April 15, 1969 R. S. EVERS ET AL 3,438,151

OPERATING LINKAGE FOR WINDOWS AND THE LIKE

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FIG.1

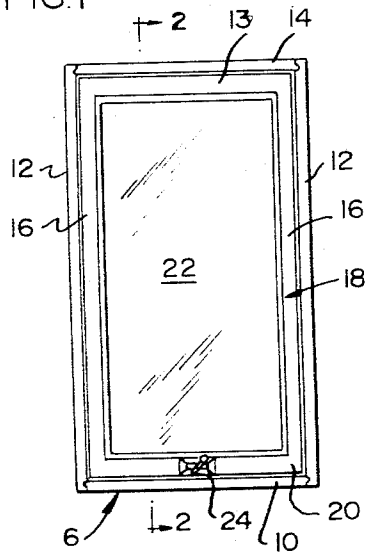


FIG.2

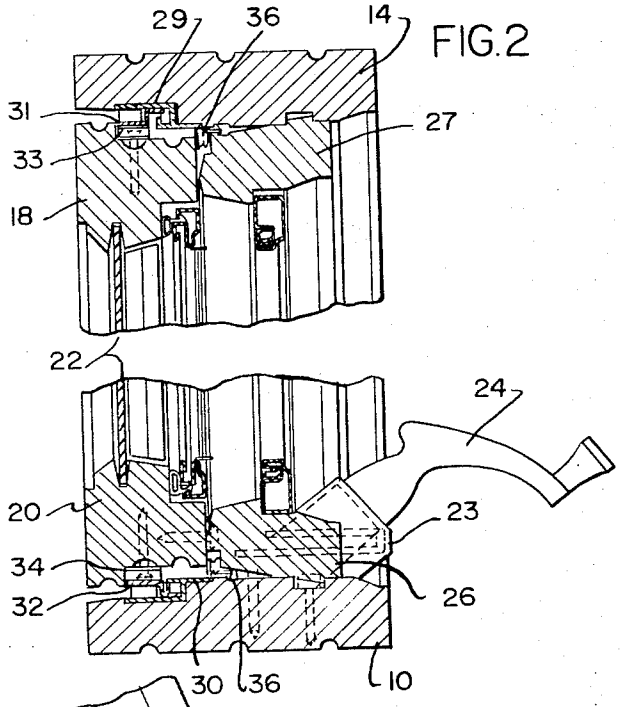
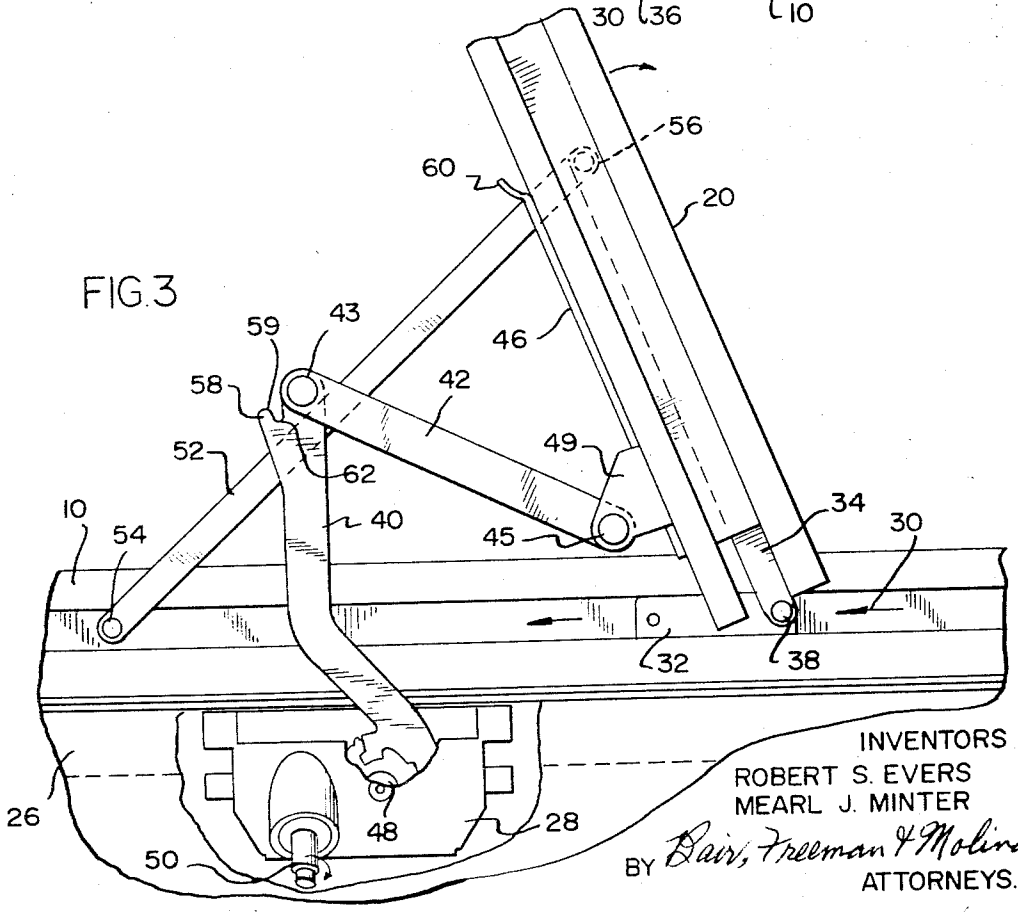


