June 23, 1953 F. SOMERSTEIN 2,642,967

AWNING TYPE WINDOW AND OPERATING MEANS THEREFOR

Filed Dec. 29, 1948 3 Sheets-Sheet 1

FIG. 1.

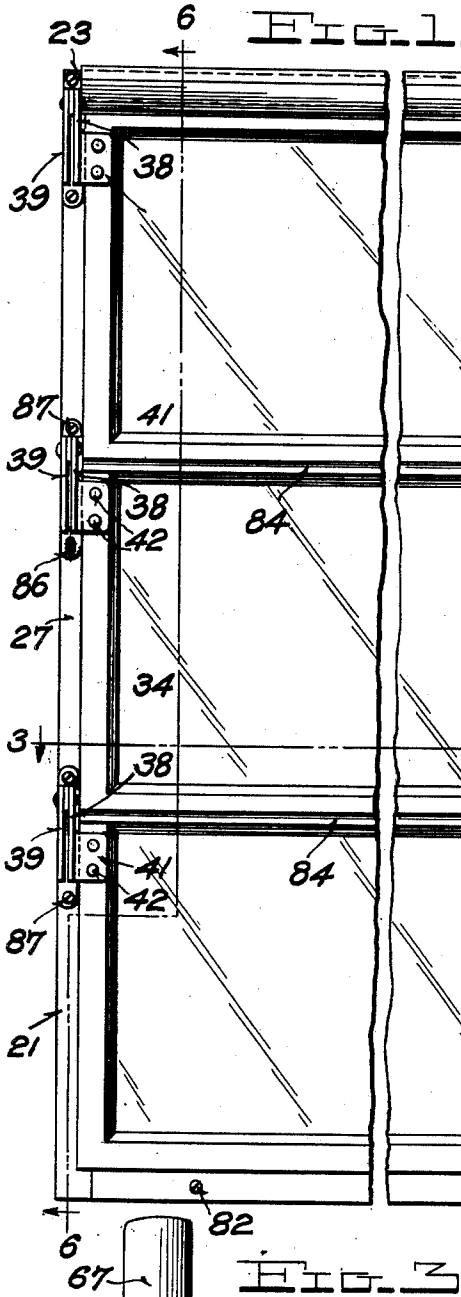


FIG. 2.

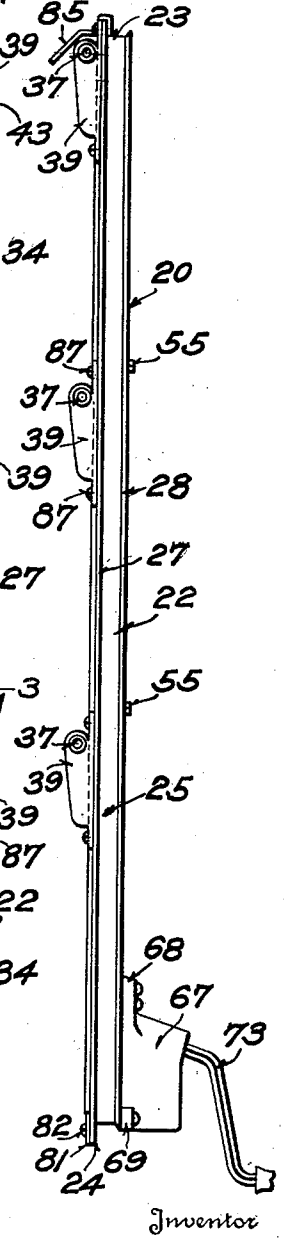
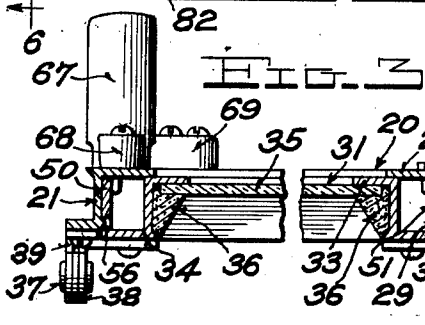


FIG. 3.



