Feb. 6, 1962 J. P. HYNES ET AL 3,020,039

OPERATING DEVICES FOR CASEMENT WINDOWS AND THE LIKE

Filed Sept. 25, 1959 3 Sheets-Sheet 1

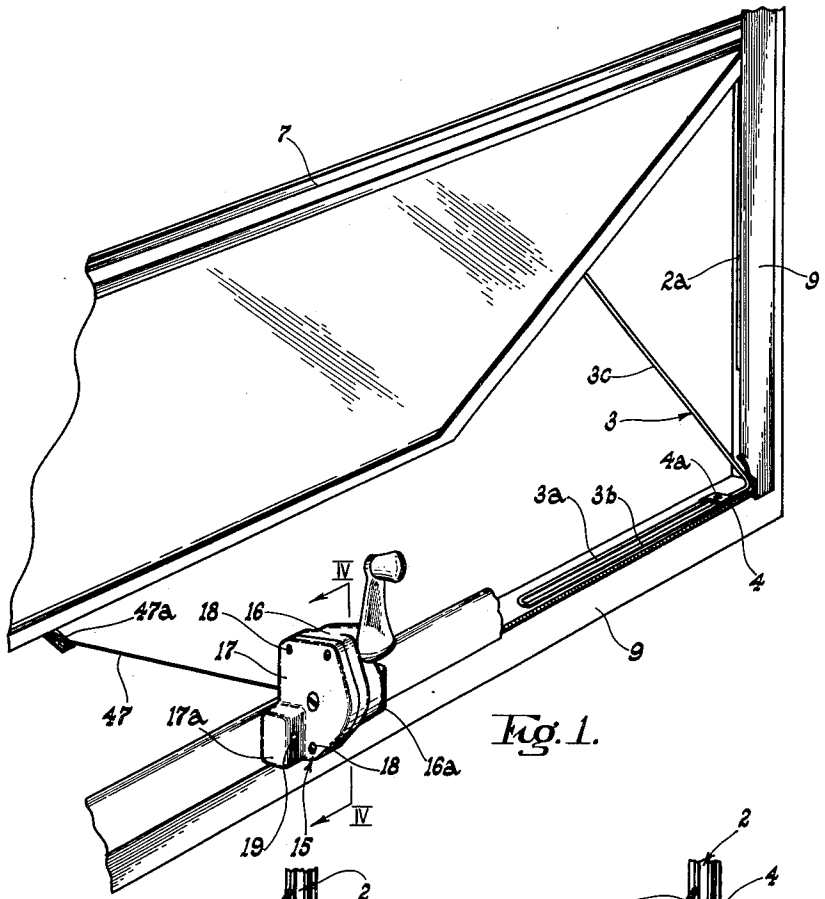

Fig. 1.

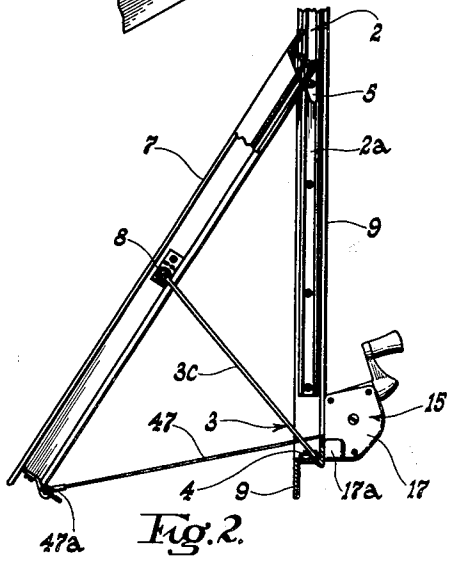

Fig. 2.

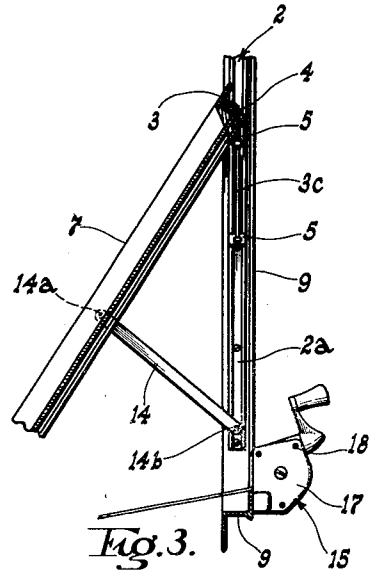

Fig. 3.

