw 46 in this manner adjustments may be made during the life of the operator which will take up any wear that may occur between the worm 16 and the worm gear sector 17 and as a result the device can in this way be adjusted as frequently as is required to maintain a tight fitting and anti-rattling connection between the worm 16 and the worm gear sector 17.

While I have, for the sake of clearness and in order to disclose the invention so that the same can be readily understood, described and illustrated specific devices and arrangements, I desire to have it understood that this invention is not limited to the specific means disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and it is desired to claim it so that all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a casement window operator of the character described the combination of a housing of soft metal, said housing having a cavity into which a crank operated worm is disposed, a casement window controlling lever arm having an integrally formed worm engaging gear sector concentric to its axis adapted to extend into the cavity of said housing and engage said worm, a removable clevis-like member forming a wear resisting bearing upon which said lever arm is pivotally mounted, an abutment located within the cavity of said housing, a hook-like extension carried by said clevis-like member adapted to engage said abutment, and means operating upon said clevis-like member for holding said hook-like extension in engagement with said abutment and simultaneously biasing said clevis-like member with said lever arm and its worm gear sector into engagement with said crank operated worm, whereby said casement window controlling lever arm will be movably supported out of wear engaging relation to the walls of said soft metal housing.

2. In a window operating device of the character described, the combination of a lever arm supporting housing, a lever arm having a pivotal axis at one end with an arcuate gear sector concentric to its pivotal axis, a worm gear carried by said housing adapted to engage and cooperate with the gear sector upon said lever arm, a bearing forming member carried by said lever arm and providing a removable pivotal support for said lever arm adapted when secured in said housing to retain the gear sector upon said lever arm in cooperating relation with the worm carried by said housing, said lever arm and said bearing forming member being removable from said housing as a unit for the purpose of disassembly when said lever arm is in a window open position with respect to said housing, a retaining abutment carried by said housing and means carried by said lever arm forming a direct interlocking connection between said retaining

abutment and said lever arm to prevent removal of said lever arm and said bearing forming member from said housing when said lever arm is in its window closed position.

3. In a window operating device, the combination of an enclosing housing having a crank operated worm gear at one end and an oppositely disposed end wall, an abutment extending transversely of said housing between said worm gear and said end wall, a pivotally mounted lever arm having a worm engaging gear sector adapted to engage the crank operated worm within said housing, a movable bearing forming member upon which said lever arm is pivotally mounted, said bearing forming member having an extension adapted to interlock with the abutment extending transversely of said housing, and means cooperating with the end wall of said housing for holding the extension upon said bearing forming member in interlocking engagement with the abutment of said housing and maintaining the gear sector upon said lever arm in engagement with said crank operated worm.

4. In a window operating device, the combination of an enclosing housing having a crank operated worm gear at one end and an oppositely disposed end wall, an abutment extending transversely of said housing between said worm gear and said end wall, a pivotally mounted lever arm having a worm engaging gear sector adapted to engage the crank operated worm within said housing, a movable bearing forming member upon which said lever arm is pivotally mounted, said bearing forming member having a hook-like extension adapted to engage the abutment extending transversely of said housing, and a spring means interposed between said bearing forming member and the end wall of said housing for biasing the hook-like extension upon said bearing forming member into hooking engagement with the abutment of said housing and maintaining the gear sector upon said lever arm in engagement with said crank operated worm.

5. In a casement window operator, the combination of a housing having a crank operated worm journaled at one end and a transversely extending abutment located in spaced relation therewith, a removable unitary assembly comprising a window controlling lever arm having a gear sector adapted to cooperate with the worm within said housing and a bearing forming member having an extending portion adapted to interlock with and pivotally connect said bearing forming member with the transversely extending abutment in said housing, whereby said unitary assembly comprising the lever arm and the movable bearing forming member may move laterally while being held against displacement from said housing, and means carried by said housing and engaging said bearing forming member for retaining the extending portion thereof in interlocking engagement with the transversely extending abutment of said housing and imparting lateral movement to said bearing forming member, whereby the worm gear sector of said lever arm will be held in cooperating relation with said worm gear.