FIG.3



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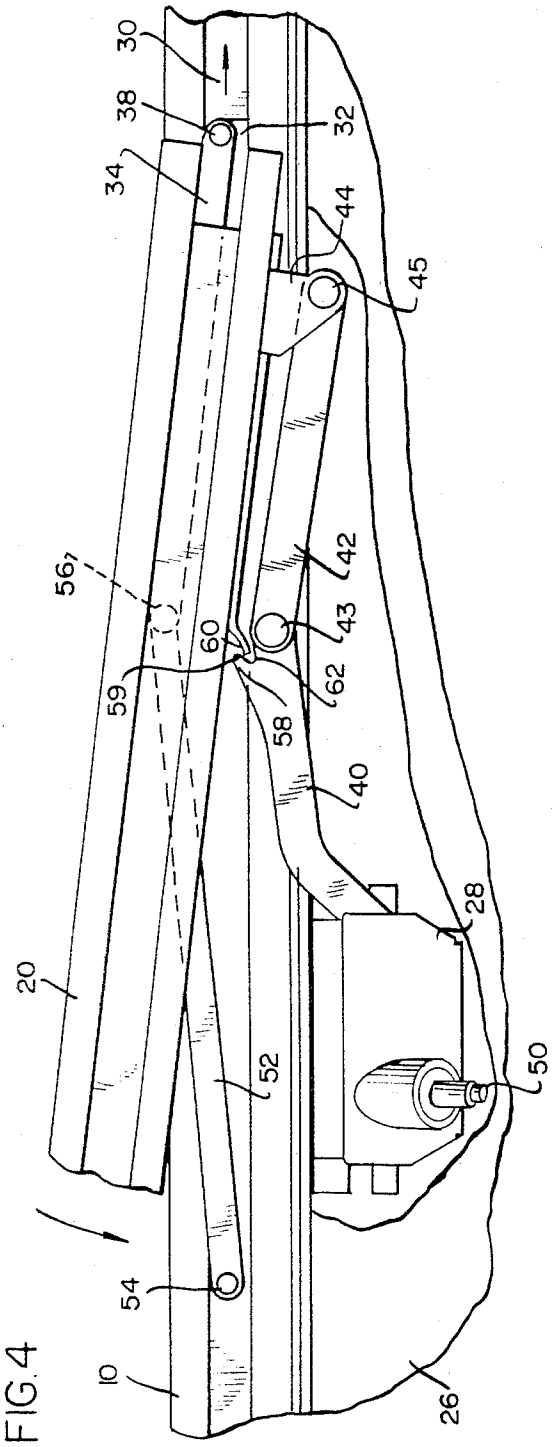