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AWNING TYPE WINDOW AND OPERATING MEANS THEREFOR

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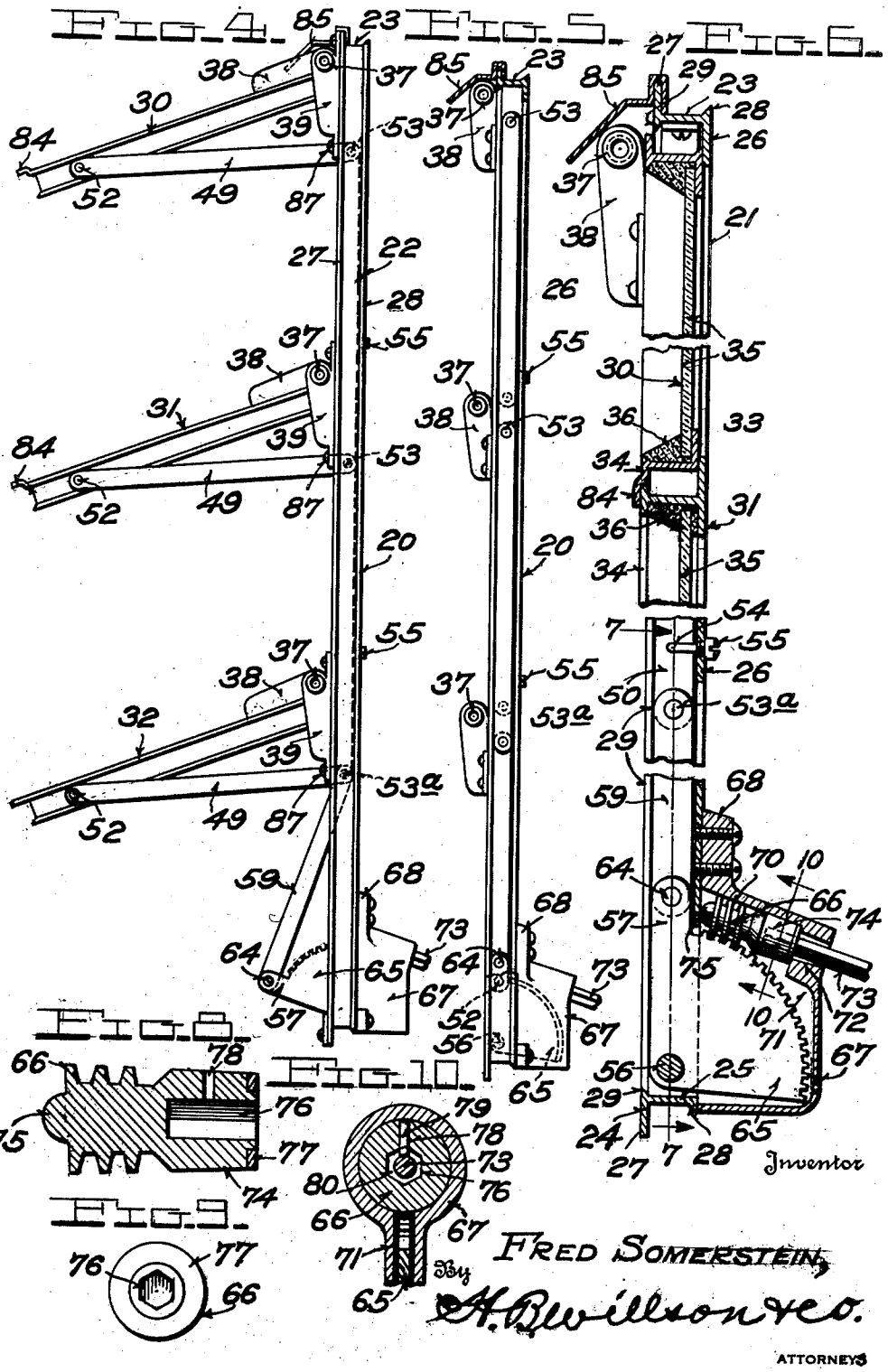

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AWNING TYPE WINDOW AND OPERATING MEANS THEREFOR

Filed Dec. 29, 1948

3 Sheets-Sheet 3

Fig. 7.

