March 1, 1960 A. W. AHLGREN 2,926,905

OPERATOR FOR OPENING AND CLOSING WINDOWS

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Fig. 1

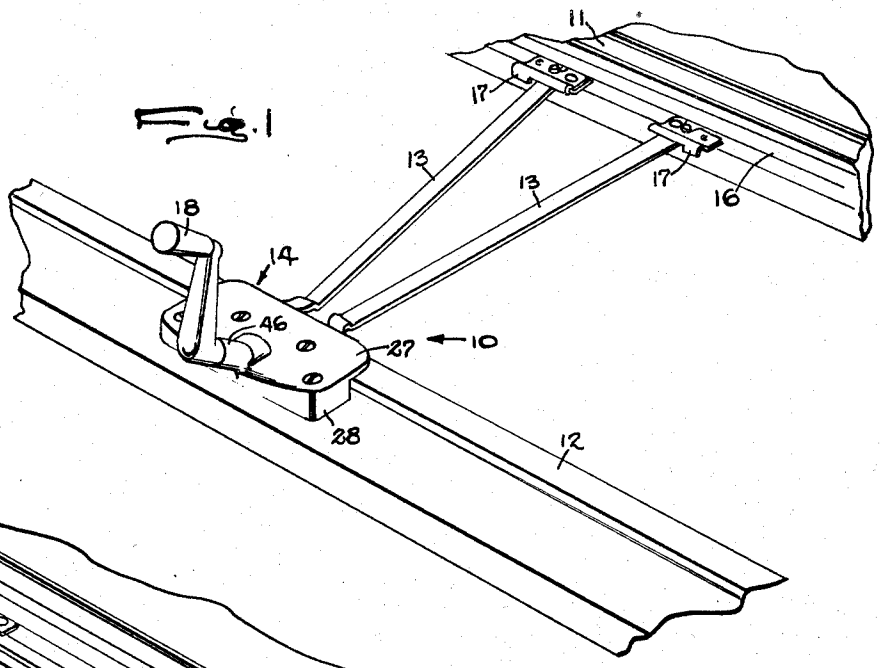
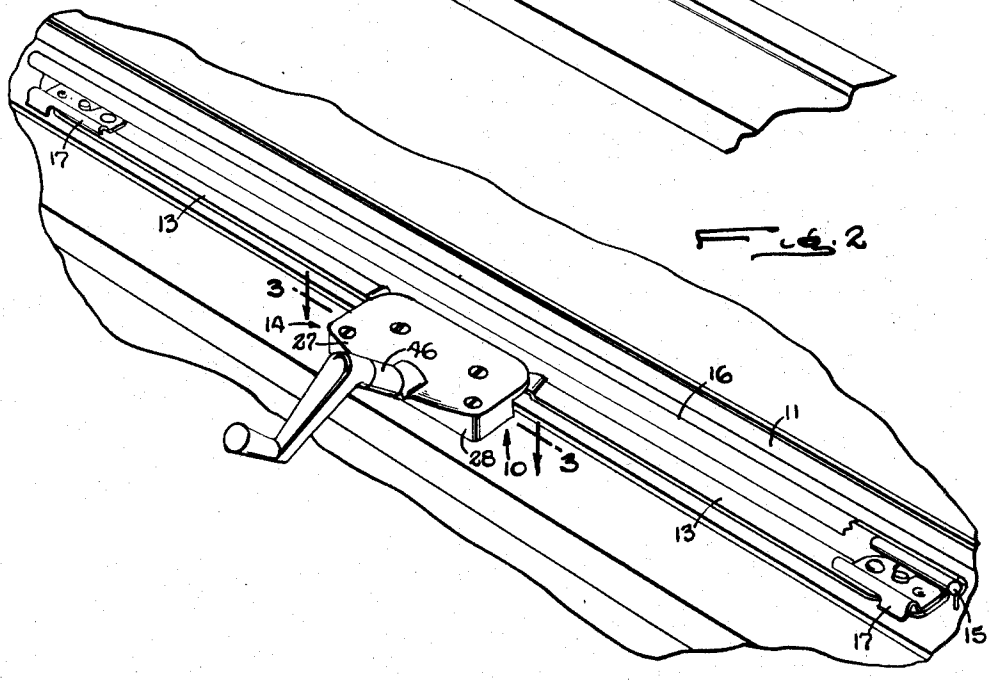