FIG. 4

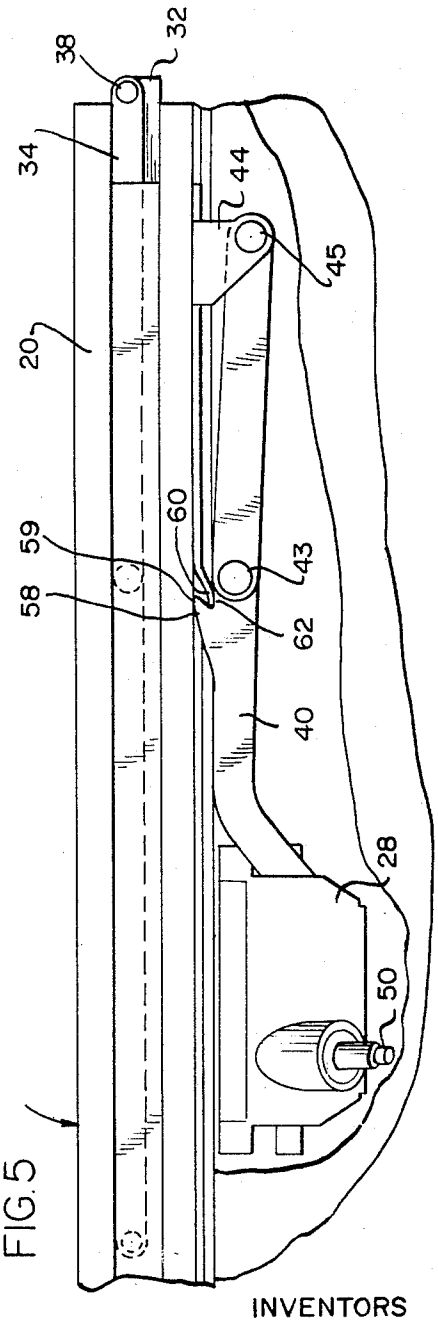


FIG. 5

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OPERATING LINKAGE FOR WINDOWS AND THE LIKE

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U.S. Cl. 49—345 2 Claims

ABSTRACT OF THE DISCLOSURE

The improvement in a linkage assembly pivots open and closed a window sash. In the embodiment for casement windows, the top and bottom ends of one side of the sash slidably mounted in horizontal channels situated in the sill and head jamb of the frame. The linkage assembly comprises a pair of interconnected lever arms which are driven by a crank and worm gear assembly in the sill. The linkage assembly drives the sash open by causing the unmounted side of the sash to swing outwardly from the frame as the pivotally mounted side slides in the channels. The improvement is a first catch means mounted on the lever arms and synchronized to engage a second catch means mounted on the sash when the sash is in a nearly closed position. The engaging catches cause the sash to close more tightly and evenly than prior window assemblies of a similar type.

Background of the invention

This invention relates to an operating linkage for horizontally or vertically swinging windows and more particularly to an improvement therein of the linkage lever arm assembly.

The advent of the construction of high-rise apartments has necessitated the designing of windows which can be easily washed or repaired from the inside of a building. The design generally incorporated has been some variation of a horizontally swinging sash in a window frame. When opening the sash, one side of the sash slides horizontally in the plane of the window frame as the other side swings outwardly away from the plane of the frame. Thus, when the sash is in the fully opened position, the plane of the sash is substantially in the middle and perpendicular to the plane of the window frame. This results in easy access from the building interior to both sides of the glass in the sash. The swinging sash facilities not only the task of washing the outside of the glass, but also the more difficult tasks of repairing or replacing glass panes while working from the interior of the building. Furthermore, the sash when in a partially opened position is angled and acts as a vent for flow of air into or out of a room.

In horizontal sashes the linkage used to drive the sash open and closed is generally comprised of a pair of lever arms which act on the sash causing one side to swing outwardly while causing the other side to slide in a horizontal direction. These lever arms interconnect the window sill and the bottom of the sash near one side member of the sash. When closing the sash, the lever members often do not effect an efficient seal between the sash and the frame members especially near the bottom and top center portions of the sash which are not directly driven by the lever arms. Ineffective closing and sealing is especially noticeable in older installations due to "play" in the linkage mechanism.

Other disadvantages are also apparent with a horizontally opening sash. The operator turning the hand crank which drives the gears and levers that close or open the sash will encounter difficulty in driving the sash

especially when the sash is just about in the closed position in the window frame. This results from connecting the lever arms to the sash near one of the vertical side members of the sash, which in turn, results in a very short turning moment axis about the hinge connecting the sash to the window frame. The short turning moment is especially apparent when the sash is in a nearly closed position and necessitates greater force on the crank handle gears and lever arms in order to drive and fully close the sash. As more force is required by the operator to close the window, more strain is placed upon the elements in the linkage resulting in greater likelihood of failure in the window linkage.

Summary of the invention

In a principle aspect of the present invention, a pair of catch means positioned near the center of the sash are synchronized to engage one another whenever the horizontal sliding sash swings to a nearly closed position. Upon engagment, the catches pull the sash closed more easily than the previous linkage arms.

It is thus an object of this invention to provide an improved operating linkage for horizontally sliding windows.

It is a further object of this invention to provide an improved operating linkage which effects a more efficient seal between a swinging, horizontally mounted sash and a window frame.

