March 1, 1966 W. A. SCOVILLE 3,237,250

WINDOW ACTUATOR AND SASH STRUCTURE IN COMBINATION THEREWITH

Filed Sept. 23, 1964 3 Sheets-Sheet 1

FIG_1

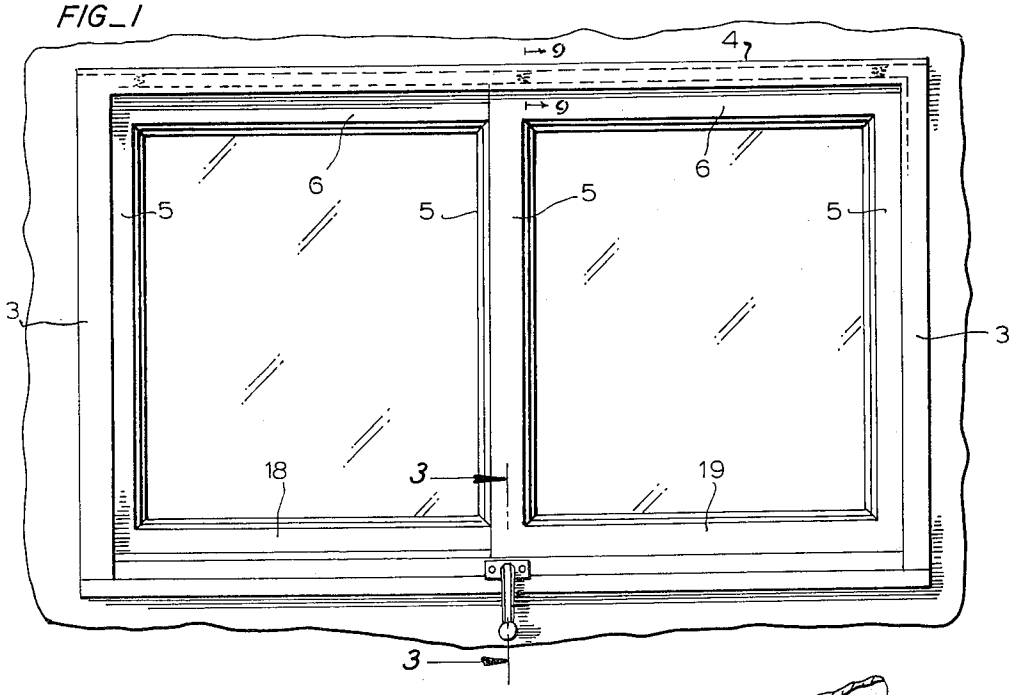
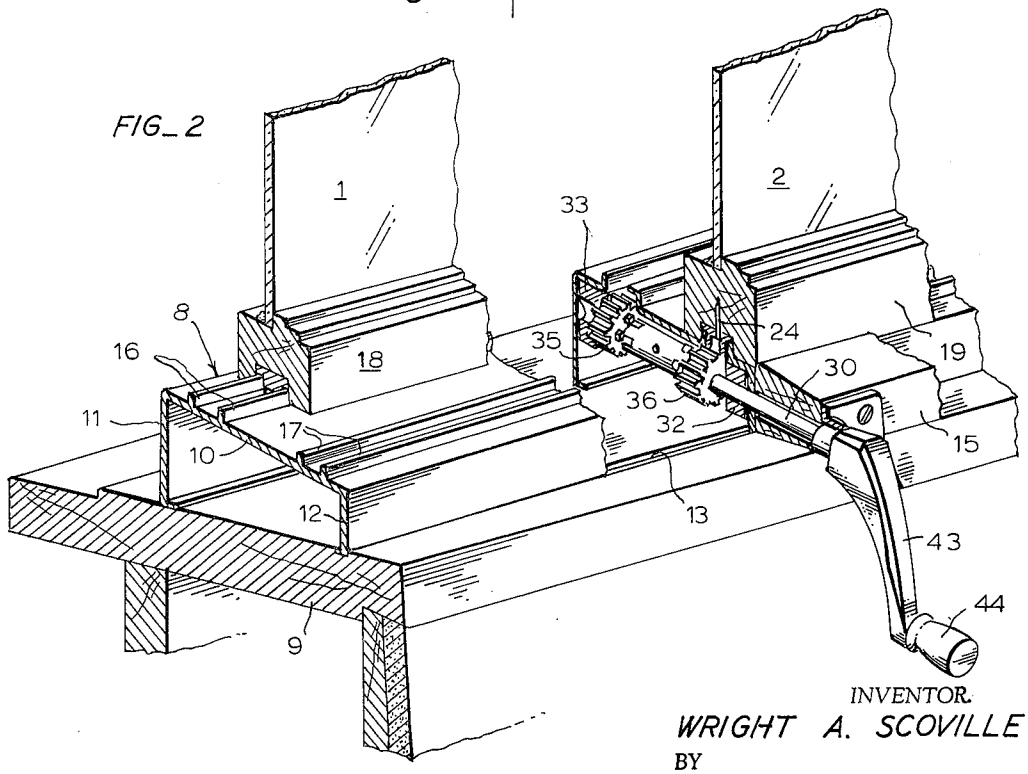


