May 1, 1962 H. L. STAVENAU 3,032,330

CASEMENT WINDOW HINGE-LOCK OPERATOR MECHANISM

Filed Dec. 12, 1957 3 Sheets-Sheet 1

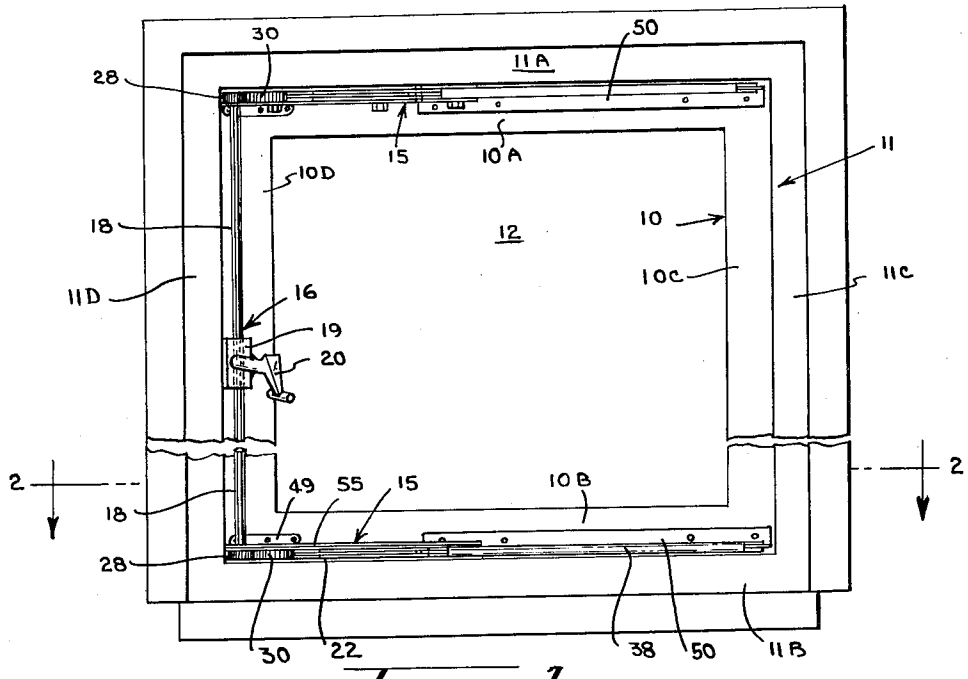


FIG. 1

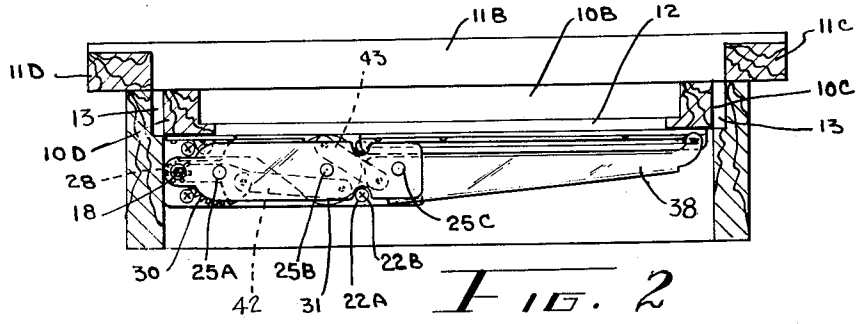


FIG. 2

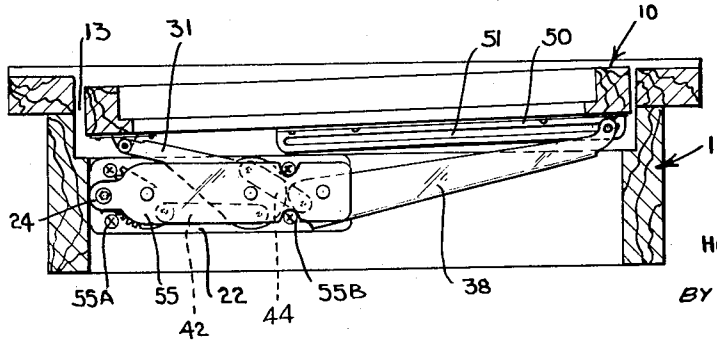


FIG. 3

INVENTOR
HAROLD L. STAVENAU
BY Ralph L. Hlugger
ATTORNEY