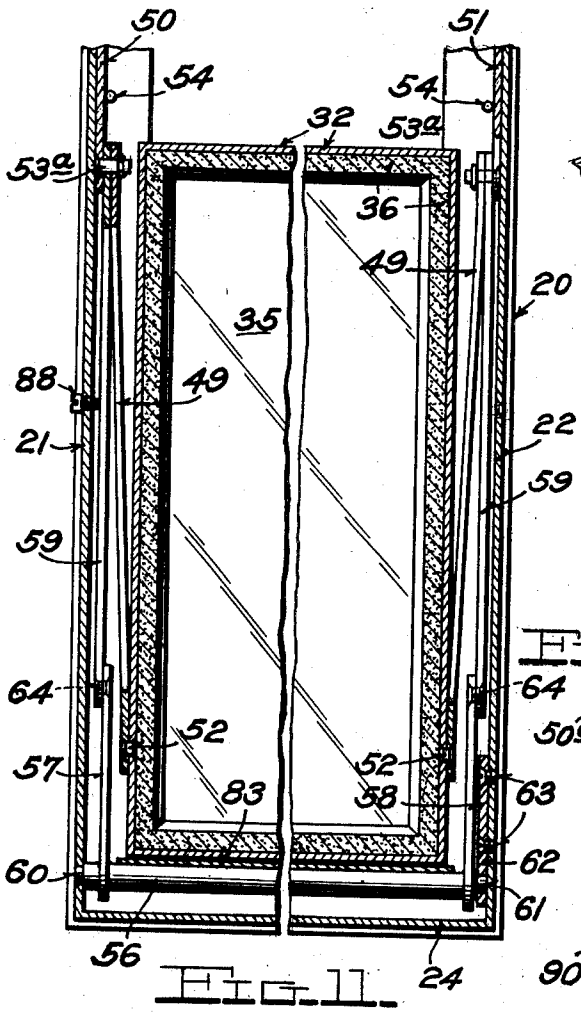


Fig. 15.

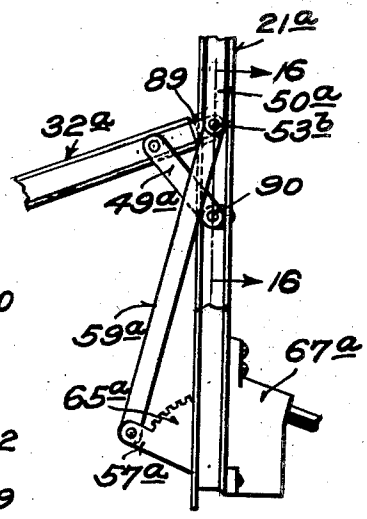


Fig. 16.

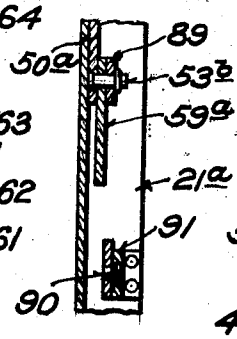


Fig. 17.

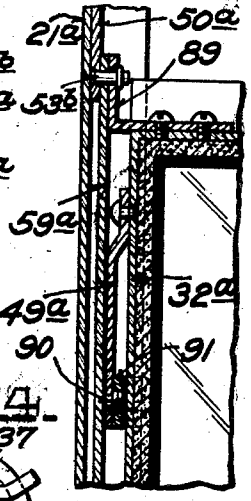


Fig. 11.

Fig. 12.

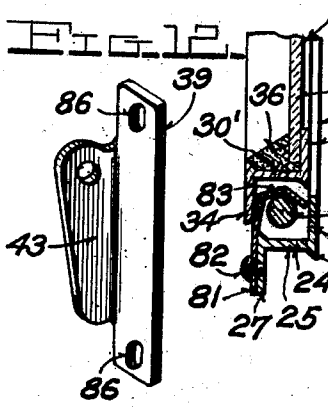


Fig. 13.

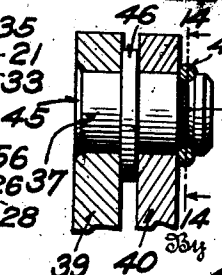
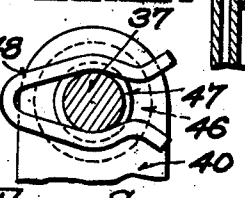


Fig. 14.



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UNITED STATES PATENT OFFICE

2,642,967

AWNING-TYPE WINDOW AND OPERATING MEANS THEREFOR

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Application December 29, 1948, Serial No. 67,831

2 Claims. (Cl. 189—69)

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My invention relates to metal windows of the so-called louver or awning type and means for operating them to simultaneously open and close the several sashes which are disposed one above another in the window frame.

In the past the horizontal, vertically swinging sashes of such windows have been operated by sliding bars in the channels of the jambs of the frame through the use of gearing to move the bars and various linkages between the bars and the sashes where the latter were pivoted on horizontal axes to the frame for swinging movement or between the frame and the sashes where the latter were pivoted to the sliding bars for both sliding and pivotal movement.