Fig. 2



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Fig. 3

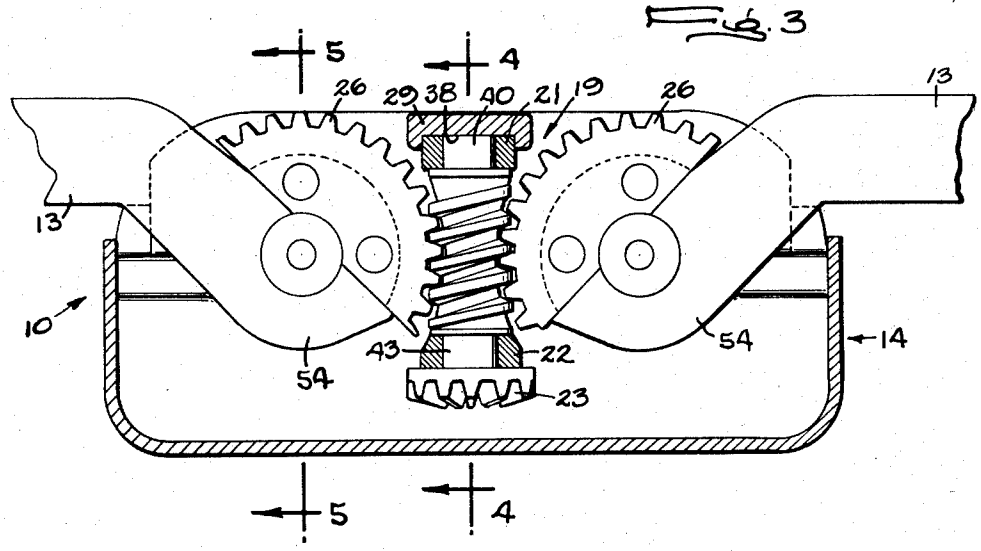


Fig. 4

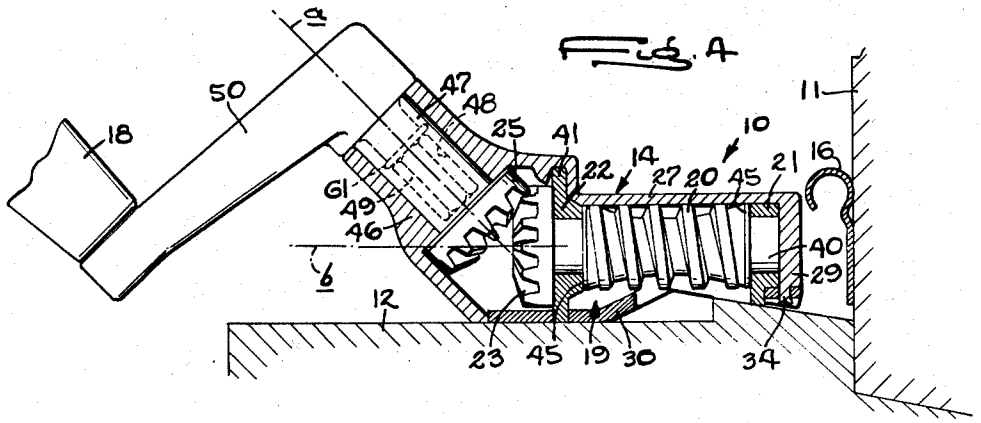
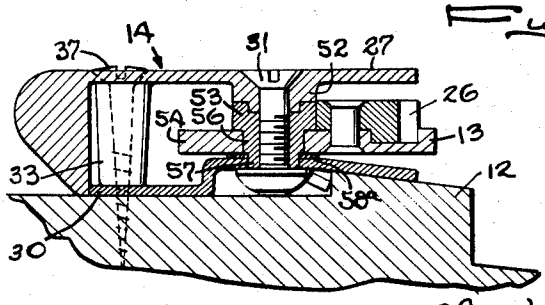