FIG_2



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Filed Sept. 23, 1964 3 Sheets-Sheet 2

FIG_3

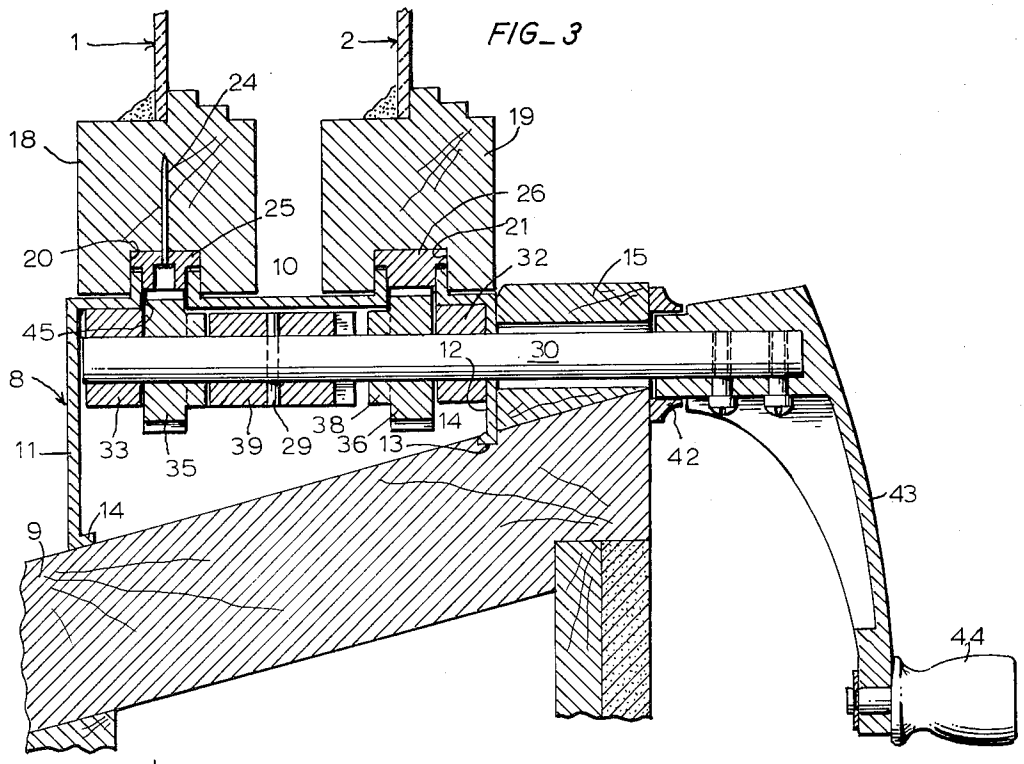


FIG_4

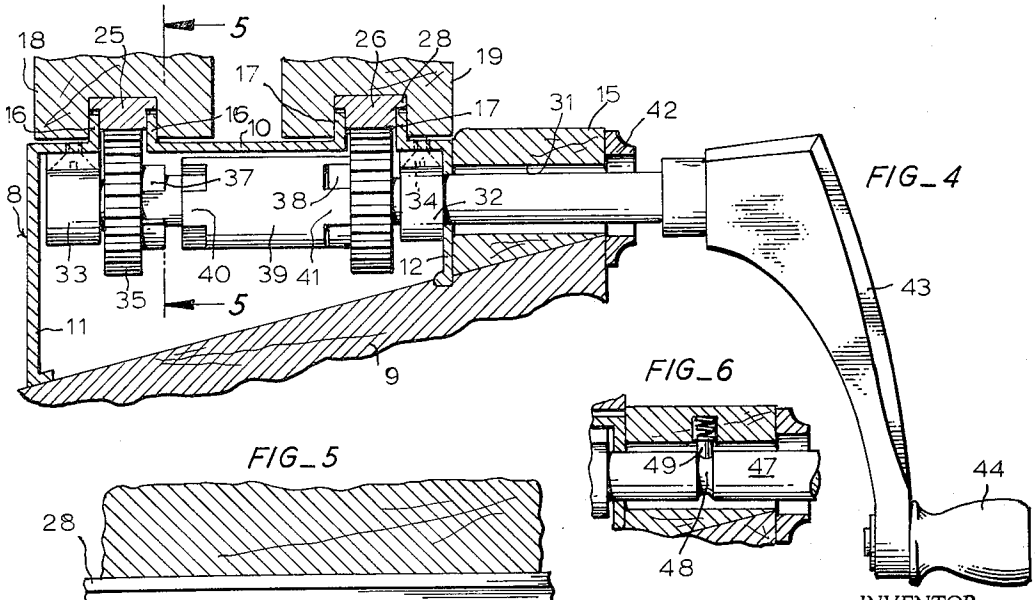
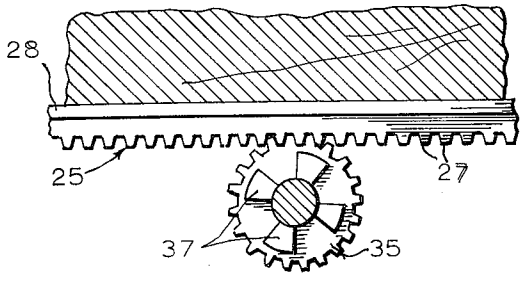