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Feb. 6, 1962 J. P. HYNES ET AL 3,020,039

OPERATING DEVICES FOR CASEMENT WINDOWS AND THE LIKE

Filed Sept. 25, 1959 3 Sheets-Sheet 2

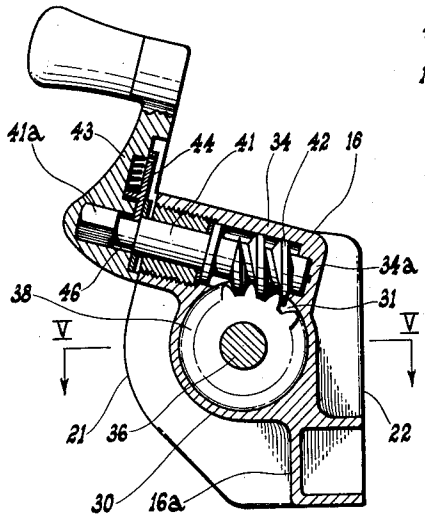

Fig. 4.

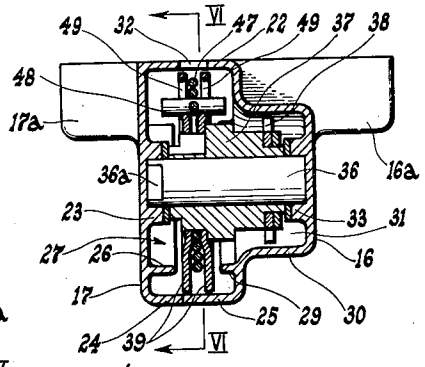

Fig. 5.

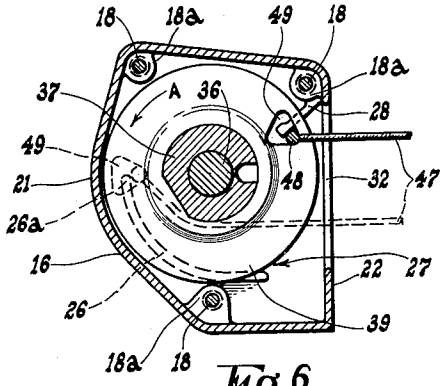

Fig. 6.

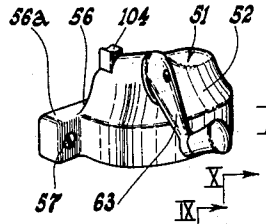

Fig. 7.

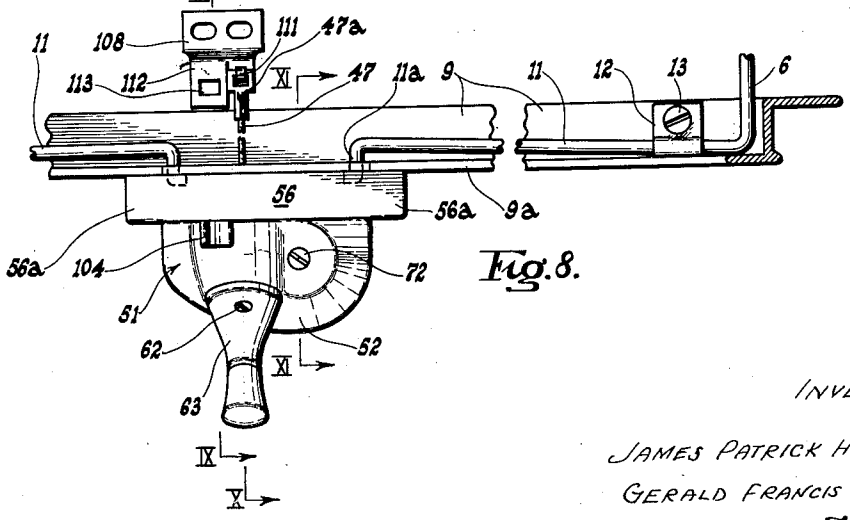

Fig. 8.

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OPERATING DEVICES FOR CASEMENT WINDOWS AND THE LIKE

Filed Sept. 25, 1959 3 Sheets-Sheet 3

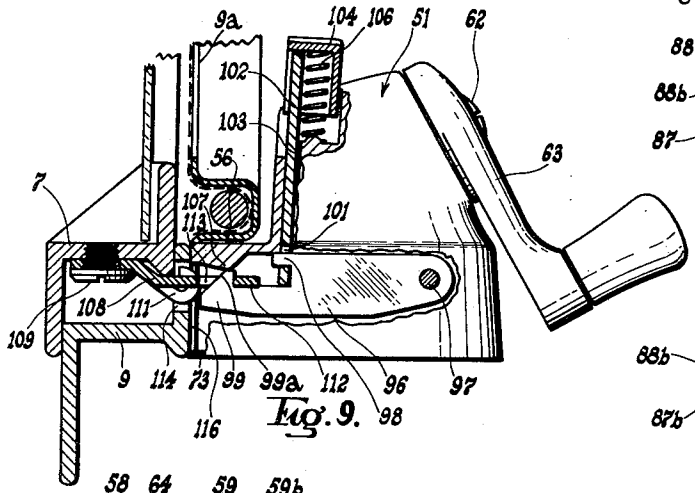

Fig. 9.