6. In a casement window operator, the combination of a housing having a crank operated worm journaled at one end and a transversely extending abutment located in spaced relation therewith, a removable bearing forming member having a hook-like extension adapted to interlock with said abutment when placed within said housing, a window controlling lever arm pivot-

ally mounted upon and carried by said removable bearing forming member, and spring means within said housing for holding the hook-like extension upon said bearing forming member in interlocking engagement with said abutment and imparting a pivotal movement of said bearing forming member about said abutment, whereby the worm gear sector of said window controlling lever arm will be biased into cooperating engagement with the crank operated worm journaled in said housing.

7. In a casement window operator, the combination of a window operating lever having a worm gear sector at its pivotal end, a bearing forming member having spaced ears between which the worm gear sector carrying end of said operating lever is pivotally mounted, a housing having spaced parallel walls slidably engaged by the spaced ears of said bearing forming member, a crank operated worm within said housing adapted to mesh with the gear sector upon said operating lever, an abutment extending transversely between the parallel walls of said housing and spaced from said crank operated worm, an abutment engaging extension upon said bearing forming member adapted to engage said abutment and permit movement of said bearing forming member about said abutment as a fulcrum, and spring means within said housing exerting a force upon said bearing forming member at a point radial with respect to said transversely extending abutment, whereby the gear sector of said operating lever will be held in operative and wear compensating relation with said crank operated worm.

8. In a casement window operator, the combination of a window operating lever having a worm gear sector at its pivotal end, a bearing forming member having spaced ears between which the worm gear sector end of said operating lever is pivotally mounted, a housing having spaced parallel walls slidably engaged by the spaced ears of said bearing forming member, a crank operated worm carried by said housing adapted to mesh with the gear sector upon said operating lever, a fulcrum forming abutment extending transversely between the spaced walls of said housing, said abutment being disposed in spaced relation with said crank operated worm and substantially in line with the axis about which said operating lever pivots, means carried by said bearing forming member adapted to engage said fulcrum forming abutment and limit the movement of said bearing forming member to a substantially lateral path, a spring means disposed within said housing and engaging said bearing forming member for imparting movement to said bearing forming member about said abutment as a fulcrum; and means carried by said bearing forming member for retaining said spring means within the housing and preventing any abnormal displacement of said bearing forming member against the action of said spring means.

9. In a casement window operator, the combination of a housing having a crank operated worm gear disposed at one end thereof, a window operating lever mounted within said housing and having an arcuate worm gear engaging sector concentric to its pivotal axis, said worm gear sector being undercut to form an overhanging extension at the outer end thereof, and a transversely extending abutment in said housing with which the overhanging end of said gear sector is adapted to interlock when the window operating lever is in its window closed position, whereby

the pivotal end of said window operating lever will be additionally secured within said housing when the casement window is in its closed position.

- 5 10. In a casement window operator, the combination of a housing having spaced parallel walls forming oppositely disposed bearing surfaces for a movable bearing forming member, a fulcrum forming abutment extending between
10 said spaced parallel walls, a movable bearing forming member having an inwardly disposed extension adapted to interlock with said abutment, a crank operated worm gear disposed in spaced relation with said abutment, a window
15 operating lever pivotally mounted upon said bearing forming member and having an arcuate gear sector engaging said worm gear, and means disposed with relation to said abutment oppositely to said worm gear for rotating said bearing
20 forming member and the extension carried

thereby about said abutment as a fulcrum to maintain said gear sector and said worm gear in anti-rattling engagement.

11. In a casement window operator of the type comprising a crank operated worm gear and a
5 pivotally mounted window operating lever, the combination of a housing having a fulcrum forming abutment extending parallel to and at a point disposed inwardly from the axis of the window operating lever, a movable bearing forming
10 member upon which the window operating lever is pivotally mounted having an extension movably engaging said abutment, and means within said housing adapted to move said bearing forming member about said abutment as a
15 fulcrum to compensate for wear and maintain a tight fitting engagement between the crank operated worm gear and the gear sector upon said window operating lever.

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