The primary object of this invention is to improve such prior structures to render them more effective in operation and less expensive to the user.

Another object is to provide in a window of this character having sash actuating slide bars in the channels of the jambs of the frame, a worm gear actuated power shaft located in the channel of the bottom or sill bar of the frame and directly beneath the slide bars, and power arm and link connections between the shaft and the slide bars to more effectively actuate the slide bars and to reduce to a minimum the lateral projection of the sash actuating and mounting parts from the side faces of the frame, as well as to reduce the cost of constructing and assembling the window.

Another object is to provide in a window having the above stated sash actuating means, improved link connections between the slide bars and the pivoted sashes, whereby the sashes may not only be opened to a substantially horizontal position and will be rigidly braced and supported by the links, but the links will have a powerful off-center pull on the sashes as they are moved to their closed positions and thus the sashes will be held in a more tightly closed position than in any known prior art structure.

Another object is to provide in a window having the above mentioned mounting and actuating means for the swinging sashes, a simple adjustment for the hinges of the sashes so that wear in the various pivotal elements of the mechanism may be taken up quickly and easily by a mechanic within the building, and thus the sash mounting and actuating mechanism can be kept in proper condition to insure the tight closure of the sashes and to prevent lost motion and rattling of the parts.

Another object of the invention is to provide a window of this character in which both the

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frame and the sashes may be formed of one inch standard extrusion Z-bars of aluminum or other metal to thereby reduce the amount of metal in the window to the minimum and hence reduce the cost, the above mentioned sash mounting and actuating means being such that the complete window will be relatively light in weight yet strong and sturdy, relatively less expensive to produce and transport, and the same time easy to operate and highly effective in use.

Another object resides in the provision of an improved worm gear operating means which is inexpensive to produce and install, which is strong and durable and which will project a minimum distance from the window sill so as not to interfer with curtains or drapes at the window.

Further objects and advantages of the invention will be apparent upon reading of the subjoined description in connection with the accompanying drawings in which:

Fig. 1 is an outer side view of a window embodying the invention, the sashes being shown in closed position.

Fig. 2 is an end or edge view of the structure of Fig. 1.

Fig. 3 is a horizontal sectional view taken on the plane of line 3—3 of Fig. 1, on an enlarged scale and with portions broken away.

Fig. 4 is a view similar to Fig. 2 but showing the sashes opened to almost their full extent.

Fig. 5 is a view similar to Fig. 2 with parts broken away and in section to show the relative positions of the pivotal connections of the sash actuating and locking mechanism when the sashes are in closed position.

Fig. 6 is a vertical sectional view taken substantially on the line 6—6 of Fig. 1, on an enlarged scale and with parts broken away.

Fig. 7 is a detail sectional view on line 7—7 of Fig. 6.

Fig. 8 is a longitudinal sectional view of the worm.

Fig. 9 is an end view of the worm.

Fig. 10 is a detail sectional view on line 10—10 of Fig. 6 showing the means for locking the crank handle to the worm.

Fig. 11 is a detail sectional view on line 11—11 of Fig. 1 showing the resilient weather strip on the sill of the window frame and how it conceals the power shaft.

Fig. 12 is a perspective view of one of the adjustable brackets of the hinges for the sashes.

Fig. 13 is a detail section showing the detach-

able pivotal connection between the brackets of one of the sash hinges.

Fig. 14 is a section on line 14—14 of Fig. 13.

Fig. 15 is a detail end view with parts broken away of the lower portion of a modified form of the invention in which the sashes are pivotally connected to the slide bars for sliding and swinging movement.

Fig. 16 is a detail section on line 16—16 of Fig. 15.

Fig. 17 is a detail vertical section through parts shown in Fig. 15 to show the mounting and actuating parts of one of the sliding and swinging sashes.

The window structure shown in Fig. 1 has three horizontally extending sashes arranged in a vertical row but a series of two or any number of sash or louver members may be mounted in the window frame which is generally indicated at 20. The rectangular frame comprises parallel side bars or jambs 21 and 22 connected at their upper ends by a top bar 23 and at their lower ends by a bottom bar or sill 24. All of these bars are of channel metal and each has a web portion 25 from the longitudinal edges of which project in opposite directions a wide inner flange 26 and a wide outer flange 27. These bars which are commonly called Z-bars also have shorter flanges or beads 28 and 29 as seen in Fig. 3; and when made of aluminum these bars are extruded. The mounting of the sashes and the sash operating mechanism hereinafter described is such, that I may use in making both the frame and the sashes, standard one inch extruded aluminum Z-bars so that the window will contain a minimum amount of metal, thus reducing the cost as well as the weight of the window unit which is to be shipped in assembled form from the factory ready for mounting in an opening in a wall.