May 1, 1962 H. L. STAVENAU 3,032,330

CASEMENT WINDOW HINGE-LOCK OPERATOR MECHANISM

Filed Dec. 12, 1957 3 Sheets-Sheet 2

FIG. 4

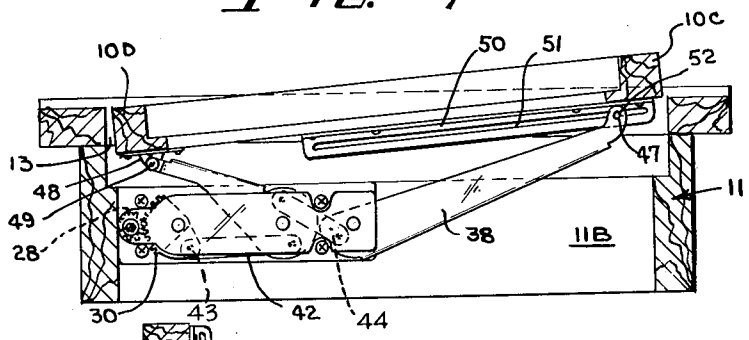


FIG. 5

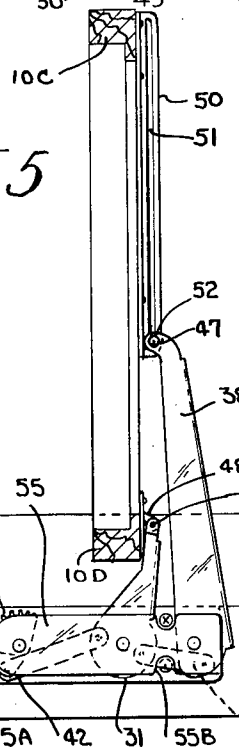


FIG. 6

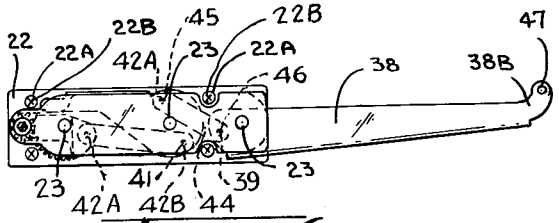


FIG. 7

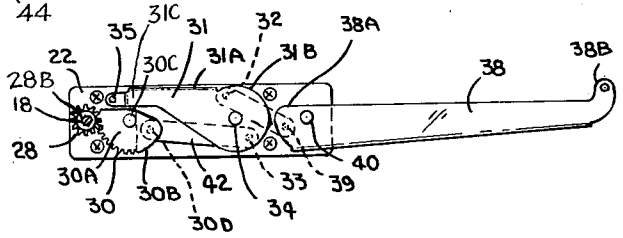
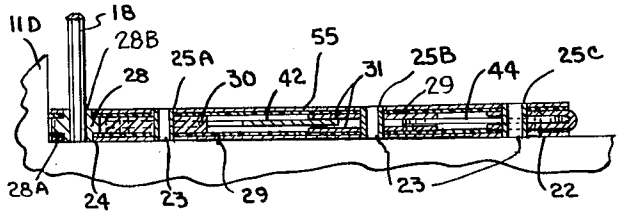