FIG_6

FIG_5



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Filed Sept. 23, 1964 3 Sheets-Sheet 3

FIG_7

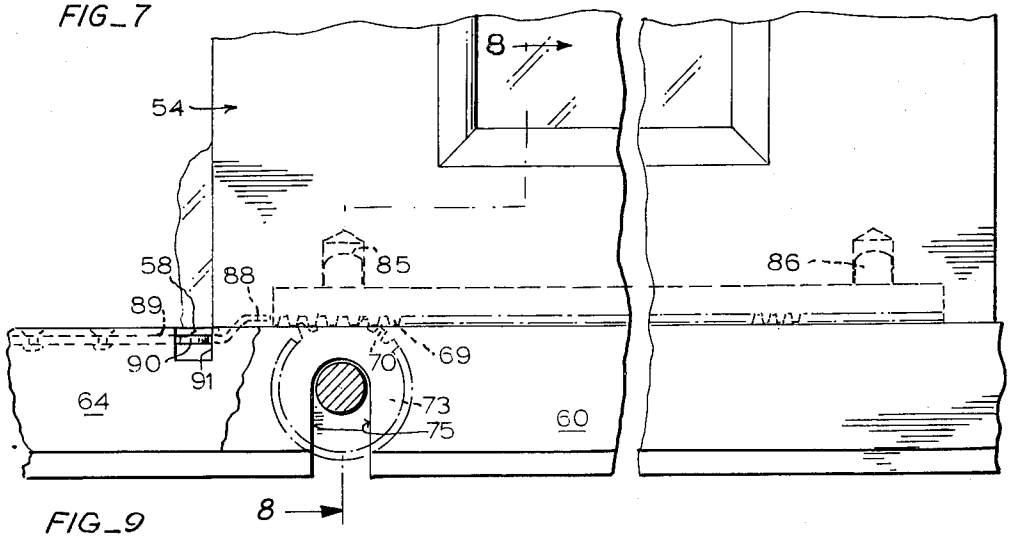


FIG_9

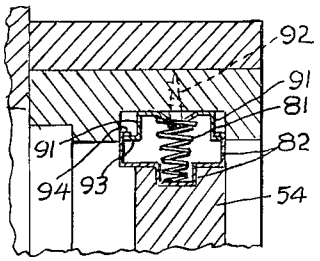
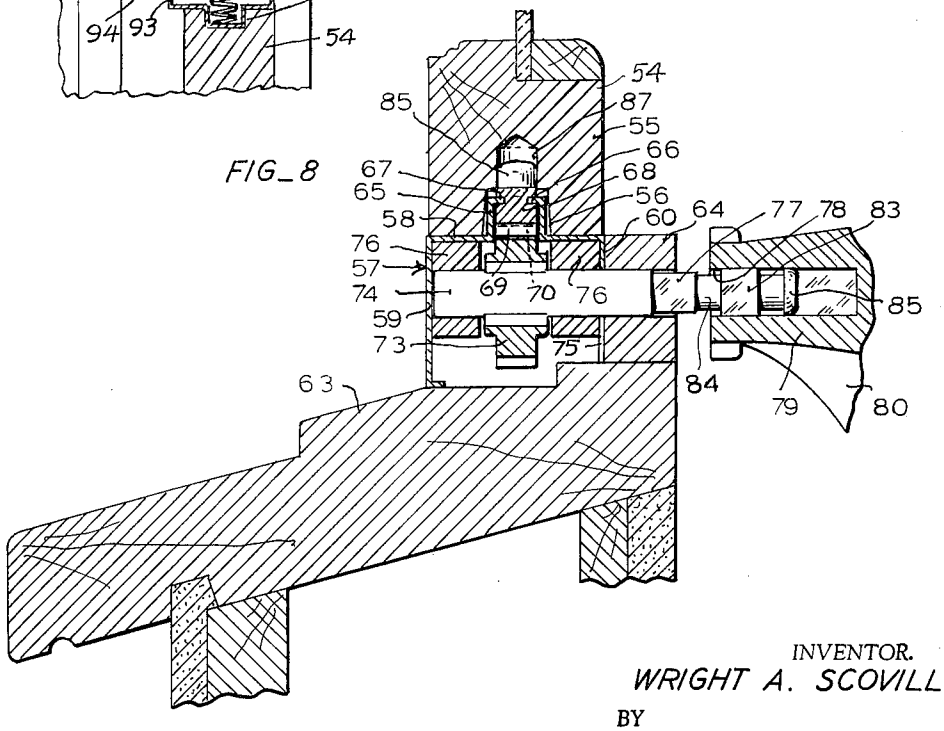