Fig. 5



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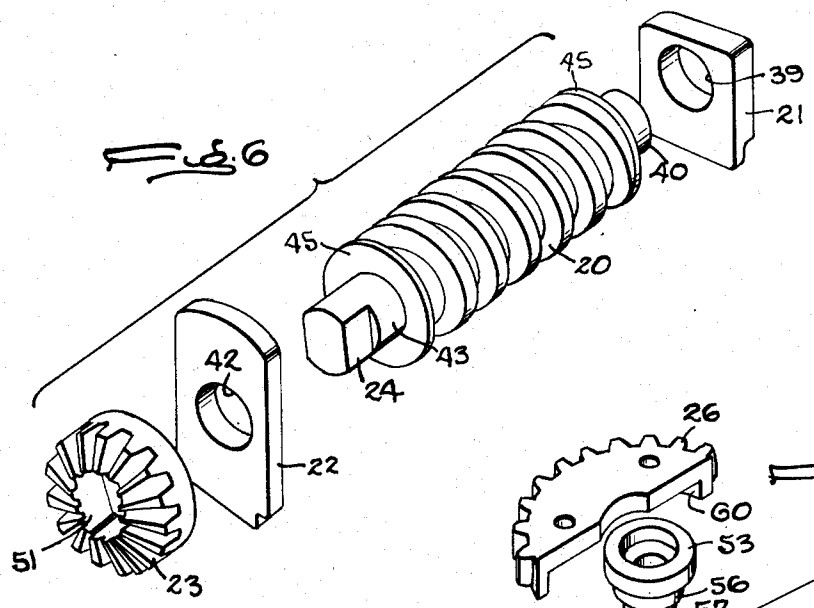


Fig. 6

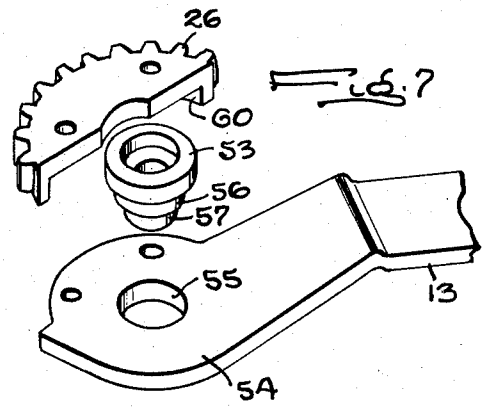


Fig. 7

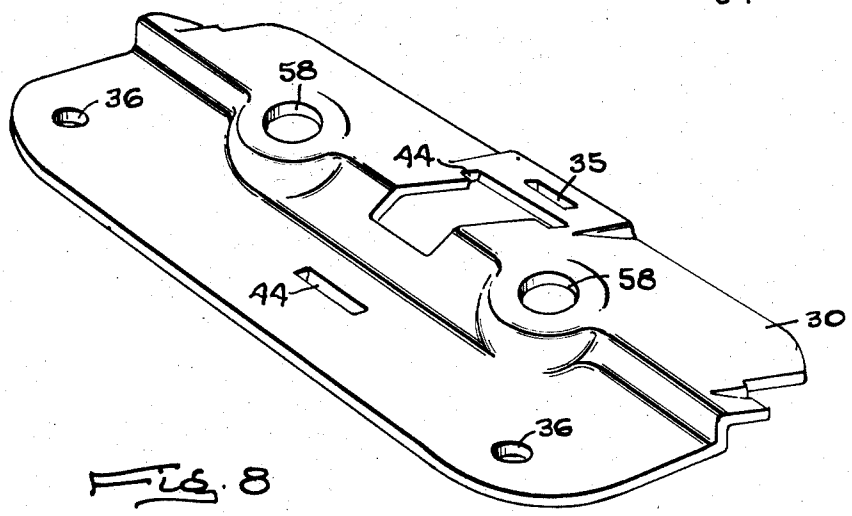


Fig. 8

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2,926,905

OPERATOR FOR OPENING AND CLOSING WINDOWS

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Application July 18, 1956, Serial No. 598,637

1 Claim. (Cl. 268—105)

This invention relates to window operators such as may be used for awning type windows in which the sash is mounted on the window frame to swing about the horizontal axis extending along the upper edge of the sash. More particularly, the invention relates to an operator with two horizontal arms pivotally mounted on the frame to swing together and apart and connected to the lower edge of the sash to open and close the latter upon such swinging. The arms are swung by turning a handle connected to the arms through gearing. The handle may be disposed at an angle, such as 45 degrees with respect to the horizontal so that the handle does not project a great distance beyond the window frame but still is accessible.

One object of the invention is to incorporate in an operator of the above character a novel arrangement of gearing which provides identical gear trains to each arm so that the effective backlash will be the same on both and which still permits the handle to be disposed at an angle.

Another object is to construct and arrange the gearing in a novel manner so that the operator may be assembled quickly and easily while still being rugged and durable in service use.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which—

Figure 1 is a fragmentary perspective view of a window incorporating the operator of the present invention.

Fig. 2 is a fragmentary perspective view with the parts in a different position.

Fig. 3 is an enlarged fragmentary sectional view taken along the line 3—3 in Fig. 2.

Fig. 4 is a fragmentary sectional view taken along the line 4—4 in Fig. 3.

Fig. 5 is a sectional view taken along the line 5—5 in Fig. 3.