The three rectangular sashes 30, 31 and 32 are also shown as made of Z-bars which have at least an inwardly extending flange 33 and an outwardly extending flange 34 projecting from opposite longitudinal edges of the web portion of the bar, as seen in Fig. 3. The sashes are of a size to move into the frame 20 when they are closed so that the flanges 33 and 34 of the side bars of the sashes will respectively engage the flanges 26 and 27 of side bars of the frame; and hence the sashes will be coplanar with the jambs of the frame when they are closed. The sashes preferably have panes 35 of glass held against the flanges 33 by glazing strips 36 or the like.

In the preferred embodiment shown in Figs. 1 through 14, the sashes are hingedly mounted on the outer face of the frame for upward and outward swinging movement on transversely alined pivots 37 which connect pairs of hinge members 38 and 39. Each of the members 38 consists of a vertically disposed hinge arm 40 from the lower portion of which projects inwardly an attaching bracket 41. The brackets 41 of each pair of hinges are secured to the outside faces of the flanges 34 of the side bars of a sash at opposite points and close to the top of the sash by screws 42 or other fastening means. The members 39 of the hinges also consist of vertical arms 43 from which project outwardly attaching brackets or plates 44. One of these hinge members 39 is shown in Fig. 12. The brackets 44 of each pair of hinges are secured against the outer faces of the jambs 21 and 22 at opposite points and are mounted for vertical adjustment for a purpose hereinafter described.

The upper ends of the arms 40 and 43 of each pair of hinges have alined openings to receive the horizontal hinge pivot 37 which may be in the from of a rivet with a washer thereon between the arms; or the arms may be detachably connected as shown in Fig. 13. In the latter the pivot pin 37 has one end 45 permanently secured to one of the arms as by expanding the end in the opening in the arm which is designated as the arm 39 in Fig. 13. The other arm 40 is detachably pivoted to the other end of the pin. An integral annular flange 46 is formed on the pin and serves as a washer to space the two arms. The free end of the pin beyond the flange or collar 46 is of greater length than the thickness of arm 40 so as to project beyond the latter, and such projecting portion is formed with an annular groove 47 to receive the arms of a resilient U-shaped clip 48 which serves as a locking key. Upon reference to Fig. 14 it will be seen that the clip 48 may be readily sprung off of the pivot pin if it is desired to separate the two members of the hinge.

The sashes or louvers are swung on their hinges by pairs of links 49 connected to two slide bars 50 and 51 mounted for vertical reciprocation in guides in the sides of the frame 20. The two links of each pair have their outer or lower ends pivoted at opposite points to the sides of a sash adjacent the lower or free longitudinal edge of the latter, the pivots 52 being preferably in the form of rivets set in the web portions of the side bars of the sash as shown in Fig. 7. The inner or upper ends of the links 49 are detachably pivoted to the sash actuating slide bars to facilitate assembling the parts of the window unit and permit ready removal of any of the sashes from the frame. These detachable connections are similar to what is shown in Figs. 13 and 14. The said ends of the links are apertured to receive pivot studs or pins 53 riveted or similarly secured in the slide bars along the longitudinal centers of the latter and at equally distant opposite points on said actuating bars. The lowermost of these pivots designated 53a in Fig. 7 is made longer than the others for a purpose hereinafter explained. The projecting or free ends of these pivots have annular grooves to be engaged by U-shaped spring clips or keys such as the one shown in Fig. 14. Because of the reduced scale of the main figures of the drawings these removable clips or keys are not shown at all places where they will be used.