FIG_8



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United States Patent Office

3,237,250

Patented Mar. 1, 1966

3,237,250

WINDOW ACTUATOR AND SASH STRUCTURE IN COMBINATION THEREWITH

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Filed Sept. 23, 1964, Ser. No. 398,562
10 Claims. (Cl. 20—52)

This invention relates generally to window structure and is a continuation-in-part of my copending application Serial No. 268,965, filed March 29, 1963 now abandoned and particularly to sliding windows, and has for one of its objects the provision of an improved combination in which there is a single crank for actuating either of two windows in a frame and which frame comprises an extruded metal sill on which the windows are slidable and which sill and the sash that is supported thereon and the window actuator are constructed to cooperate with each other for providing a more efficient and economical combination than heretofore.

Another object of the invention is the provision of an improved stationary sill portion of a frame on which sill portion a window is slidable and with which sill portion and window, a rack for moving the window is connected for movement therewith upon said rack being moved longitudinally thereof, and which window is readily removable from and replaceable on said rack, while said sill portion holds said rack against removal therefrom.

The sash in the present invention is of the wooden type, and the frame itself, except for the sill, may be of wood, and of conventional structure.

Heretofore some of the sliding windows having crank operators that carry gears that in turn engage racks that are secured to the windows require shifting of the crank handle from one shaft to another. In other forms special toothed wheels intended to operate in conjunction with spaced openings have been employed, but without success.

In the present invention the sill structure and the means for moving the windows have been designed and arranged to provide full protection for the rack gears and operating parts against rain, etc., and at the same time this structure insures maximum smoothness and reliability of operation of the window operating means, and an extremely simple and economically made structure that may be quickly installed.

Other objects and advantages will appear in the description and in the drawings.

In the drawings:

FIG. 1 is an elevational view of a pair of sliding windows from inside a room, the operating crank handle being shown in its relation to the windows.

FIG. 2 is an enlarged, isometric part sectional view showing the various parts of the invention.

FIG. 3 is an enlarged vertical cross sectional view taken through the sash of both windows, and the frame, as seen from line 3—3 of FIG. 1, and in which the window operator is in position for moving the left hand window shown in FIG. 3.

FIG. 4 is a view similar to that of FIG. 3 but in which the operating crank and gears are in elevation and the device is in a position for moving the right hand window.

FIG. 5 is an enlarged, fragmentary, sectional view taken along line 5—5 of FIG 4.

FIG. 6 illustrates a modification of a window stop in which a detent may be used as a position retaining means for a crank handle shaft.

FIG. 7 is a fragmentary, side elevational view of a modified form of the invention in which the window may be readily removed from the rack that, in turn, is secured

to the extruded metal sill portion on which the window is slidably supported.

FIG. 8 is a sectional view taken along line 8—8 of FIG. 7.

FIG. 9 is an enlarged view taken along line 9—9 of FIG. 1 showing the upper slide for the sliding window.

In detail, referring to FIG. 1, the windows are generally designated 1 and 2. The frame sides or jambs 3 and head 4 are conventional, as are the jambs 5 and heads or top rails 6 of the sash.

In the present instance the number 8 is used to designated the sill, which is part of this invention, since it is the part that directly supports the window sash, and the numeral 9 will be used to designate the bevel frame member that supports the sill. This explanation is made for the reason that in older practice the member 9 has functioned as the sill.

The sill 8 is a single horizontally extending channel member of extruded metal, having a horizontally disposed web 10 and vertically disposed sides or legs 11, 12 depending from opposite edges of said web.

The leg 11 of channel 8 is the outer leg since it is outermost relative to the inside of the room in which the window is positioned and leg 12 is the inner leg, being innermost. Leg 11 is longer than leg 12 by a sufficient distance to support the web 10 horizontal when the legs 11, 12 are supported on and parallel with the lower bevel member 9. The latter may be formed with a longitudinally extending recess 13 in which the lower edge of leg 12 is seated (FIG. 3), and both of the legs 11, 12 are formed with beads or flanges 14 along their lower edges that project toward each other.

The sill 8 may be secured in any manner against said lower bevel member 9, and against an inner horizontally extending stop 15 of wood that is secured against the upper side of the bevel member 9 along its inner edge.

The sill 8 and stop 15 extend between the lower ends of the jambs or sides 3 of the window frame and become part of the frame.