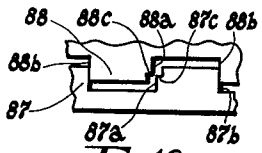

Fig. 16.

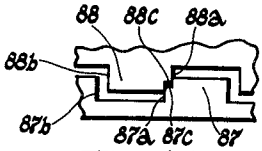

Fig. 17.

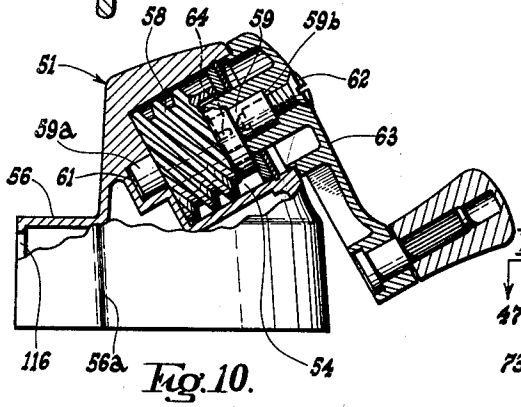

Fig. 10.

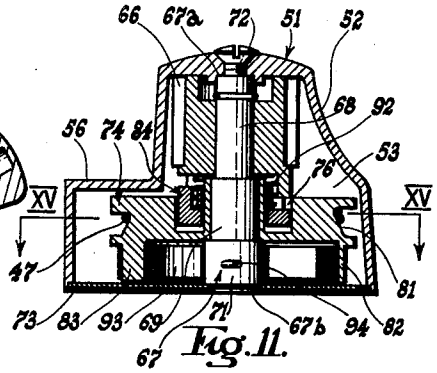

Fig. 11.

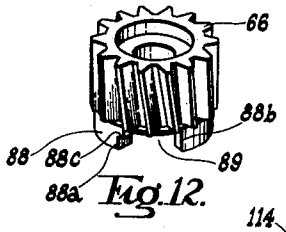

Fig. 12.

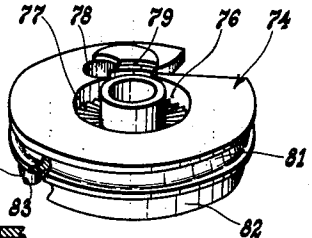

Fig. 14.

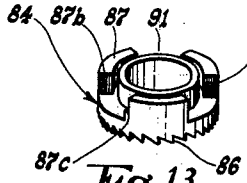

Fig. 13.

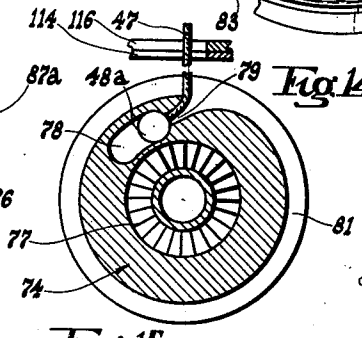

Fig. 15.

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United States Patent Office 3,020,039 Patented Feb. 6, 1962

3,020,039

OPERATING DEVICES FOR CASEMENT WINDOWS AND THE LIKE

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Filed Sept. 25, 1959, Ser. No. 842,253
9 Claims. (Cl. 268—109)

This invention relates to operating devices for casement and awning windows and more particularly to improvements in the drive control and transmitting mechanism of such devices for opening and closing the windows.

One well known operating device in common use employs, as the force transmitting element between the drive control and window sash, a special form of chain which becomes rigid when the window is being opened and flexible when the window is being closed. That device is somewhat expensive and unattractive, as the housing needs to be rather large to accommodate the drive mechanism as well as the full length of chain when the window is in its closed position. When the window is open the chain cannot be concealed and thus adversely affects the appearance of the window.