The sash actuating slides or bars are disposed in the channels of the jambs 21 and 22 against the web portions thereof and between the inwardly extending flanges of the jamb bars as seen in Fig. 3. The side edges of the slide bars are in sliding contact with these inwardly extending flanges so that the slide bars are effectively guided in their longitudinal movements and cannot shift laterally. To prevent the slide bars from bowing inwardly and to assist in guiding such bars in their sliding movements a vertical row of removable, transversely extending pins 54 is provided on each of said frame side bars or jambs. These pins 54, any number of which may be used, project coaxially from the inner ends of screws 55, as shown in Fig. 6, mounted in threaded openings in the wider flanges 26. The pins are of less diameter than the screws and the latter have at their outer ends enlarged heads formed with screw driver kerfs so that the guiding and retaining pins may be easily applied and removed in assembling and disassembling the parts of the unit. The pins 54 may be relatively

short if the construction shown in Fig. 3 is used. By slightly changing the die used in extruding standard Z-bars, the short flanges or beads 29 may be formed with an under cut portion or groove 56 and when that is done one longitudinal edge of each of the slide bars 50 and 51 is beveled to engage such under cut, as will be understood upon reference to Fig. 3. However by making the pins 54 longer the slide bars will be effectively guided in the channels of standard extrusion bars.

When the sashes are closed the links 49 are in the inwardly facing channels of the jambs of the frame, and the pivots 52 are in vertical alinement with each other and with the pivots 53 and 53a as seen in Fig. 5. The sashes are closed by upward movement of the slide bars and by making the links long and pivoting them close to the bottoms or free longitudinal edges of the sashes, the bottom portions of the latter will be effectively drawn inwardly to tightly closed positions when the slide bars are forced upwardly. Since the hinge pivots 37 are spaced outwardly from the outer face of the window frame and from the line of the pivots 52 and 53, the above mentioned arrangement applies pressure in the opening and closing of the sashes where the work is being done and a powerful action is obtained. Further by the relative arrangement of the pivots 37 and the pivots 52 and 53, 53a of the long links 49, when the sashes are in open position the sashes will be self-locking in such position and they will also be effectively braced and held steady even under very high wind pressure. It will be noted that when the sashes are in open position shown in Fig. 4, the center of gravity of the sashes will be above their links 49 so that the closing thrust of each sash will be in a direction substantially perpendicular to the length of the slide bars. The sashes will, therefore, be held in such open position even when the worm 66 is removed from engagement with the quadrant 65. Such self-locking action of the sashes facilitates the initial assembling of the parts of the window and is also advantageous when the parts are to be adjusted or repaired. The arrangement of the four pivots 37, 37, 52, 52 for each sash at about its four corners in connection with the disposition of the sash links 49 at about right angles to the slide bars when the sash is open provides an extremely strong and rigid structure and permits the parts to be made of very light weight metal such as the standard one inch Z-bars.

In order to operate the slide bars 50 and 51, I provide in the bottom of the window frame a power shaft 56 with two power arms or levers 57 and 58 connected by links 59 to the lower ends of said slide bars. The shaft 56 is disposed in the inwardly facing channel of the bottom bar or sill 24 of the frame as shown in Fig. 11 and it is so mounted as to be readily removable from the frame. One end of the shaft is reduced to form a journal 60 rotatable in a bearing opening formed in the web portion of the channeled side bar 21 as shown in Fig. 7. The other end of the shaft has a similar reduced journal 61 rotatable in an opening in the lower portion of a bearing bracket or plate 62 which is removably secured by screws 63 or the like against the web portion of the channel in the other side bar 22 of the frame. The power arms 57 and 58 are welded or otherwise fixed to the shaft at its end portions which are in the channels of the jambs and which are positioned below the slide bars as seen in

Fig. 7. The pivots connecting the ends of the arms to the links 59 are preferably in the form of rivets 64 but detachable pivotal connections are provided between the upper ends of the links and the slide bars. Said ends of the links are apertured and may be mounted on the pivot studs or pins 53a in which case the links 59 are disposed between the slide bars and the links 49 of the lowermost sash as shown in Fig. 7.

Power is applied to the shaft by a worm gear segment 65 which meshes with a worm gear 66 journaled in a casing 67 secured to the interior face of the frame at one side of the latter as will be seen upon reference to Figs. 3, 4 and 6. The gear segment is suitably fixed to shaft 56 but I preferably make it integral with power arm 57. It is in the form of a quadrant projecting from one edge of that arm; and when the sashes are closed and the power arms and their links are vertically disposed as seen in Fig. 6, the segment projects inwardly of the frame 20 but when said parts are angled to open the sashes, the gear segment moves partially beyond the exterior of the frame 20 as seen in Fig. 4. Thus the worm gearing and its housing 67 can be made to project a minimum distance inwardly of the frame so as not to interfere with curtains or drapes, since as the lower sash swings open portions of the geared actuating means swing to the outside of the window frame. The other two dimensions of the gear casing 67 are also extremely small. In width it need be only a little greater than the diameter of the worm 66 to provide a bearing for the latter, and in height it need be only sufficient to enclose the gear segment and the worm which is disposed in the upper portion of the casing.