The web 10 of the sill is formed with two pairs of upstanding, spaced, opposed, parallel, horizontally extending ribs or ridges that extend from end to end of the sill parallel with the latter, thus providing an outer pair of ribs 16 and an inner pair 17, the ribs of each pair being relatively close together compared with the space between the two pairs.

The window sash 1 has a horizontally extending lower rail 18 while the sash 2 has a lower rail 19. Rails 18, 19 are respectively formed on their lower surfaces with corresponding recesses 20, 21 extending their full length, each being rectangular in cross sectional contour. The spacing between the opposed vertical sides of each of said recesses is such as to receive one of the pairs of ribs 16, 17 therein, substantially in slidable engagement with said sides.

Secured by nails 24 (FIGS. 2, 3) against the closed upper end of recesses 20, 21 are horizontally extending racks 25, 26, the rack 25 being in recess 20 and rack 26 being in recess 21. The teeth 27 of these racks are spaced from the laterally facing, longitudinally extending edges of the racks, thus providing coplanar extensions 28 along the base of each rack projecting oppositely outwardly of the teeth, and which extensions extend to the opposite sides of each of the recesses 20, 21.

The ribs 16, 17 which are preferably flat sided respectively extend between the opposite sides of recesses 20, 21 and the teeth 27 of racks 25, 26 and approximately to the extensions 28 on the bases of the racks when the lower edges of the rails 18, 19 are substantially slidably supported on the web 10 of the sill 8 at opposite sides of the pairs of said ribs or ridges. The teeth 27 of said

racks are spaced above the level of the upper surface of web **10** and, as seen in FIG. 3, said web extends across the space between the pairs of ribs.

When the window sash are in closed position, as seen in FIG. 1, the adjacent jambs **5** thereof will be in lapping relation. Racks **25**, **26** each extend substantially the full lengths of the lower rails **18**, **19** respectively, hence they are also in lapping relation.

A horizontal shaft **30** rotatably extends through the stop **15** and leg **12** centrally between the jambs **5**, said stop being formed with a passageway **31** through which said shaft extends, and the leg **12** being formed with an opening concentric with the passageway **31**. Coaxial bearings **32**, **33** respectively secured against the underside of web **10** and respectively adjacent to legs **11**, **12** rotatably and slidably support said shaft **30** by screws **34**.

Also slidably and rotatably supported on said shaft **30** are a pair of spur gears **35**, **36**, the gear **35** having its teeth in mesh with the teeth of rack **25** and the teeth of gear **36** being in mesh with the teeth of rack **26**, openings being formed in web **10** to pass the teeth of the gears.

Gear **35** is formed with conventional clutch dogs **37** (FIGS. 4, 5) projecting toward gear **36** and the latter has corresponding clutch dogs **38** projecting toward gear **35**.

A cylindrical clutch member **39** is secured by pin **29** (FIG. 3) on shaft **30** between the dogs **37**, **38** and the opposite ends of said clutch member **39** are complementarily formed with respect to the dogs **37**, **38** to provide dogs **40** on said clutch member that are adapted to releasably interengage with dogs **37** when shaft **30** is moved axially toward the leg **11**, and dogs **41** that interengage with dogs **28** when the shaft **30** is moved in a direction away from leg **11**. When the clutch dogs **37**, **40** are fully engaged the dogs **38**, **41** are disengaged, and vice versa, but when the clutch member is equally spaced between the gears **35**, **36**, the dogs at opposite ends of the clutch member will engage both the dogs **37**, **38** and the window sash will be locked when both sash are closed.

The inner end of shaft **30** projects through a face plate **42** that is secured to the inner face of stop **15**, and said inner end is provided with a crank arm **43** having a handle **44** thereon for manually rotating shaft **30** and which arm and handle also provide for manually pushing and pulling shaft **30** to effect engagement and disengagement of the clutch member with the dogs on gears **35**, **36**, or to lock the windows in closed position.

From the foregoing it is seen that the pairs of ribs **16**, **17** not only function as guides for the sash, but they also project past the base or roots of the teeth **27** (FIG. 5) to points close to the extensions **28**, which extensions project over the upper edges of the ribs. Thus the racks and all of the operating mechanism, such as the gears, clutch members and operating shaft are fully protected against rain and the elements, and when the windows are closed there are no visible projections on the sill. Also the ribs **16**, **17** form guides for the racks whereby the racks and sash cooperate to reduce to a minimum any wear resulting from the sliding of the sash, and the ribs including the sides of the openings **45** through which the gears **35**, **36** extend hold the gears in positions with their teeth in engagement with the rack teeth.

Referring to FIG. 3 the clutch dogs **37**, **40** are in interengaging position, while clutch dogs **38**, **41** are out of engagement, hence upon rotating the crank arm **43** in a clockwise direction the window **1** (FIG. 1) would be moved to the right, and since the rack **25** extends the length of the lower rail **18** the sash **1** may be fully opened, or it may be partially opened, and upon moving shaft **30** axially inwardly to disengage dogs **37**, **40** and to interengage dogs **38**, **41**, a counterclockwise revolving of crank arm **43** will move sash **2** to the left to any desired degree.