FIG. 8



INVENTOR
HAROLD L. STAVENAU

BY Ralph L. Wugger

ATTORNEY

May 1, 1962 H. L. STAVENAU 3,032,330

CASEMENT WINDOW HINGE-LOCK OPERATOR MECHANISM

Filed Dec. 12, 1957 3 Sheets-Sheet 3

FIG. 9

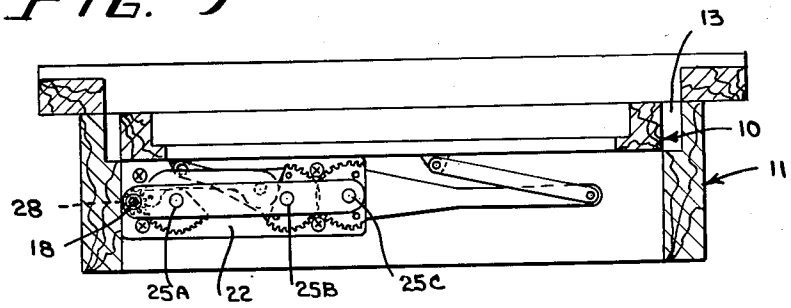
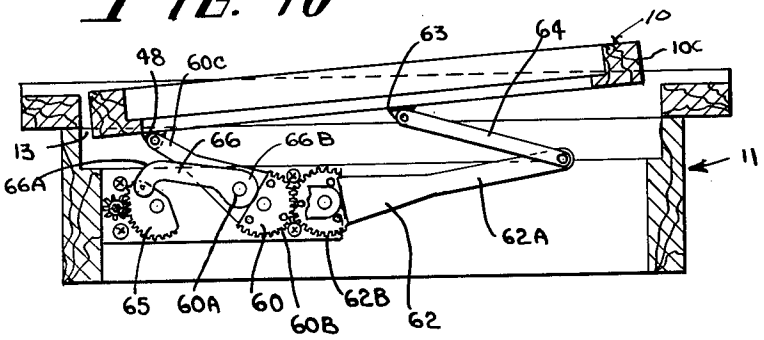
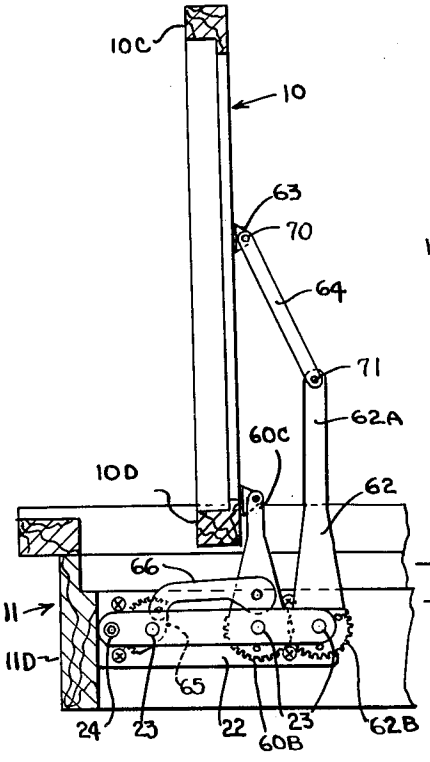


FIG. 10





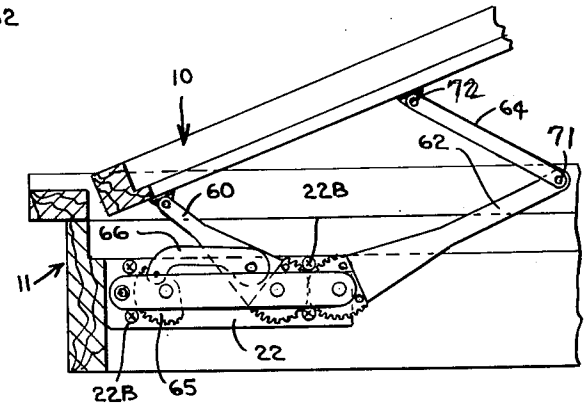


FIG. 11

FIG. 12

INVENTOR
HAROLD L. STAVENAU
BY Ralph L. Wegger
ATTORNEY

United States Patent Office

3,032,330

Patented May 1, 1962

3,032,330

CASEMENT WINDOW HINGE-LOCK OPERATOR MECHANISM

Harold L. Stavenau, Mankato, Minn., assignor to Truth Tool Company, Mankato, Minn., a corporation of Minnesota

Filed Dec. 12, 1957, Ser. No. 702,400
5 Claims. (Cl. 268—118)

This invention relates to apparatus for hingedly mounting casement windows. More particularly this invention relates to a hinge-lock operator mechanism having a double linkage for actuating a casement type window and at the same time supportedly mounting said window without the use of the conventional hinges. The double linkage operates to push the window outwardly in a plane substantially normal to the window surround opening in which it is mounted until the window frame clears the window surround.

An object of this invention is to provide a window hinge-lock operator mechanism that not only hingedly mounts a window in the window surround but it also is used to actuate a window and lock the window is a "set" position. Another object of this invention is to provide a hinge-lock operator mechanism having a "double linkage" for supporting the window whereby both of the side members of the window sash are swung away from the side members of the window surround.

Still another object of this invention is to provide a hinge-lock mechanism for a casement window having lever arms that swing in opposing directions when the window is either open or closed, said lever arms forming a double linkage for supporting and for opening and closing said window. Further, the lever arms are to be so constructed that when the window is in an open position they lock the window against any swinging or swaying motion when it is in said position. In addition, the lever arms support the window frame in a position substantially normal to the window opening with the portion of said frame adjacent to the window opening being spaced from the sides of the window surround and also substantially normal to the sides of the window frame wherein the hinge-lock mechanism is mounted.

A further object of this invention is to provide a hinge-lock operator mechanism which may be connected to the window and to the window surround without requiring recessed portions being formed in the window surround or in the window frame. Further, this mechanism is to provide a minimum obstruction to passage of light and air through the window when opened.

An additional object of this invention is to provide a hinge-lock operator mechanism for casement windows wherein plastic weather stripping such as vinyl, nylon or Teflon may be used. The weather strip is to be mounted in the space between the window frame and the window surround.