Another object of the present invention is to provide an improved linkage which relieves stress and strain on the gears and lever arms in prior art linkage mechanisms when the sash is near the closed position in the window frame.

These and further objects, features, and advantages will become further understood in the detailed description which follows.

Brief description of the drawings

FIG. 1 illustrates a front elevation of a sash installed in a window frame;

FIG. 2 is a cross-sectional view taken along the line 2—2 as shown in FIG. 1;

FIG. 3 is a top plan view of the improved linkage with the sash in an opened position;

FIG. 4 is a top plan view of the improved linkage with the sash coming into a nearly closed position; and

FIG. 5 is a top plan view of the improved linkage with the sash in a fully closed position.

Description of the preferred embodiment

FIG. 1 shows a window frame, generally at **6**, with a sash **8** mounted therein. The frame **6** consists of a sill **10**, side jambs **12**, and a head jamb **14**. The sash **8** is comprised of side sash members **16** with a top sash member **18** and a bottom sash member **20** connecting the side sash members **16** so that the entire sash **8** is in a snug relationship with the frame **6**. A pane of glass or other translucent or transparent material **22** is suitably fastened into the opening defined by the sash members. FIG. 1 shows the window frame assembly as it would appear from the inside of a typical room.

Turning the hand crank **24** will cause the sash assembly **8** to pivot outwardly and also slide horizontally at one end. In the fully open position, the pane **22** is substantially perpendicular to the plane of the frame **6**. In this position, both sides of the window pane **22** are exposed so that a person may reach from the inside of a room through the frame **6** in order to clean or replace the window pane **22**.

Looking at FIG. 2, one can see the detailed construction of a typical sash and frame assembly. The sill **10** has an upper sill plate or block **26** attached thereto. The

crank handle **24** is attached to a lug which in turn is attached to gears which drive the window lever arms. The gears are in a housing **28**.

Likewise, the head jamb **14** has an attached head jamb plate **27**. The sill **10** and head jamb **14** each have a channel member **30** extending longitudinally across the entire width of the window. A lower plate **32**, which is part of the hinge assembly which connects the channel **30** to the bottom sash member **20**, is positioned to slidably engage the channel **30**. The plate **32** is pivotally attached to a hinge member **34** which, in turn, is attached to the lower sash member **20** by suitable fastening means such as a screw. The upper sash member **18** also has a hinging member **33** connected to an upper plate **31** which slidably engages the channel **29**. The pane **22** is shown set in grooves made to receive the pane **22**. When the sash is in the closed position, as shown in FIG. 2, the sash is sealed against the frame by sealing means **36** which extend around the circumference of the junction between the sash **8** and the frame **6**.

FIG. 3 shows the bottom sash member **20** which is attached to the sash hinge member **34**. The sash hinge member **34** is, in turn, attached to the channel plate **32** by means of the pivot or pin at **38**. The plate **32** slides transversely in the channel **30** in the direction denoted by the arrows as the position of the sash **8** is changed. The plate **32** slides to the right as the sash **8** is closed and to the left as the sash **8** is opened. The top sash member **18** is similarly constructed to allow the sash **8** to slide relative to the frame **6**.

The upper sill plate or block **26** is shown cut away so that the gear housing **28** can be observed. The housing **28** is partially cut away so that the position of the gears **48** can be shown. The crank handle (not shown in FIG. 3) is attached to the handle lug or fitting **50**. Turning the handle causes the gears **48** to mesh and drive the first lever linkage arm **40**. This arm is connected to a second lever linkage arm **42** at a pivot point **43**. The second lever arm **42** is, in turn, connected to the bottom sash member **20** by means of a connecting plate **44** fastened to the bottom sash member **20** at the pivot point **45**. Rotating the crank handle at the handle fitting **50** in the direction denoted by the arrow will cause the sash **8** to slide in the channels **29** and **30** and swing as denoted by the arrows to an open position. Rotating the handle in the opposite direction causes the sash **8** to close.

To position the sash **8** in an opened position so that it swings outwardly until it is perpendicular to the frame **6** when in the fully opened position, a guide and support member **52** is connected to the bottom sash member **20** at a sash pivot point **56** near the middle of the bottom sash member **20**. The support member **52** is connected at its other end to the sill **10** at a pivot point **54** near the gear housing **28**. The support member **52** provides a secondary axis about the sash pivot point **56** about which the sash **8** can rotate or swing to a fully opened position.