Another type of operating device commonly used has a system of levers or push bars as the force transmitting element between the drive control and window sash. To enable the levers or push bars of that type of device to function, one or three sides of the drive control housing must be left open thereby allowing a great amount of dust and grit to gather on or near the mechanism, and also giving the device a shabby or unfinished appearance. The number of open sides depends upon whether one or two sets of levers or push bars are used. In the case of two sets being used, a large drive control housing with three open sides is necessary and this allows the mechanism and accumulating dirt to be plainly visible. In addition to the above disadvantages, the levers or push bars are in sight at all times adding further bulk and unattractiveness to the assembly.

It is the primary purpose of this invention to provide an operating device of simple and neat construction, that occupies a small space only and to reduce the bars, levers, gearing and similar force transmitting elements between the sash and drive control to a minimum both in size and in number.

The proposed device is described herein as being used in combination with awning or like windows which have sliding hinges, but it can be adapted for use on windows having any other conventional type of hinge.

The foregoing and other objects and advantages of the invention will be readily appreciated from the following description and the accompanying drawings wherein:

FIGURE 1 is a perspective view of the operating device and a torsion member in one of their forms, shown connected to an awning type window which is partially open;

FIGURE 2 is a side elevation of the arrangement shown in FIGURE 1 with parts shown in section;

FIGURE 3 is a side elevation showing an alternative method of connecting the torsion member to the window;

FIGURE 4 is a sectional elevation along line IV—IV of FIGURE 1;

FIGURE 5 is a sectional plan view along line V—V of FIGURE 4;

FIGURE 6 is a sectional elevation, along line VI—VI of FIGURE 5, showing the winding cord positions when fully extended and, unbroken lines, during rewinding;

FIGURE 7 is a perspective view of the operating device in a modified and preferred form;

FIGURE 8 is a plan view of the modified device shown in FIGURE 7 and also illustrates an alternative method for fixing the torsion member to a window sill or the like;

FIGURE 9 is a side elevation, partly sectioned along line IX—IX of FIGURE 8, and in which the window is assumed to be in its closed and locked position;

FIGURE 10 is a part sectional view along line X—X of FIGURE 8;

FIGURE 11 is a sectional view along line XI—XI of FIGURE 8;

FIGURE 12 is a perspective view of the helical gear shown sectioned in FIGURE 11;

FIGURE 13 is a perspective view of the ratchet wheel shown sectioned in FIGURE 11;

FIGURE 14 is a perspective view of the winding drum shown sectioned in FIGURE 11;

FIGURE 15 is a sectional view along line XV—XV of FIGURE 11, and in which the window is assumed to be in a fully opened position;

FIGURE 16 is a fragmentary developed view in one position of the driving lugs of the worm and ratchet wheels shown in FIGURES 12 and 13; and

FIGURE 17 is a fragmentary developed view in a second position of the driving lugs of the worm and ratchet wheels shown in FIGURES 12 and 13.

For application to awning windows as shown in the drawings, the operating device may be used in combination with a pair of sliding hinges of any known or suitable form and a pair of torsion members for biasing the window into an open position, one torsion member and one hinge being provided at each side of the window.

The torsion member 3 shown in FIGURES 1 and 2 consists of two arms bent at right angles to each other, one arm being fixed and the other movable. The fixed arm comprises two closely spaced parallel limbs 3*a*, 3*b*, united at one end so as to form a narrow elongated U, and is secured to the window sill as by means of a metal plate 4, straddling the parallel limbs and attached by one or more screws 4*a*. This plate preferably has its opposite end portions bent to pass over the outside of each of the limbs 3*a* and 3*b* of the fixed arm, and a depending lug accommodated between these limbs so that there can be no relative movement without restricting torsional motion.

The movable arm 3*c* has its outer end pivotally connected to the window sash 7 as at 8 in FIGURE 2, and in this embodiment takes the place of the support arm normally used in conjunction with a sliding hinge of the type illustrated.

Referring to FIGURES 1 and 2 the sliding hinge 2 has a slide channel 2*a* fixed to the window frame 9 and a sliding carrier 5 pivotally secured to the top of the sash 7.

FIGURE 8 shows a modified torsion member having a fixed arm 11 terminating at one end in an L shape portion 11*a* which projects through a hole in an upright flange 9*a* of the window frame. At or near its other end the arm 11 is held to the frame by a plate 12 and screw 13. The movable arm 6 is similar to that of FIGURES 1 and 2.

FIGURE 3 illustrates an alternative arrangement for the torsion member and hinge, in which the U shaped arms of the torsion member are fixed along the top of the sash and the arm 3*c* is held by two sliding carriers 5 so that it may move up and down the window frame as the window is closed or opened. In this case the torsion member does not support the window but a supporting arm 14 is pivoted as at 14*a* and 14*b* to the sash 7 and the sliding hinge track 2*a* respectively.