An additional object of this invention is to provide two hinge-lock operator mechanisms for supportedly mounting a window in a window surround, each of said mechanisms being connected to opposing sides of both the window and window surround and each of said mechanisms made up of substantially identical elements.

The forementioned hinge-lock operator mechanism structure is to be made of simple construction, easy to assemble, and inexpensive to produce. The structure of the hinge-lock operator mechanism is to be such that it may be readily used with any of the present existent casement windows or similar operating structures.

Other and further objects are those inherent in the invention herein illustrated, described in the claims, and will be apparent as the description proceeds.

To the accomplishment of the foregoing and related

ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

The invention is illustrated by reference to the drawings in which the corresponding numerals refer to the same parts and in which:

FIGURE 1 is a front elevational view of a window or closure of the casement type and a hinge-lock operator mechanism as viewed from the inside of a building, the window being of a type which swings outwardly.

FIGURE 2 is a horizontal cross-sectional view taken along the lines and in the direction of the arrows 2—2 of FIGURE 1 showing the window in a closed position and also showing a top view of the hinge-lock operator mechanism.

FIGURE 3 is a similar view to that shown in FIGURE 2 wherein the window is shown in a partially opened position to illustrate that the initial opening movement of the window is along a path of travel wherein the plane of the window remains substantially parallel to that of the window frame opening.

FIGURE 4 is a view similar to that shown in FIGURE 3 wherein the window is shown in a more open position to illustrate the path of travel of the window and also to illustrate the opposite directional movements of the hinge-link arms.

FIGURE 5 is a top horizontal cross-sectional view of a portion of the window frame and of the window in a fully opened position illustrating the locking features of the hinge-link arms.

FIGURE 6 is a top view of the window hinge-lock operator mechanism illustrating said mechanism in a window-closed position, the gears and their respective linkages being shown in dotted line.

FIGURE 7 is a similar view to that shown in FIGURE 6 except that the cover plate has been removed to better illustrate the links and gears connections in the window hinge-lock operator mechanism.

FIGURE 8 is a vertical cross-sectional view taken along the lines and in the direction of the arrows 8—8 of FIGURE 5 showing the relative horizontal positions of the various members making up the hinge-lock mechanism.

FIGURE 9 is a horizontal cross-sectional view of the window to show a modified embodiment of my hinge-lock operator mechanism mounted in a position for use, the window being shown in a closed position.

FIGURE 10 is a similar view to that shown in FIGURE 9 wherein the window is shown in a partly opened position to illustrate the relative movement of the various elements of the hinge-lock mechanism of a modified embodiment of my invention.

FIGURE 11 is a similar view to that shown in FIGURE 10 wherein the window is shown in a more widely opened position to further illustrate the relative movement of the various elements of the hinge-lock mechanism of the modified embodiment of my invention.

FIGURE 12 is a similar view to that shown in FIGURE 11 wherein the window is shown in a fully opened position to illustrate the operation of the various elements of the hinge-lock mechanism of a modified embodiment of my invention.

Referring to the drawings, FIGURES 1 and 2 illustrate a typical casement type window of which the window sash 10 is mounted in a window frame 11. The window sash is composed of a top member 10A, a bottom member 10B, and side members 10C and 10D. In the sash there is mounted the usual glass window pane 12. A window

frame 11, sometimes designated as a "surround," is composed of a top member 11A, a bottom member 11B, and side members 11C and 11D. The window sash 10 is mounted so that there is a space 13 between the window frame and the window sash, this space usually being provided with weather stripping.

The window is supportedly mounted by a pair of window hinge-lock operator mechanisms, generally designated 15, which are the subject of the instant invention. As shown in FIGURES 1 and 2, one of the hinge-lock mechanisms swinging connects the top sash member 10A to the top window frame member 11A and a second hinge-lock operator assembly being construed of the same elements as the aforementioned hinge-lock mechanism swinging connects the bottom sash member 10B to the bottom window frame member 11B.

The window is manipulated from an opened to a closed position and vice versa by the window operator mechanism generally designated as 16, said mechanism being used to actuate the hinge-lock operator mechanisms 15 to open or close the window. The window operator 16 is made up of an actuating rod 18 journaled for rotation in the crank housing 19, said actuating rod being connected by suitable linkage (not shown) to be rotated by the hand crank 20. The linkage is conventional and does not form a part of the instant invention. The crank housing 19 is mounted on the side member 11D of the frame 11, said housing being held in place by screws (not shown). The hand crank is mounted in the housing so that its longitudinal central axis forms a 45 degree angle with the side member 11D of the window frame, thereby not extending an appreciable amount into the room. The actuating rod extends both upwardly and downwardly from the crank housing so that it operates both of the window hinge-lock operator mechanisms, one of the hinge lock operator mechanisms being mounted on the top member and the other on the bottom member of the window frame.