The invention consists of a pair of catch members synchronized to engage each other when the sash **8** is in a nearly closed position. The first catch **58** extends from the first linkage arm **40** and the second catch **60** extends from the bottom sash member **20** so that they will intersect and engage one another when the sash **8** is nearly closed. Preferably the second catch **60** is part of the inside sash plate **46** of the connecting plate **44**. A single metal plate (the combination of the second catch **60**, the inside sash plate **46** and the connecting plate **44**) adds stability and strength to the sash member **20** and also eliminates an extra step in the manufacturing process, i.e., measuring and positioning the second catch **60** in relation to the first catch **58**. Thus, accurate positioning of the catches **58** and **60** is inherently obtained by stamping or fabricating them as part of the linkage assembly parts. Finally, when the second extension **60** is made an extension of the inside sash plate **46**, it can more easily be fastened to the bottom sash member **20** by fastening means such as screws or the like so that it will be in the same plane and otherwise properly positioned relative to extension **58**.

While in FIG. 3 the sash assembly is shown in an opened position, FIG. 4 shows the sash assembly drawn into a nearly closed position in the direction denoted by the arrow. The hinge plate **32** has moved in the channel **30**, as denoted by the arrow, to accommodate the change in position of the sash **8**. In the nearly closed position, the first catch **58** has just made contact with the second catch **60**. In FIG. 3, the lever arms **40** and **42** are driving the sash to a closed position through the pivot point **45** about an axis through the hinge pivot **38**. However, in FIG. 4 the lever arm **40** is coupled through a pivot point which is the intersection of the second catch **60** and the guiding cam surface **59** of the first catch **58**. Thus the lever arm **40** in FIG. 4 drives the sash closed about the hinge pivot **38**.

The distance between the hinge pivot **38** and the point of intersection on the guiding cam surface **59** between the extensions of catches **58** and **60** is much greater than the distance between the hinge pivot **38** and the plate pivot **45**. The greater distance or longer axis in the improved device results in a mechanical advantage for driving the sash which is greater than available in previous devices. Such a mechanical advantage is especially desirable in the nearly closed or nearly opened position of the sash since at these positions movement of the sash by turning the crank is especially difficult.

In FIG. 5, the lever arms **40** and **42** have been extended into a straight position. The lever arms **40** and **42** tend to stay in a straight position due to the interaction of the engaged catches **58** and **60**. To reopen the sash, the handle is turned to activate the lever arms. A contact point **62** on the first linkage lever **40** presses against the second catch **60** thereby causing a pushing force on the sash **8**. The effective lever arm acting on the sash to open it extends from the contact point **62** through the hinge pivot **38**. Prior to the disclosed improvement, linkage devices were constructed so that the only force tending to open the sash was that transmitted through the pivot **45** to the connecting plate **44** and thence to the sash thereby making the effective lever arm the distance from the pivot **45** to the hinge pivot **38**. The amount of force required to turn the sash **8** about a torque axis through the hinge pivot **38** is greater when the force is to be applied through the connecting plate pivot **45** rather than through the second catch **60** at a point opposite the contact point **62**. Therefore, it is clear that this device makes it not only easier to lock and close a sash but also easier to open the sash once it has been closed.

It is to be understood that this invention is not limited to the specific embodiment of a horizontally swinging sash depicted in the drawing and specification; rather, it is intended that all equivalents, including the application of the present invention to a vertically swinging sash, and others obvious to those skilled in the art be included within the scope of this invention, as claimed.

What is claimed is:

1. In a window frame which includes a sill, a head jamb and connecting side jambs; a sash within said frame, said sash including a top, a bottom and opposite side sash members, said top and bottom sash members each including mounting plates slidably mounted in channels in the head jamb and sill respectively; and an operating linkage for driving the sash from a closed position in said frame to an open position, said linkage including at least one guide and support member, said support member pivotally attached at one end to said sill and at its opposite end to the mid-portion of said bottom sash member, said linkage also including a driven first lever linkage arm pivotally driven at one end from a sill mounting intermediate said side jambs and connected at its opposite end to one end of a second lever arm, said second lever arm having its opposite end pivotally connected to said bottom sash member adjacent one of said side sash members, the

improvement comprising in combination:

first and second interlocking catch members attached respectively to said first lever linkage arm and said bottom sash member, said catch members adapted to engage when said sash is in a nearly closed position, said first catch member being positioned on said first linkage arm intermediate the pivotal connection between said linkage arms and said sill and extending toward said sash when said sash is in a nearly closed position.

2. The improvement of claim 1 wherein said first catch member provides a camming surface to engage said second catch member and guide said second member into and out of engagement with said first member.

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49—324