It will be noted that the longitudinal axis of the worm is inclined slightly downwardly and inwardly to position the threads of the worm close to the portion of the gear segment that adjoins the power arm 57, so that even though the over-all dimensions of the housing 67 are small the worm and its gear segment are relatively large and will exert a powerful action on the shaft.

The casing 67 has an open side disposed against the inner flange 26 of the side bar 21 to which it is secured by screws in an upwardly extending attaching lug 68 formed on the top of the casing. Another laterally extending attaching lug 69 near the bottom of the casing is similarly secured to the inner face of the inner flange of the sill 24 as seen in Figs. 2 and 3.

Both the worm and the casing are preferably die-cast so that no secondary machining will be necessary. The casing has an outwardly tapered but substantially cylindrical chamber 70 to receive the worm and into which opens a narrow chamber 71 to receive the gear sector 65. The casing is also formed with an opening 72 concentric with the chamber 70 to receive a crank handle 73 for rotating the worm. The teeth of the worm are formed near one end of a cylindrical body 74 which is tapered lengthwise to correspond with the taper of the chamber 70 so that the entire worm will have a bearing in the latter. A semi-cylindrical thrust bearing 75 is formed on one end of the worm body to engage the inner face of the flange 26 as seen in Fig. 6. In the other end of the worm is broached a hexagonal socket 76 to receive the crank 73, the latter being preferably formed from a hexagonal metal rod and may have a handle on its free end.

At the socketed end of the worm is inset a brass

or other softer metal washer 77 which engages the end wall of the chamber 70.

In some installations it is desirable to have the crank handle attached to the worm so that it may not be readily removed. I therefore form the worm body with a radial bore 78 to loosely receive a locking pin 79 the inner end of which enters an annular groove 80 formed in the crank as seen in Fig. 10. Where it is desired to remove the crank when it is not needed or for other reasons, the pin 79 may be easily removed after the casing 67 has been separated from the frame.

A thin resilient rectangular metal sheet 81 is secured on the sill 24 and extends between the frame side bars 21 and 22, as shown in Figs. 1 and 11 to serve both as a weather strip and to conceal the power shaft. This strip which has its lower portion secured by screws 82 to the outer face of the sill, extends upwardly to above the top of shaft 56 and then inwardly as at 83 over said shaft. The upper free portion of the strip is engaged by the outer flange of the bottom bar of the lower sash and is pressed inwardly as the sash closes as will be understood upon reference to Fig. 11. It thus not only serves to exclude rain, snow and wind, but conceals the shaft and presents a more attractive appearance when the sash is open. If desired the lower bars of the upper sashes 30 and 31 may have off-set portions 84 on their outer flanges to overlie the outer flanges of the top bars of sashes next below to prevent rain, etc. from entering between the sashes. The usual rain shield may be provided on the top bar 23 as shown at 85 to prevent rain entering above the top sash.

It will be noted upon reference to Figs. 4, 5 and 6 that the axis of rotation of the shaft and the arrangement of the pivots 64 and 53*a* is such that when the sashes are closed all of the pivotal connections except the hinge pivots 37 on each side of the frame will be in alinement in a vertical plane that intersects the longitudinal axis of the power shaft. The power arms 57 and 58 and their links 59 as they move to vertical positions will exert a powerful leverage to move the slide bars upwardly to close the sashes, and the latter will be held in such positions by the locking action of the worm gearing. At the same time it will not require much force to swing the arms 57, 58 outwardly to move the pivots 64 past the dead-center positions to angle the arms and their links and pull the slide bars downwardly to window opened positions. Since all of the pivots 52, 53, 53*a* and 64 on each side of the frame are in a vertical plane intersecting the longitudinal axis of the shaft when the sashes are closed, I can effectively compensate for wear in the various joints and bearings by the above mentioned vertical adjustment of the sash hinges. As shown in Fig. 12 the attaching brackets or plates 44 of the hinge members 39 are formed with vertically extending slots 86 to receive screws 87 which fasten the hinge brackets to the side bars of the frame. Such vertical adjustment of the sashes can be made by a mechanic within the building, and hence all lost motion and looseness due to wear in the various joints of the sash mounting and actuating mechanism may be quickly and easily eliminated and the sashes can be made to tightly close. To prevent the gear sector 65 from moving out of mesh with the worm gear, a stop pin 88 in the form of a screw may be positioned in the web portion of either or both of the jambs to limit the downward movement of the slide bar or bars as will be understood on reference to Fig. 7.