Fig. 6 is an exploded perspective view of part of the gearing.

Fig. 7 is a fragmentary exploded perspective view of another part of the gearing.

Fig. 8 is a perspective view of the bottom cover plate for the operator.

For purposes of illustration, the invention is shown in the drawings embodied in an operator **10** for opening and closing the sash **11** of an awning type window. As is well known in the art, the sash is pivotally mounted on the frame of the window to swing about a horizontal axis extending along the upper edge of the sash so that the lower edge may be moved toward and away from the sill **12** of the window frame.

The operator **10** includes a pair of elongated horizontal arms **13** whose outer ends are connected to the lower edge of the sash **11**, the inner ends being pivotally connected to a casing **14** which is fastened to the sill **12**. The connection between each arm and the sash comprises a horizontal cylindrical shoe **15** (Fig. 2) which is received in a downwardly opening channel **16** which is of semicircular cross section and which extends across the width of the

sash. The shoes are attached to brackets **17** which are pivotally mounted on the outer ends of the arms so that the shoes may slide back and forth in the channel **16** as the arms are swung together and apart.

When the arms are swung together as shown in Fig. 1, the sash is swung open and the sash is drawn closed when the arms are swung apart as illustrated in Fig. 2. A handle **18** is mounted on the casing **14** and, through gearing **19** (Fig. 3), is connected to the arms to swing the latter in unison but in opposite directions. The handle is disposed at an angle, herein a 45 degree angle, with respect to the horizontal so that it is accessible but still does not project a great distance beyond the inner edge of the sill **12**.

The present invention contemplates constructing and arranging the gearing **19** in a novel manner so as to include identical gear trains to both of the arms **13** so that there is no difference in the backlash in the two trains whereby both arms operate equally effectively. This result is achieved even though the handle **18** is disposed at an angle to the horizontal. In addition, the gearing **19** is arranged for quick and easy assembly and still it is rugged and durable in service use. To the foregoing ends, the gearing includes a horizontal worm **20** journaled within the casing **14** in spaced bearings **21** and **22** and carrying a bevel gear **23** on an extension **24** (Fig. 6) on its inner end. The bevel gear **23** meshes with a second bevel gear **25** journaled in the casing and connected to the handle **18** so that the latter turns the worm. Arcuate gears **26** are fastened to the inner ends of the arms **13** and are disposed on opposite sides of the worm to mesh with the latter so that, as the worm is turned, the arms are swung in opposite directions about their respective pivots.

In the present instance, the casing **14** includes a cast cover element **27** which is formed with a downturned flange **28** extending along the inner edge and the side edges of the cover. The flange stops short of the outer edge as shown in Figs. 1 and 3. Integrally formed with the cover is a vertical post **29** (Figs. 3 and 4) which projects downwardly from the center portion of the front edge of the cover. The casing is closed by a bottom plate **30** which is stamped from sheet metal and is held to the cover by bolts **31** (Fig. 5) which extend down through the cover in the plate and are threaded into nuts **32**. The plate is located properly relative to the cover by hollow cylindrical bosses **33** projecting downwardly from the inner corner portions of the cover and by an ear **34** on the underside of the post **29**. The ear projects through a matched slot **35** in the plate (see Fig. 8) and the reduced lower end portions of the bosses are received in holes **36** in the plate **30** (Fig. 5).

As shown in Fig. 5, the contour of the bottom plate **30** generally matches the contour of the sill **12** so that the casing rests firmly on the latter. To secure the operator in place, screws **37** project down through the bosses **33** and are threaded into the sill.

Formed on the inner side of the post **29** is a vertical slot **38** (Fig. 3) whose lower end is open to receive the front bearing **21**, the latter being in the form of a small block fitted in the slot and having a central hole **39** (Fig. 6) to receive the rounded forward end portion **40** of the worm **20**. Alined with the post and disposed near the front of the cover **27** is a downwardly opening recess **41** (Fig. 4) which receives the upper end portion of the inner bearing **22**. This bearing also is in the form of a small block having a central opening **42** for the cylindrical inner end portion **43** of the worm gear. Both bearings project down into slots **44** in the bottom plate **30**. The slots **44** together with the slot **38** and the recess **41** hold the bearings against turning relative to the cover **27**. Washers **45** (Fig. 4) are interposed between the ends of the worm and the bearings.