When the windows are fully closed and the shaft **30** is moved axially to interengage the dogs **40**, **41** with dogs **37** and **38**, neither of the sash can be moved upon rotation of the handle **43** in either direction, nor can either sash be manipulated from inside or outside the room to push either sash to open position. This position of the shaft is readily determined by the fact that it cannot be rotated when in said posiion, however, FIG. 6 shows a modification in which shaft **47**, which corresponds in function to shaft **30** is formed with an annular recess **48**, while a spring urged detent **49** is secured in stop **15** in a position to enter the recess **48** when the gears are in engagement with both racks. The resistance to movement of the shaft, while slight, is sufficient to yieldably hold the shaft in a locking position of the gears and indicates to the user the locking position.

In FIGS. 7–9 a single sliding window **54** is shown, hence the pair of gears and clutch members described for FIGS. 2–4 are not required.

The lower rail **55** of window **54** is formed in its lower side with a downwardly opening recess **56** extending longitudinally thereof. Recesses **20**, **21** in FIG. 3 are similar. However the opposite sides of recess **56** extend divergently relative to each other in a downward direction.

The sill member supporting window **54** for sliding thereon is a horizontally extending, downwardly opening channel of extruded metal, the bottom of which is uppermost and comprises a horizontally disposed web **58** with vertically positioned, parallel, legs **59**, **60** integral therewith extending downwardly from the longitudinally extending edges of the web. Said legs are supported on a lower bevel member **63** that corresponds in function and position to member **9** of FIG. 2. The shorter leg **60** of the sill member **57** is against a stop **64** on member **63**.

Web **58** is formed with a pair of upstanding, spaced, opposed, parallel ribs **65** that extend from end to end of sill **57**, and flanges **66**, which are integral with said ribs along their upper edges, project toward each other, and into oppositely outwardly opening grooves **67** formed in oppositely outwardly facing vertical surfaces or a horizontally extending rack **68**, which rack is parallel with and between ribs **65**.

The teeth **69** (FIG. 7) on rack **68** are directed downwardly, and are in mesh with the teeth **70** on a gear **73**. Gear **73**, in turn, is keyed on a horizontal shaft **74** (FIG. 8).

Said shaft **74** rotatably extends through stop **64** (FIG. 8) and through a downwardly opening recess **75** formed in leg **60** (FIG. 7) of the sill, and bearings **76** secured to sill **57** between legs **59**, **60** rotatably support shaft **74** with the teeth **70** on gear **73** in mesh with the teeth **69** on rack **68**. The said teeth **70** project between the ribs **65** in relatively close relation to the latter (FIG. 8).

Shaft **74** has a polysided portion **77** that is adapted to be received in a polysided laterally opening socket **78** formed in one end portion **79** of a handle **80**.

A bearing **83** secured in socket **78** and spaced from the open side of the latter rotatably supports a cylindrical extension **84** on shaft **74** rotatably extends through, and is supported by bearing **83** and a head **85** on the terminating end of the extension **84** is slidable and rotatable in the portion of socket **78** that is at the side of bearing **83** opposite to the open side of the socket.

When the handle is pushed toward the window the polysided portion **77** will be received in the polysided socket, and by revolving the handle the shaft **74** will be rotated to rotate gear **73** in one direction or the other, according to whether the window is to be moved from closed position to open position, or vice versa.

Upon moving the handle **80** in a direction away from the window, the handle will freely swing to depending vertical position relative to shaft **74** and out of operative relation to the shaft.

Rigid with the rack **68** and on the end portion of the rack that is adjacent to the gear **73** when the window is closed is an upstanding pin **85** that may be cylindrical with a diameter substantially equal to the thickness of the rack. If desired a second pin **86** (FIG. 7) may be on the opposite end of the rack.

A downwardly opening cylindrical recess **87** is formed on the bottom of the horizontally elongated recess **56**

in rail **55** to releasably receive pin **85**, and a similar recess is for pin **86** in the event a second pin is required.

By the above structure, the window **54** may be lifted off the rack **68** when the window is moved to a position in the frame permitting the sash to be lifted so that the lower rail will clear the rack and pins **85, 86**.

Structure for permitting the removal of sliding windows in the above manner is conventional. When the sash **54** is in open position it may be moved upwardly against the resistance of one or more springs **81** that react between a member **82** that is slidably seated in an upwardly opening recess in the head rail of the sash. The head of the frame is recessed to receive the member **82** upon upward movement thereof. When the lower rail **55** clears the pin **85** or pins **85, 86**, the lower portion of the window may be swung into the room, and may be replaced by reversing the steps.