The operation of both the upper and lower window hinge-lock mechanisms 15 shown in FIGURE 1 being identical, the operation and structure of the lower one of said mechanisms will now be described. A substantially rectangular mounting plate 22 having openings 22A therein for screws is screwed to the lower window frame member 11B by screws 22B. Three spaced spacer apertures 23 and a drive gear aperture 24 are located on a longitudinal center line through the horizontal face of the mounting plate, said drive gear aperture being located in the end portion of the mounting plate that is adjacent window frame side member 11D.

Hollow cylindrical spacers 25A, 25B, and 25C having shoulders formed on each exterior end portion of said spacers are mounted in the spacer openings. The axial length of a shoulder is substantially equal to the depth of the mounting plate. The diameter of the narrow portion of the shoulder is slightly less than the diameter of the spacer apertures, thus a portion of said shoulder bears on the upper face of the mounting plate.

A cylindrical toothed drive gear 28 having shoulder portions 28A at both ends is mounted on the mounting plate, one of the shoulder portions 28A being mounted in the drive gear aperture 24 similarly as the spacers were mounted in the spacers openings. An opening 28B extends through the central portion of the drive gear such that an end of the actuating rod 18 may be mounted therein to operatively rotate the drive gear 28. The teeth of the drive gear intermesh with the teeth of the drive gear segment 30.

A plastic wear plate 29 being similar in shape to the mounting plate and having openings therein spaced similarly as the drive gear and spacer apertures in said mounting plate is mounted on the mounting plate (see FIGURE 8).

The drive gear segment 30 is made up of two identical spaced flat discs integrally connected at one straight line edge portion thereof, the plane of the upper face of one

disc being parallel to the plane of the upper face of the other disc. The discs are substantially semi-circular in cross-section, each having a quarter section 30A that is toothed in its outer periphery. An opening 30C is formed at the center axis of the quarter section such that the drive gear segment may be mounted to rotate about the spacer 25A. The non-toothed section 30B of the drive gear segment has an operator link aperture 30D located adjacent the corner whereat the circular periphery of said section intersects with the straight line edge portion thereof.

A support arm 31 being formed of two identical spaced portions integrally connected along the straight line edge 31A of said portions is rotatably mounted on spacer 25B. Since the two portions of the support arm are identical, only one will be described. A support arm portion in cross-section is a flat plate being formed substantially of a ¾ circle section 31B with an extension arm 31C extending from the non-circular portion and integral therewith. The aforementioned straight line edge 31A is an edge portion of the extension arm and is parallel to a tangent of the outer periphery of the ¾ circle section 31B.

A control link pivot aperture 32 is located adjacent the outer edge of the support arm where the straight line edge 31A is connected to the ¾ circle section. Substantially 145° around the peripheral edge of the ¾ circle section from the control link aperture 32 and an equal distance from the center, an operator link pivot aperture 33 is provided. At the center of the ¾ circle section, an opening 34 is provided such that the support arm may be rotatably mounted as previously mentioned. Adjacent the outer end of the arm extension 31C, an extension arm aperture 35 is located such that the support arm may be pivotally connected to the window sash.

On the third spacer 25C, a control arm 38 is rotatably mounted. The control arm is made up of two identical flat, substantially trapezoidal, spaced portions being integrally connected along one elongated side portion thereof. The two sections of the central arm being identical, only one will be described.

One of the narrow ends of the trapezoidal portions has an integral concave extension 38A wherein a connector link pivot aperture 39 is provided. Inwardly from said aperture 39 a control arm spacer aperture 40 is located such that the spacer 25C may extend upwardly through the control arm to rotatably mount said control arm.

At the opposite end of the support arm portion, a substantially right angle offset 38B is integrally connected. A slider pin aperture 47 is formed in said offset.

The vertical spacing between the two flat sections of the drive gear segment 30, the control arm 38 and the support arm 31 is equal (see FIGURE 8). Thus the upper and lower faces of each of the respective faces of the aforementioned elements lie in the same plane.

An elongated rectangular shaped operator link 42 having apertures 42A and 42B in its respective end portions is made of a depth that is slightly less than the spacing between drive gear segment disc portion so that one end portion extends between the two portions of said drive gear segment. This end portion is pivotally held in place by pivot pin 43 extending through apertures 42A and 30D. Similarly the opposite end portion of the operator link is pivotally held in place between the two support arm portions by a pivot pin 41 extending through apertures 42B and 33 of the operator link and the support arm respectively.