In the arrangements described, the window pivot 8, or alternatively 14*a*, is situated nearer to the bottom than the top of the sash so that there is greater mass above than below the pivot. This allows for the torsion members to

be only slightly biased to provide the initial opening of the window after which the greater mass above the pivot takes over and provides the force necessary to open the window to the full extent. Use of the sliding hinges enables the window to be opened downwardly and outwardly simultaneously. Conventional hinges could however be used, the only requirement being that the torsion members in that event would have to be biased to a greater extent.

Reference will now be made to the operating device as illustrated in FIGURES 1 to 6. It includes a casing or housing preferably comprising two parts, a main part **16** and a side cover plate **17** attached thereto by screws **18** passing into lugs **18***a*. These two parts have sideward extensions **16***a* and **17***a* through which screws **19** may extend to secure the casing to the window frame.

According to FIGURES 1 to 6 the casing viewed from a side is in the shape of an irregular pentagon having one corner formed by a large radius **21**. The longest side **22** of the pentagon forms the vertical back of the casing, that is the side nearest to the window, and the radiused corner **21** is directly opposite side **22** thus forming part of the casing front.

The cover plate **17** has a boss **23** located approximately at its centre, and a wall **24** extending around the perimeter that meets a similar wall **25** on the casing **16** when the two portions are joined. Another wall **26** projects inwardly from the cover plate **17** and extends part way up the front portion and along the base of the cover plate **17** as shown in FIGURE 6. The inner face of this wall **26** constitutes a cam track and the extremity **26***a* of which is closer to the boss **23** than its other extremity so that the passage **27** between the cam track and the boss gradually decreases in width from the rear of the casing. A stop **28** projects towards the central boss **23** from the top rear corner of the perimeter wall **24**, and terminates at a distance from the boss **23** approximately equal to the width of the narrow end of the passage **27** between the cam track **26** and the boss **23**.

The main part **16** of the casing has a cam track **29** and a stop (not shown) corresponding to those in part **17**. The outer side of the main part **16** may have a stepped down sideward extension **30** forming a small inner chamber **31**, and the rear side **22** of the perimeter wall **25** has a vertical slot **32** therein for the greater part of its height. A boss **33** corresponding to the boss **23** of part **17** projects inwardly from the extension **30** and a hollow cylindrical portion **34** (FIGURE 4) extends outwardly from the top of the said extension **30**. The cylindrical portion **34** is closed at its rear end **34***a* but is open at the front, and its interior communicates with chamber **31**.

A fixed shaft **36** extends between parts **16** and **17** when they are fixed together the ends of this shaft being supported in the bosses **23, 33**. The aperture in boss **23** may have a flat face corresponding to a flat face **36***a* at the respective end of the shaft so that the latter is held against rotation. A cylindrical drum or sleeve **37** is rotatably mounted upon the shaft **36** and has a worm wheel **38** secured near one end and a pair of disc like flanges **39** fixed a short distance apart near its other end.

The worm wheel **38** meshes with and is driven by a worm **42** mounted on a shaft **41** and housed within the hollow cylindrical portion **34** of the casing **16**. The shaft **41** extends for a short distance out through the open end of the portion **34** and has a square **41***a* provided thereon to enable the connection of a crank or like handle **43**. The handle **43** is provided with a spring loaded plate **44** which enters a groove **46** formed in the worm shaft **41** thus retaining the crank handle on the worm shaft.

A wire cable, cord or like flexible line **47** has fixed to one of its ends a stop pin **48** the ends of which are accommodated within triangular shaped holes **49**, one of which is provided in each of the said drum flanges **39** (FIGURES 5 and 6). The cord **47** is attached to the centre of

the stop pin **48** so that it may be wound onto the drum in between the flanges **39**, and passes out of the casing through the vertical slot **32** in the rear wall **22**.

The end **47***a* of the cord is secured to the window sash **7** and the torsion members are connected to the window and biased in such a way that the window is urged open by them as the cord is unwound from the drum. When the window is fully closed, the cord is fully wound about the drum as indicated in FIGURE 5. In this position the cord stop pin **48** is held, by the surrounding coils of cord, as near the drum surface as the triangular holes **49** will allow.

To open the window, the handle **43** is turned in such a direction (see the arrow A in FIGURE 6) that the cord will be unwound from the drum initially under the influence of the torsion members and thereafter by the weight of the window both of which forces cause the window to move downwardly and outwardly.