From the foregoing structure, it is apparent that the window may be quickly removed from the sill without removing the rack, and the flanges **66** also coact with the rack to preclude ingress of water past the rack and to the gear, or past the sill into the room.

It should be noted that the web **58** is continuous except where the gear **73** projects therethrough for engaging the teeth of the rack, although the section so removed may extend below an upwardly offset end portion **88** (FIG. 7) of a flat spring strip **89** to lock the window in closed position. This strip may extend below the web at the end thereof opposite to the end portion **88**, and be rivetted to said web. The lower rail is recessed at the underside thereof to receive end portion **88** of the spring, and said end portion will be in the path of the rack **68** to block movement thereof for opening the window until said end portion is depressed to permit the sash to slide thereafter.

A laterally extending finger depressible projection **90** extends through a lateral opening **91** in the leg **60** of the sill, and a registering recess in stop **64** to permit downward movement of said projection **90**.

It is to be understood that modifications and variations of the present invention are possible in the light of the above teachings, and that, within the scope of the appended claims, the invention may be practiced otherwise than is specifically described.

While I have noted that the window may be removed when in an open position, in FIG. 1 I indicate the upwardly slide member **82** extending the full length of the frame, so that the sliding window may be removed from the frame at any point within the latter. Obviously if the slide member were to be disposed in only the portion of the frame alongside the fixed window, it could only be removed from the frame when in said position.

The springs **81**, it may be noted (FIG. 9) are each secured at one end thereof in generally inverted U-shaped clips **91** by a screw **92** and the legs of the clips terminate in out-turned flanges **93** that are overlapped by inturned flanges **94** on the sides of slide **81** to hold the guide strips in the frame when the window is removed. As already stated, this is conventional structure, and is illustrated because one of the features of the invention is the removability of the window from the rack **68**, which rack is retained on the sill when the window is removed.

I claim:

1. In a window frame defining the sides of a window opening and having a sash in said opening reciprocably movable in opposite directions therein and which frame includes an elongated frame member forming one side of said frame adjacent to which one edge of said sash is reciprocably movable longitudinally of said edge and frame member, the improvement that comprises:

(a) a pair of spaced, parallel ribs rigid with said frame member projecting into said opening and extending longitudinally of said frame member substantially from end to end thereof;

(b) said one edge of said sash being formed with a recess extending from end to end of such edge within which recess said pair of said ribs extend for guiding said edge of said sash along a path of travel extending longitudinally of said frame member; and

(c) separate, interengaging means respectively carried by said frame member and connected with said sash in engagement with each other at a point between said pair of said ribs actuatable for reciprocating said sash within said frame.

2. In window structure having a window frame that includes a horizontally elongated sill adapted to support a pair of sash thereon for horizontal reciprocable movement of said sash longitudinally of said sill, said sill comprising:

(a) a horizontally elongated, metal channel member of inverted shape in cross-sectional contour providing a horizontal web and a pair of vertically disposed legs integral therewith depending from opposed longitudinally extending edges of said web;

(b) a pair of parallel, spaced ribs in side by side relation integral with and projecting upwardly from the upper surface of said web and extending parallel with said channel member;

(c) a vertical sash having a horizontally extending lower rail formed with a downwardly opening recess extending longitudinally of each rail from end to end thereof;

(d) said pair of ribs slidably extending upwardly into each of said recesses for guiding and supporting said sash on said sill for movement of said sash longitudinally of said sill;

(e) actuatable means rigid with said rail disposed between said pair of said ribs adapted to interengage with rotary actuator means for moving said sash in one direction or the other according to the direction of rotation of said actuatable means;

(f) actuator means rotatably supported below said web for rotation in one direction or the other extending into the space between said pair of said ribs and into interengaging relation with said actuatable means within said space for so moving said sash; and

(g) means connected with said actuator means for so rotating the latter.

3. In window structure as defined in claim **2**:

(h) said actuatable means comprising a rack having a row of downwardly directed teeth extending longitudinally of said recess and between said pair of ribs;

(i) said actuator means comprising a spur gear having its teeth in meshing relation with the teeth of said row.

(j) said web having an opening formed therein to pass the teeth of said gear at its upper side only into intermeshing relation with the teeth of the rack thereover whereby said rack will be substantially wholly enclosed by said web, ribs, and the walls of said recess.

4. In a window structure as defined in claim **3**:

(k) said rack having a base portion extending from end to end thereof and projecting laterally oppositely therefrom over and in relatively close relation to the upper edges of said ribs whereby said extensions on said base portion will cooperate with said ribs and to enclose the teeth of said rack.