A control link 44 of a similar shape as the operator link but not as long is pivotally mounted at its respective end portions between the two portions of the control arm and the support arm by pivot pins 45 and 46 respectively, said control link having apertures at its opposite end portions for inserting the pivot pins therethrough.

A second plastic wear plate 29 is mounted between the lower face of cover plate 55 and the upper surfaces of the drive gear segment, support arm and control arm,

said cover plate being of similar shape as the wear plate but slightly larger. Flat headed rivets counter-sunk or other suitable means passing through the hollow spacers may be used to hold the mounting plate, the cover plate and the parts mounted therebetween intact.

The cover plate **55** is generally rectangular in shape and has a drive gear aperture **24**, and three spacer apertures **23** therein. The spacing of the aforementioned apertures is the same as that of the corresponding apertures in the mounting plate. The apertures are of a diameter such that the upper shoulder of the spacers **25A**, **25B**, **25C** may be inserted therein. The corner portions of the end of the cover plate adjacent the frame side member **11D** are notched out **55A** such that the screws securing the mounting plate to the window frame may be readily inserted or removed. Similarly slots or notched out portions **55B** are formed in the outer edges of the cover plate in the area adjacent the outer peripheral portions of the support arm and the control arm for providing easy access to the other two screws securing the mounting plate to the window frame.

The main functional purpose of the cover plate is to protect the gearing and linkage portion of the mechanism so that foreign articles will not fall therebetween and at the same time form a stable mounting structure to firmly hold the drive gear and the spacers in their proper positions.

A pivot bracket **48** is secured to the window sash at one end of the bottom member **10B** by screws **48A**, said pivot bracket having a right angle flange portion **48B** formed integral therewith and constructed such that it will extend between the two flat portions of the support arm. A pivot bracket pin **49** mounted in the pivot bracket aperture **53** pivotally secures the pivot bracket to the support arm.

An angle shaped sash slide bracket **50** extending longitudinally from adjacent side member **10C** of the sash to a point approximately two-thirds the distance across the lower member **10B** is connected to said lower member **10B** of the sash by screws extending through one leg of said angle. In the other leg of the sash slide bracket is an elongated slot **51**. The slotted portion of the sash slide bracket is inserted between the right angle offset portions **38B** of the control arm such that a slide pin **52** may be used to slidably secure the control arm to the window sash.

The structure of the upper window hinge-lock mechanism is identical to that set forth heretofore except that the positions of the cover plate and the mounting plate are reversed. The structure of the window hinge-lock operator mechanism having been described, I will now proceed to the operational movements thereof.

Turning the hand crank **20** actuates the actuating rod **18** which in turn rotates the drive gear **28**. The rotational movement of the drive gear induces a rotational movement in the opposite direction in the drive gear segment **30** through the intermeshing toothed positions of said drive gear and drive gear segment.

The rotational movement of the drive gear segment **30** is transmitted through the operator link **42** to the support arm **31** and from the support arm through the control link **44** to the control arm **38**, said support arm and control arm being pivotally connected at appropriate apertures in said drive gear segment, support arm and control arm. Since the operator link aperture **30D** which is located in the drive gear segment, the operator link pivot aperture **33** and the control link aperture **32** which are located in the support arm and the support arm pivot aperture **39** which is located in the control arm are each equally spaced from the respective pivot points about which they are rotated, the aforementioned linkage connections results in the control arm and the support arm each being rotated through the same angle that the drive segment is rotated.

The same directional movement of the drive gear segment and the support arm is obtained since the pivotally connected points of the operator link thereto are on the same side of a line drawn through the center of rotation of said drive gear segment and support arm; whereas the support arm and the operator arm rotate in opposite directions since the pivotal connections points of the control link thereto are located on opposite sides of a line drawn through the respective centers of rotation of the support arm and the control arm. Thus the support arm and the control arm are rotated in opposite directions each being rotated through the same arcuate angle.

When the window is in a closed position (FIGURE 2), a clockwise rotation of the support arm **31** will cause sash side member **10D** to move outwardly since the outer portion of said arm is pivotally connected to a pivot bracket **48** mounted adjacent said side. At the same time the control arm which is connected to the opposite side of the sash is rotated in a counterclockwise direction and pushes the sash side member **10C** in an outward direction faster than the support arm pushes side member **10D**, said control arm **38** being longer than said support arm **31**. The control arm being slidably connected to the window sash through the slide pin **52** and sash slide bracket **50** permits the window to be swingingly rotated as it is pushed outwardly by the control and support arms (FIGURES 2–5).