In the modification illustrated in Figs. 15, 16 and 17 the sashes are mounted for both swinging and sliding movement but only the lowermost sash 32*a* is shown. All of the sashes have their upper corners pivoted to the slide bars, the lower portion of one of which is shown at 50*a* in the channel of a frame side bar 21*a*. The slide bar actuating mechanism is the same as in the preferred form and Fig. 15 shows one of the links 59*a* pivoted to a power arm 57*a* which is integral with a worm gear segment 65*a* operated by a worm in the casing 67*a*. Sash 32*a* is hung for swing movement by angle brackets 89 engaged with pivots 53*b* which connect one of the links 59*a* to a side bar as seen in Fig. 17. The sashes are caused to swing on the pivots 53*b* as the slide bars reciprocate by links 49*a* which are pivoted at one end to the opposite sides of a sash and at their other ends to pivot pins 90 fixed to the window frame. As seen in Fig. 16 the link 49*a* is apertured to receive the pivot 90 projecting from a screw in a bracket 91 secured to a flange of the bar 21*a*. In Fig. 15 sash 32*a* is partly open, and as the slide bar is moved upwardly the sash will likewise be raised and at the same time will be swung by the links 49*a* to the closed position shown in Fig. 17. It is to be understood that the sash mounting and actuating mechanism is the same on each side of the frame with the exception of the worm gearing.

From the foregoing detailed description it is believed that operation and advantages of the invention will be apparent to those skilled in the art. It may be noted however that both the frame and the sashes may be inexpensively made of standard one inch extrusion bars thus rendering unnecessary the use of large and especially shaped bars that are quite expensive. Further the sash mounting and actuating mechanism is composed of the minimum number of simple and inexpensive parts that may be quickly and easily assembled and disassembled, that are strong, durable and effective in operation and that may be readily kept in proper operative condition. The complete window unit is such that it is less expensive to produce and transport than any known prior art structures and can be maintained in effective operating condition at small cost to the user.

From the foregoing detailed description of the preferred embodiments of the invention it will be evident to those skilled in the art that minor changes and modifications might be made without departing from the spirit and scope of the following claims.

I claim:

1. In an awning-type window structure, an upright rectangular window frame having channel-metal side bars with their channels facing inwardly, the channel on each side bar being formed by a wide inner flange and a narrow outer flange, said narrow flanges having their inner sides undercut, a vertical series of window sashes for said frame mounted for simultaneous movement into and out of said frame, means for actuating said sashes including flat slide bars slidably contacting the bottoms of the channels of said side bars of the frame, each of said slide bars having one longitudinal edge beveled for slidable engagement with the undercut side of the narrow flange of one of the side bars and its other longitudinal edge slidably engaged with the wide flange of said one side bar.

and a plurality of vertically spaced pins on each side to retain said slide bars in their channels, said pins overlying said slide bars and having screw threaded portions engaged with threaded openings in said wide flanges.

2. In an awning-type window structure, an upright rectangular window frame composed of channel bars with their channels facing inwardly, the bottom bar of said frame having an outer longitudinal flange extending downwardly, a vertical series of rectangular window sashes pivotally mounted on the outer side of said frame for simultaneous swinging movement into and out of said frame, the lowermost sash having its bottom bar provided with a downwardly extending longitudinal flange, means for actuating said sashes including a transverse power shaft rotatably mounted in the channel of the bottom bar of said frame, and a combined resilient weatherstrip and shaft protecting shield, the latter comprising an elongated, resilient metal sheet of a length to extend between the side bars of said frame, the lower portion of said resilient sheet being vertically disposed and covering the outer face of said downwardly extending flange on the bottom frame bar, the intermediate portion of said resilient sheet extending upwardly to a point above the top of said shaft and disposed outwardly of the latter in the path of swinging movement of said downwardly extending flange of the bottom bar of the lowermost sash and the free upper portion of said sheet extending inwardly to overlie said shaft, said sheet having its said lower portion removably fixed to said depending flange of the bottom frame bar to permit the free upper and intermediate portions of the sheet to yield inwardly when the lowermost sash moves to its closed position in the frame.

FRED SOMERSTEIN.

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