5. In window construction:

(a) a horizontally elongated horizontally disposed, flat metal sill formed with two spaced pairs of spaced, upwardly projecting ribs extending from end to end of said sill in side by side relation and parallel with said sill and a pair of legs extending the length of said sill depending in parallel opposed relation to each other from the two opposite lateral, longitudinally extending edges of said sill;

(b) a pair of sash having lower, horizontally extending sash rails each of the latter being formed with

a downwardly opening recess extending from end to end thereof;

(c) a pair of said spaced ribs projecting into each of said recesess substantially in slidable engagement with the sides of said recesses, respectively:

(d) a horizontal shaft rotatably extending through said legs at a right angle thereto at a point centrally between the ends of said sill and means supporting said shaft on said sill for rotation about its horizontal axis and for movement axially thereof;

(e) a pair of spur gears rotatably supported on said shaft below the space between each pair of ribs having their upper teeth projecting into each such space;

(f) a rack secured in each recess rigid with each rail and extending from end to end of each recess with its teeth in interengaging relation with the teeth of the gear projecting into each recess;

(g) a clutch member secured on said shaft between said gears reciprocably movable with said shaft between terminal end positions adjacent to said gears;

(h) clutch elements on the opposed sides of said pair of gears adapted to be selectively engaged by said clutch member according to terminal end position to which said clutch member is moved;

(i) said clutch member being movable to an intermediate position spaced between said terminal end positions into intergengaging relation with the clutch elements on both of said gears for locking said clutch elements against movement of either of said gears; and

(j) means for yieldably holding the clutch member in said intermediate position.

6. In a vertically disposed frame defining the sides of a window opening including a horizontally elongated sill portion and a vertically disposed sash horizontally movable in said opening having a horizontally elongated lower rail parallel with and supported on and over said sill portion for movement longitudinally of the latter, improvement comprising:

(a) a horizontally elongated, downwardly opening recess in the underside of said rail extending longitudinally of the latter;

(b) a pair of horizontally elongated, parallel ribs in spaced side by side relation rigid with and extending longitudinally of said sill portion projecting upwardly into said recess providing a guide for movement of said rail longitudinally of said ribs and providing an upstanding barrier against passage of water transversely across said sill portion between said rail and said sill portion into the space between said ribs;

(c) a horizontally extending rack between said ribs parallel with and connected to said rail, and having its teeth projecting downwardly;

(d) a gear rotatably supported in said sill portion having its teeth in engagement with the teeth of said rack for moving said window longitudinally of said sill portion upon rotation of said gear.

7. In a structure as defined in claim **6**:

(e) means respectively on said rail and on said rack detachably connecting said rack and rail for upward movement of said rail free from said rack upon moving said window sash upwardly relative to said sill member.

8. In a structure as defined in claim **7**:

(f) means respectively on said rack and on said sill member connecting them for horizontal slidable movement of said rack relative to said sill portion longitudinally of the latter and connecting said rack and said sill member against upward movement of said rack out of said sill member upon such upward movement of said rail and sash upwardly relative to said sill member.

9. In a structure as defined in claim **6**:

(e) an upward projection on said rack rigid therewith;

(f) a second downwardly opening recess in said rail into which said projection is releasably fitted connecting said rack and said rail for movement of said rail and rack together longitudinally thereof upon rotation of said gear;

(g) a pair of laterally, oppositely outwardly opening recesses respectively in opposite sides of said rack extending longitudinally thereof; and

(h) a pair of flanges integral with said ribs projecting into said recesses in opposite sides of said rack securing said rack and ribs together against upward movement of said rack from between said ribs.

10. Window sash supporting and actuating means for a horizontally slidable sash that includes a lower horizontal rail, comprising:

(a) a horizontally elongated inverted channel member of extruded metal providing a sill portion having a pair of vertically disposed, spaced, opposed, parallel, horizontally extending side walls defining the sides of said channel member, and a horizontally disposed, horizontally elongated upper wall integral with and connecting said side walls along the upper edges thereof;

(b) a pair of parallel, horizontally extending ribs in spaced side by side relation integral with and projecting upwardly from said upper wall;

(c) a horizontally extending rack slidably positioned between said ribs having its teeth directed downwardly with their lowermost ends substantially even with said upper wall;

(d) a vertically disposed gear between said side walls of said sill portion having the uppermost teeth thereon projecting between said ribs and in engagement with the teeth on said rack, said side walls being in relatively closed opposed relation to the opposite ends of the teeth projecting between said ribs, whereby the teeth on said rack and the teeth on said gear will be retained against lateral displacement relative to each other, and an opening formed in said upper wall through which the uppermost portion of said gear projects;

(e) a horizontal shaft on which said gear is secured supporting said gear with its uppermost teeth in mesh with the teeth of said rack;

(f) means on said sill portion supporting said shaft for rotation relative to said rack and sill portion;

(g) means for securing said rack to such rail and in a position on said sill portion for movement of said rail with said rack and relative to said sill portion when said rail is over said sill portion parallel with the latter, and when shaft and gear are rotated together, and

(h) means connected with said shaft for rotating the latter;

(i) interengaged means on said rack and said ribs securing them together against vertical removal of said rack from said ribs.

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