As may be noted in FIGURE 5 when the window is in a fully open position it is at substantially right angles to the plane of the window frame opening. The length of the slot **51** and the length of the control arm **38** have been so chosen that when the window is in a fully opened position the pivot pin **52** in the right angle offset **38B** of the control arm **38** will be at one end of travel in the aforementioned slot. This tends to draw the sash slide bracket **50** in an inward direction along the line substantially normal to the window frame opening but such movement is prevented by the connection of the support arm **31** to the pivot bracket **48**, thus the window is locked in an open position. When the window is in a position between a fully opened and a fully closed position, any force applied to the window tending to open or close said window will be opposed by an opposite force at the slide pin pivot connection having one component in a plane normal to the window frame and the other component in a plane parallel to the window frame. This slide pin connection along with the pivot bracket connection will similarly lock the window in a "set" position to prevent it from rocking or moving until the hand crank **20** is turned.

Also, since the two arms rotate in opposite directions wherein their centers of rotation are on a line parallel to a line passing through the pivotal connections of the arms to the window when said window is in a closed position, the initial outward movement of the window from the window frame opening is large in comparison to its rotational movement. This results since the outward movement is a function of a sine of an angle formed by the arms with the window frame whereas the rotational movement is a function of the cosine of same angle. As a result the window is moved substantially in an outward direction until it clears the window frame, thus leaving substantially the same clearance around the periphery of the window sash between said sash and its window surround. This is advantageous as plastic weather stripping such as nylon, vinyl, etc., may be inserted in the space **13** between the window sash **10** and its surround **11**. Using conventional window hinges, the window sash is pivoted inwardly into the frame such that the sash would tightly squeeze a portion of the weather stripping and unequally wear the peripheral portions. Also in cold weather, the plastic would be more brittle and it being tightly squeezed would result in it cracking. With the present invention, the window sash snugly fits into a weather stripping border attached to the frame without tightly squeezing any portion thereof.

The "lock action" of the hinge lock mechanism when the window is in a fully opened and a partially opened position has been previously set forth; now the lock action of said mechanism will be set forth for the window when it is in a closed position. As may be noted the pivot bracket 48 is connected adjacent the lower corner of the side member 10D of the window sash. The slot 51 previously described extends to a point adjacent the opposite vertical member 10C of the window sash. The length of the slot 51 and the length of the control arm 38 have been chosen so that when the window is in a fully closed position the slide pin 52 pivot connection in the right angle offset 38B of the control arm is brought to bear against the end of the slot. This tends to move the window in a horizontal direction but the window is prevented from doing so since the support arm which is connected at the opposite side of the window operates in the opposite direction.

The arms being fully extended prevent any rotational movement of one side about the other, that is, the window is prevented from moving outwardly from the window surround. Thus it may be seen that no separate lock mechanism need be provided.

Also, the "lock action" prevents the sides of the window from being jimmied open without first breaking the hinge-lock mechanism. Although the construction of the mechanism is such that it will securely hold the window in the position desired, at the same time, the structure is light, sturdy, and easily operable by the actuating structure that has been described.

Having described the preferred form of my invention, I will now proceed to describe a modified embodiment thereof, which is illustrated in FIGURES 9–12, inclusive. The actuating mechanism, the drive gear, the mounting plate, the spacer plate, and the pivot bracket and their respective connections are the same as that set out for the preferred embodiment.

The support arm 60 is of similar construction as the one used in the preferred embodiment except that only one aperture 60A is provided in the portion of the arm that is rotatably mounted on the mounting plate 22 and that the ¾ circle portion 60B has teeth formed on its outer periphery. The control arm 62 is generally the same shape as the support arm but it has an extension arm 60C which is substantially longer than the extension arm 62A of the support arm. When the support arm is rotated in one direction, it transmits its rotation movement to the control arm since the spacers 25B and 25C, which form the pivots for said arms are positioned such that the toothed portions of the respective arms will intermesh.

The drive gear segment 65 is the same as the one used with the preferred embodiment except the entire circular periphery of said segment has teeth formed therein. The rotational movement of the drive gear segment is transmitted through an operator link 66 which is pivotally connected at its one end 66A to the drive gear segment and at the other end 66B to the support arm. As may be noted in FIGURE 9, the points of pivotal connection in ends 66A and 66B are offset from the main body of the operator link so that the link will not be impeded in its travel by the spacer apertures 25A and 25B.