The cover 27 is formed with a boss 46 which projects inwardly and upwardly at a 45 degree angle from the inner edge of the cover. A hollow shaft 47 (Fig. 4) is journaled in this boss with its axis *a* projecting downwardly and forwardly and intersecting the axis *b* of the worm 20 at a point behind the inner bearing 22. The bore 48 of the shaft has a hexagonal shape and receives a complementally shaped shaft 49 which is rigid with and projects at right angles from one end of a crank 50, the handle 18 being on the other end of the crank. Thus, turning the handle turns the hollow shaft 47 through the crank 50 and the shaft 49.

To connect the handle 18 to the worm 20, the bevel gear 25 is fast on the lower end of the hollow shaft 47 and meshes with the bevel gear 23 on the extension 24 (Fig. 6) on the inner end of the worm. The extension 24 projects inwardly beyond the bearing 22 and has flats on its sides and fits into a similarly shaped hole 51 in the bevel gear 23 so that this gear turns the worm. The two gears 23 and 25 are formed with 22½ degree bevels to permit the axis *a* of the hollow shaft 47 to be disposed at a 45 degree angle with respect to the axis *b* of the worm 20.

On either side of the worm 20, a short cylindrical boss 52 projects downwardly from the inner side of the cover 27 and on each boss is fitted a cylindrical bearing 53 (Fig. 5). The inner ends of the arms 13 are enlarged as indicated at 54 and the enlarged end portions are formed with holes 55 (Fig. 7) which are received on the reduced central portions 56 of the bearings. The lower ends 57 of the bearings are reduced further and project into holes 58 in the bottom plate 30. A washer 58a is interposed between each sector gear 13 and the bottom plate. The bearings have bores 59 through which the bolts 31 extend and thus these bolts clamp the bearings between the cover and the bottom plate. In this way, the arms 13 are mounted to turn about the axes of the bearings.

The enlarged portion 54 of each arm fits into a mating recess 60 on the side of one of the arcuate gears 26. The latter are sector gears and extend through approximately 180 degrees. The sector gears are riveted to the enlarged portions 54 of the arms and mesh with the worm 20 on opposite sides thereof. The sector gears complete the connection between the handle 18 and the arms. This connection extends through the crank 50, the hollow shaft 47, the bevel gears 25 and 23, the worm 20 and the sector gears 26. Thus, by turning the handle, the arms are swung in unison but in opposite directions.

It will be observed that the operator may be assembled easily and quickly. The cover 27 is placed upside down and the hollow shaft 47 with the bevel gear 25 attached is inserted into the boss 46. Then the bearing blocks 21 and 22 are slipped onto the end portions 40 and 43 of the worm and the bevel gear 23 is placed on the extension 24 after which this entire subassembly is simply dropped into

place with the bearing block 21 sliding into the slot 38 and the bearing block 22 dropping into the recess 41. The cylindrical bearings 53 then are placed on the bosses 52 and the arms 13 with the sector gears 26 attached are placed on these bearings. Next, the bottom plate 30 is placed in position, it being located by the bosses 33 and the ear 34 and the cover and plate are clamped together by the bolts 31 and nuts 32. Finally, the shaft 49 on the crank 50 is slipped into the hollow shaft 47 and is held in place by a snap ring 61. In spite of this simple assembly, the operator is rugged and capable of standing up under the comparatively large forces applied to it during the opening and closing of the sash 11. This result is achieved because the thrust on the worm 20 is taken up by relatively sturdy parts, namely, the post 29 and the boss 46 which are integral parts of the cover casting 27.

I claim as my invention:

An operator for a swinging sash comprising a cover adapted to be secured to the sill of the window frame and having a downturned flange along its rear edge and a center post projecting downwardly from its front edge, said post having a vertical groove opening inwardly of the cover, a recess in said cover alined with and spaced inwardly from said groove, first and second bearings received in said groove and said recess respectively and held against turning relative to said casing, a worm disposed between and having end portions journaled in said bearings, arcuate gears disposed on opposite sides of said worm to mesh with the latter and journaled in said cover to turn in unison but in opposite directions upon turning of the worm, two arms, one secured to each of said arcuate gears, said arms projecting outwardly of said cover on opposite sides of said post, means for connecting said arms to the window sash, an extension on the inner end of said worm projecting beyond said second bearing, a shaft journaled on said cover with its axis disposed at an angle relative to said worm and intersecting the axis of the worm at a point behind said second bearing, bevel gears on said shaft and said extension and meshing with each other, a plate attached to the underside of said cover and enclosing said gears, said cover having a shoulder abutting the back of the bevel gear on said shaft whereby the other bevel gear and the shoulder hold the shaft against axial movement and a handle connected to said shaft to turn the latter thereby to turn said worm and swing said arms.

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