When the cord **47** is almost fully unwound, as shown dotted in FIGURE 6, the stop pin **48** is no longer restrained against outward movement by surrounding coils of cord and as the drum rotates further the pin is pulled towards the outside of the flanges **39** for as far as the triangular holes **49** will allow. With the stop pin **48** in this position continued rotation of the drum will engage the said pin against the stop **28** as shown in full in FIGURE 6. The stop pin **48** remains held in this position by means of the cord tension, thereby preventing further rotation of the drum in its original direction.

It will be appreciated that the worm gearing being irreversible will in effect lock the window in any selected position between fully closed and fully open.

To close the window the crank handle **43** is turned in the opposite direction to that previously used. As rewinding begins, the stop pin **48** is carried downwards from the unbroken line position of FIGURE 6 by the rotation flanges **39** away from the stop **28** and enters the wide end of the passage **28** inside the cam tracks **26** and **29**. As rotation of the drum continues the pin **48** is gradually forced in closer to the drum surface by the cam tracks. After leaving the narrow end of the passage **27** the stop pin **48** is held by the cord tension in as near to the drum surface as the triangular holes **49** will allow and in this position can pass below the stop **28** thus enabling complete rewinding of the cord and subsequent closing of the window to take place.

Reference will now be made to the preferred form of the operating device as illustrated in FIGURES 7 to 14. The device includes a hollow casing **51**, open along its base, having a curved front **52** which slopes back from the vertical, two compartments **53** and **54** the interiors of which are in communication along one side, and a rearwardly stepped portion **56** having sideward extensions **56***a* through which screws **57** pass to secure the device to a window frame **9**, fitted with fly wire screen **9***a*.

Referring to FIGURE 10, the compartment **54** slopes upward from inside the casing **51**, opens onto the curved front **52** and contains a worm **58**. The said worm has one end **59***a*, of its spindle **59**, rotatably mounted within a bore **61** which is provided in the closed inner end of compartment **54**, and its other end **59***b* secured by means of screw **62** to the operating handle **63**. The handle and worm are keyed together, as at **64**, to provide a positive driving connection between them, and the worm meshes with a driven member or worm wheel **66** which is rotatably mounted on the top section **68** of a non-rotatable stepped shaft **67** located within compartment **53**.

As shown in FIGURE 11, the top end **67***a* of the said shaft is secured to the top of casing **51** by means of a screw **72**, and the lower end **67***b* is riveted over to support a thin plate **73** which covers the open base of the said casing. A winding drum **74** which is rotatably mounted on the centre section **69** of the shaft **67** has an annular depression **76** with ratchet teeth **77** provided around its base, an aperture **78** which is connected by a passage **79**

to a peripheral groove **81**, and a skirt **82** having a gap **82***a* within which is located a downwardly projecting boss **83**. Rotation of the said drum is accomplished by means of a ratchet wheel **84**, which is mounted within the depression **76** of the drum **74** and influenced downwardly by a spring **92** to engage teeth **86** provided about its lower face with the drum teeth **77** located between the driven member or worm wheel **66** and the wheel **84**. A space is provided between the worm wheel **66** and ratchet wheel **84** to enable the said wheel to rise against the action of spring **92** and pass out of engagement with the drum teeth **77**.

The said ratchet wheel **84** and worm wheel **66** have lugs **87** and **88** which engage within apertures **89** and **91** respectively at all times constituting a dog clutch thereby enabling the worm wheel **66** to transmit its rotary motion to the ratchet wheel **84**. The drum **74** is retarded against motion in one direction by a flat coil spring **93**, the innermost coil of which is located around the lower section **71** of the shaft **67** and held against rotation by outwardly extending lugs **94** provided on the said section, and has its extreme outer end secured about boss **83** of the drum **74**.

The cord **47** has anchor pin **48***a* located within the aperture **78** of drum **74** as shown in FIGURE 15 and is wound about the said drum within groove **81**. The cord passes through an aperture **116** provided in the back wall of the casing **51** and a second aperture **114** in the window frame **9** for connection of its end **47***a* to the window sash **7**.

To enable locking of the window, a latch lever **96** is pivotally connected beneath compartment **54** to the casing **51**, as at **97** shown in FIGURE 9, and has a forwardly projecting finger **98** and hook line member **99** formed at the end remote from the pivot **97**. The finger **98** is located within a hole **101** provided in an actuating plate **102** which is slidably mounted within slot **103**. A button **104** is secured to the plate **102**, and a compression spring **105** situated beneath the said button urges the lever **96** upwardly until the hook **99** comes against an abutment **107** formed on the underside of the stepped portion **56**. A locking plate **108** secured to the window sash **7** by means of screws **109** has a hook **111** for attachment at the end **47***a* of the cord **47** as shown in FIGURE 8, and in addition this plate is provided with a tongue **112** having a hole **113** therein, this tongue projecting in towards the operating device from beneath the sash **7**. This tongue **112** is capable of passing through the apertures **114** and **116** so that the hook **99** of the lever **96** engages within the hole **113** when the cord **47** is fully wound onto the drum **74**.

