

[54] **AUTOMATICALLY-LOCKING
POSITIVELY-UNLOCKED SASH BALANCE**

[76] Inventor: **Donald M. Trout**, 15750 Meyers Rd., Detroit, Mich. 48227

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[51] Int. Cl. **E05d 15/22, E05d 13/12**

[58] Field of Search **49/181, 162, 172, 174**

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Primary Examiner—Dennis L. Taylor

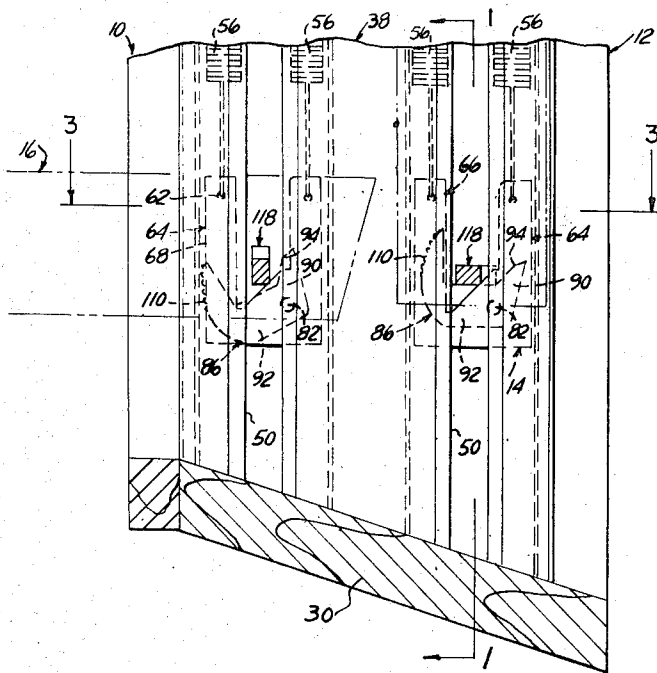
[57] **ABSTRACT**

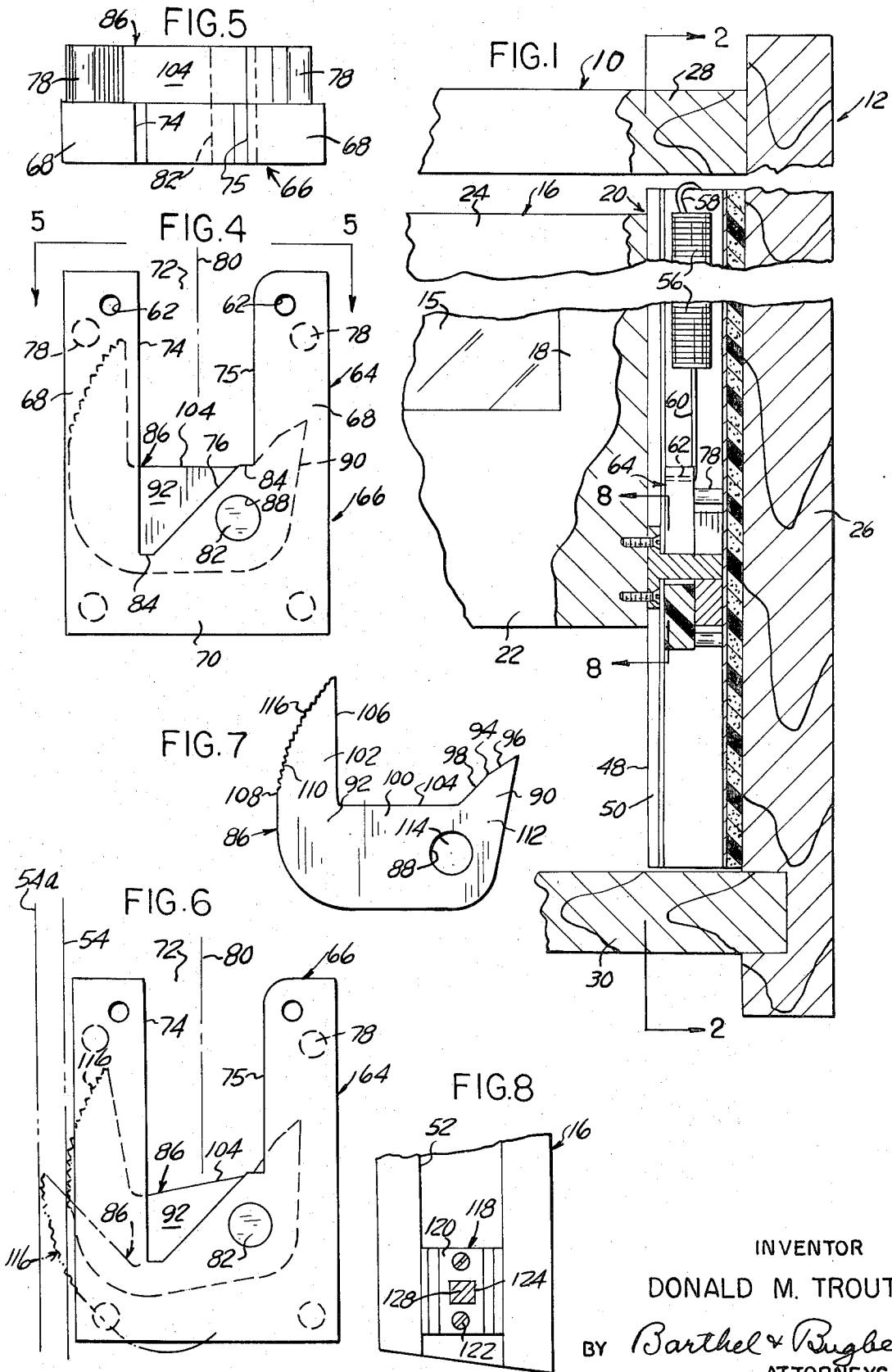
A double-hung tiltable sliding sash window installation has elongated sash guides mounted on opposite sides of its window frame, the sash guides on at least one side of the window frame having elongated longitudinally-slotted spring casings associated therewith. Secured to the upper end of each spring casing is an elongated sash balancing spring, the lower end of which is connected to a locking device therefor including an elongated slide body having an elongated longitudinal opening therein. Pivotally mounted on a pivot element offset laterally from the central axis of the slide body is an approximately J-shaped bent locking lever having on one side of said pivot element a

bent locking arm with an arcuate externally-serrated locking portion at its outer end disposed excentrically to said pivot element and having on the opposite side of said pivot element a cam arm inclined at an obtuse angle to said locking arm. The serrations on the excentric arcuate outer edge of the bent locking arm are adapted to be pulled forcibly into locking engagement with the adjacent side wall of the