Another difference in the modified embodiment is that a control arm pivot bracket 63 is mounted on the lower member of the window sash 10B slightly on the opposite side of the center from the first pivot bracket 48. A connector link 64 is pivotally connected to the control arm pivot bracket 63 at one of its ends and is pivotally connected to the extension arm portion 62A of the control arm, the pivotal connection being pivot pins 40 and 71, respectively. The lengths of the connector link, the control arm, and support arm, are such that when the extension portion 62A of the control arm and the extension portion 60C of the support arm are substantially parallel, the window will be in a plane that is normal to the plane of the window frame. It is to be noted that the connector

link 64 rotates in an opposite direction about the control arm pivot bracket pin 70 from that of the direction of rotation of the control arm about the spacer 25C. Due to this type of pivotal connections the window moves in a substantially identical path as the window moved by the preferred window hinge operator mechanism previously described.

A flat elongated rectangular cover plate 65 that is rounded at its ends and has a drive gear aperture 24 and spacer apertures 23 spaced similarly as those in the mounting plate 22 is mounted above the drive gear segment, the control arm and the support arm similarly as the cover plate 55 previously described. The cover plate 65 serves the same functions as those set forth for cover plate 55.

Since the parts of this embodiment perform similar or equivalent functions to those performed by those of the preferred embodiment and since the mounting of identical parts is the same as the mounting of the parts of the preferred embodiment, a further description is not considered necessary.

As many widely varied and different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments herein.

What I claim is:

1. In a hinge-lock mechanism for a window of the casement type which has a sash and a window frame, a mounting plate, a support arm rotatably mounted on the mounting plate, said support being pivotally connected to one side of a window sash, a control arm rotatably mounted on the mounting plate, said control arm being pivotally connected to the opposite side of a window sash, means for rotating said support arm and control arm in opposing directions to open a window and actuating means for rotating the control arm and support arm in opposing direction, said actuating means including a drive gear segment and link means to rotate the support arm in the same direction as said drive gear segment.

2. For a casement window having a frame and a sash, an operator mechanism and a hinge-lock mechanism, said hinge-lock mechanism comprising a mounting plate, a support arm having one end portion rotatably mounted on said mounting plate, a control arm having one end portion rotatably mounted on the mounting plate, said support arm having an axis of rotation spaced from the axis of rotation of the control arm, means forming a driving connection between the rotatably mounted end portions of said arms, and a link having one end pivotably connected to the rotatably mounted support arm end portion in spaced relation to the axis of rotation of said support arm end portions, each of said arms having an opposite end pivotably connected to said sash in spaced relation to one another, and operator mechanism including actuating means connected to the opposite end of said link for simultaneously pivoting said link and moving said link to rotate said support arm about its axis of rotation.

3. The apparatus of claim 2 further characterized in that the driving connection is intermesting tooth portions on said rotatably mounted end portions of the support arm and control arm for causing said arms to rotate in opposite directions as one of the arms is rotated.

4. For a casement window having a frame and a sash, an operator mechanism and a hinge lock mechanism comprising a mounting plate, a support arm having one end portion rotatably mounted on said mounting plate, a control arm having one end portion rotatably mounted on the mounting plate, said support arm having an axis of rotation spaced from the axis of rotation of the control arm, each of said arms having an opposite end pivotably connectable to said sash in spaced relation to one another, a link having one end pivotably connected to the rotatably mounted end portion of the control arm in spaced relation to the axis of rotation of said control arm, said link having an opposite end pivotably connected to the

rotatably mounted end portion of the support arm in spaced relation to the rotational axis of the support arm, said operator mechanism including actuating means connected to one of the rotatably mounted arm end portions to rotate said one end portion about its axis of rotation.

5. For a casement window having a frame and a sash, an operator mechanism and a hinge-lock mechanism, for moving a window sash between an opened end in a closed position, said hinge-lock mechanism comprising a mounting plate, a plurality of spacers mounted on said mounting plate, an elongated control arm having one end portion rotatably mounted on one of the spacers, an elongated support arm having one end portion rotatably mounted on another of the spacers, means including a driving connection between the rotatably mounted end portions of the support arm and the control arm for rotating said arms, the rotation of said arms swingably rotating a casement window sash, said driving connection including a control link that is pivotably connected at one end to the rotatably mounted end portion of the support arm and at the other end to the rotatably

mounted end portion of the control arm, and an operator mechanism comprising a housing, and rotatable means connected to said housing for actuating the means for rotating the support arm and control arm, said control link being connected to cross a line drawn between the center axis of the spacers on which the arms are rotatably mounted when said mechanisms are in a closed position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,851,810	Cone	Mar. 29, 1932
1,956,476	Rund	Apr. 24, 1934
2,226,376	Harrison	Dec. 24, 1940
2,582,558	Parquette	Jan. 15, 1952
2,767,979	Hummert	Oct. 23, 1956

FOREIGN PATENTS

457,508	Great Britain	Nov. 30, 1936
499,229	Great Britain	Jan. 20, 1939