In operation, and assuming that the window is in the closed and locked position as shown in FIGURE 9, the button **104** must be depressed so as to release the hook **99** from the tongue **112** before the window may be opened. To then open the window, the handle **63** must be turned so that the ratchet wheel **84** is rotated in the non-driving direction that is, with the sloping face of the teeth **86** leading. When the ratchet wheel is rotated in this direction, the bias of the torsion members produces a tension in the cord **47** thereby creating a torque on the drum **74** so that it rotates in the same direction as the ratchet wheel **84** as this wheel is turned.

Since the teeth **77** and **86** are held in engagement by the spring **92**, when the wheel **84** is rotated in the direction specified, the drum **74** follows its movement thereby unwinding the cord and allowing the window to open.

When the cord is completely unwound from the drum so that it passes directly from passage **79** out through apertures **116** and **114** as shown in FIGURE 15 the window is in its fully open position and the cord tension creates a straight pull on the drum instead of the torque it created when in its wound or partially wound condition. Thus, for any further rotation of the ratchet wheel **84** in the direction specified, there would no longer be corresponding movement of the drum **74**, and the ratchet wheel teeth **86** would ride over the drum teeth **77** by compressing the spring **92** thereby obtaining a "free wheeling" action.

If the window is only partially opened and rotation of the handle **63** is then stopped, the drum **74** is held against further rotation since the vertical pressure faces of teeth **86** and **77** are in contact, and the turning force on the said drum produced by the cord tension cannot cause the wheel **84** and worm wheel **66**, which are in constant engagement, to rotate the worm **58** due to the irreversibility of the worm drive.

Whilst the window is being opened, rotation of drum **74** causes the spring **93** to be progressively loaded. This load on the spring **93** enables the window to be pushed shut from outside the room, the cord **47** being rewound onto drum **74** without the need for rotation of handle **63** and associated parts. As the window is closed or partially closed in this manner, there is a release of tension on the cord **47** and the loaded spring **93** then rotates the drum **74** in the direction required for rewinding. This direction of rotation of the drum **74** is opposite to that previously described and is such that the sloping faces of the teeth **77** are leading, and thus the ratchet wheel **84** is periodically lifted against the action of spring **92** so that the said drum "free wheels" under the action of spring **93** and rewinds the cord **47**. This arrangement acts as a safety device preventing the window from moving suddenly outwards and so causing injury due to the sudden release of the potential energy stored in the torsion bars.

As previously mentioned, the torsion members are only biased so as to initially open the window and thereafter the weight of the window itself becomes the force producing further opening thereof. If opening of the window is continued after the weight of the window takes over from the torsion members, then the torsion members are progressively loaded to cause them to be biased in a direction opposite to their original bias, this new bias providing assistance when the window is closed in that the operator does not have to pull against the full weight of the window.

To close the window by means of the operator, the handle **63** is rotated in the opposite direction to that required to open the window and the rotation of the ratchet wheel **84** is then such that the vertical pressure faces of teeth **86** are leading. As the teeth **86** and **77** are held in engagement by spring **92** the drum **74** is forced to rotate in the same direction as the wheel **84** and the cord **47** is subsequently rewound within groove **81** of the said drum thereby closing the window. During the final stages of closing the window, the tongue **112** presses against the sloping face **99***a* of the latch lever hook **99**, so that the said lever is forced downwards by the inward movement of the said tongue and the hook **99** finally locates within hole **113** thereby locking the window in its closed position.

In addition to the foregoing features it has been found preferable for the lugs **87** and **88** of the gear **66** and wheel **84** respectively to be provided with stepped faces **87***a* and **88***a* and plane faces **87***b* and **88***b* as shown in FIGURES 12, 13, 16 and 17. FIGURES 16 and 17 illustrate the lugs **87** and **88** in this preferred form when engaging in the apertures **91** and **89** during opening and closing of the window respectively.

Referring firstly to FIGURE 16, it will be seen that when opening the window, the faces **87***b* and **88***b* are in contact, the apertures **91** and **89** being of such a width that there is sufficient clearance between faces **87***a* and **88***a* to allow the steps **87***c* and **88***c* to pass when the wheel **84** is periodically lifted during "free wheeling" of the ratchet mechanism. This condition also applies when the window is pushed shut from outside the room, because rotation of drum **74** under influence of the spring **93** then causes the faces **87***b* and **88***b* to remain in contact.

However when the window is being closed by means of

the operator, the faces 88*a* and 87*a* are in contact as shown in FIGURE 17, and upward movement of the wheel 84 is therefore limited by the steps 87*c* and 88*c* coming into contact.

It will be appreciated that upward movement of the wheel 84 could, in the case when the teeth 86 and 77 are made from nylon or similar resilient material be caused by bending of the vertical pressure faces of the said teeth when they undergo an excessive load and, if this movement were allowed to continue the said teeth could be permanently damaged.

It will be appreciated that with both the methods of attachment described herein, the torsion members are relatively inconspicuous and furthermore due to their construction and small section these torsion members may, if desired, be further concealed, by incorporating them, in part, behind the wood or steel frame of the window.

It will also be apparent that the window operator described occupies a minimum of space in addition to providing a means of automatically locking the window and allowing it to be closed from the outside.

Although the torsion members and operating device have been described for use on windows having their sills in an accessible position, it will readily be appreciated that they can be adapted for use on windows or the like which are, for instance, situated at too great a height above floor level for the sills to be easily reached. In such cases a pulley or the like can be secured to the sill and the cord passed from the window sash, over the said pulley or through a flexible cable housing down to the operating device which is secured in any suitable accessible position.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

1. An operating device for windows and the like comprising a winch mechanism for controlling opening movements of a window and for returning said window to a closed position within a window frame, said winch mechanism comprising a rotatable drum mounted in a casing, a flexible line having one end connected to said window and the other end connected to said rotatable drum, means arranged in said rotatable drum for automatically preventing rotation of said rotatable drum in a window opening direction when the window reaches the fully opened position, driving means for rotating the rotatable drum in winding and unwinding directions, and means connected to said window and window frame for torsionally biasing said window to an open position.

2. A device according to claim 1, wherein said driving means comprises a worm and worm wheel which locks the window in any selected position between fully closed and fully open.

3. A device according to claim 1 wherein said drum is provided with two closely spaced discs between which said flexible line is adapted to be coiled, said means for automatically preventing rotation of said drum consisting of each disc having an aperture through which a pin connected to the drum end of the flexible line extends transversely, the length of each aperture in a radial direction relative to the drum being substantially greater than the diameter of said pin so that the latter can move substantially radially within the apertures, at least one stop member being mounted in said casing engaging said pin when it is in the outermost position in said apertures and thus prevent further rotation of the drum in a window-opening direction when the window is fully open, and at least one cam track disposed in said casing for co-operating with said pin in order to move it inwardly along said apertures when the drum is rotated in the window-closing direction from the fully open position.

4. A device according to claim 1 and including spring means connected to said drum tending to turn said drum in a window-closing direction, a driven member connected to said driving means, and a ratchet device arranged between said drum and said driven member of said driving means, whereby said drum rotates in a window-closing direction under the influence of said spring means independently of operation of said driving means in order to rewind the flexible line around the drum when the window is being closed by direct manual pressure.

5. A device according to claim 4 wherein said ratchet device includes a set of ratchet teeth on a face of said drum, a ratchet wheel displaceable axially in relation to the drum and having a set of ratchet teeth complementary to the drum ratchet teeth, a driving connection formed between said ratchet wheel and the driven member whereby said ratchet wheel is at all times drivingly connected in a rotational sense to the driven member of said driving means, and spring means being provided to resiliently urge the ratchet wheel into engagement with the ratchet teeth on said drum.

6. A device according to claim 5 wherein the driving connection between said ratchet wheel and said driven member comprises circumferentially spaced lugs on said driven member projecting into gaps between further lugs on the ratchet wheel, said lugs having stepped driving faces.

7. A device according to claim 1 further in combination with means for automatically locking the window upon its return to a fully closed position, including a hook member pivotally attached at its inner end within said casing and adapted at its outer end to engage a co-operating portion or extension of the window when the latter reaches the fully closed position, manually operable means being provided to disengage said hook member preparatory to opening the window.

8. A device according to claim 1 in which said means for biasing the window includes at least one torsion member having a rigid arm that is secured to one side of the window frame and a movable arm that is connected at its free end to the window.

9. A device according to claim 8 wherein an identical torsion member is provided at the other side of the window frame.

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