balancing spring casing by the sash-balancing spring in response to the tilting of the sash and the consequent tilting of a flat-sided trunnion key secured thereto. This trunnion key is insertable through the elongated slot in the sash balancing spring casing and through the opening in the slide body into engagement either with the cam arm or with the bent locking arm of the locking lever.

When the sash and its trunnion keys are swung away from the plane of its sash guides into a tilted position, the trunnion key within the balancing spring casing rotates and operatively engages the contact arm of the locking lever so as to forcibly swing its serrated excentric arcuate locking portion into locking engagement with the adjacent side wall of the spring casing. Swinging of the sash back into the plane of the sash guides and the consequent swinging of the trunnion key causes the trunnion key within the sash balancing spring casing to rotate in the reverse direction and engage the inclined cam arm of the locking lever whereupon a downward push on the sash forcibly swings the locking portion of the locking arm of the locking lever out of locking engagement with the adjacent side wall of the spring casing, thereby releasing the thus-unlocked sash to move freely upward or downward. This locking and unlocking action occurs whether or not the sash is completely removed from the window frame as for repair purposes or is only tilted relatively thereto for cleaning.

10 Claims, 8 Drawing Figures





INVENTOR

DONALD M. TROUT

BY *Barthel & Bugbee*
ATTORNEYS

FIG. 2

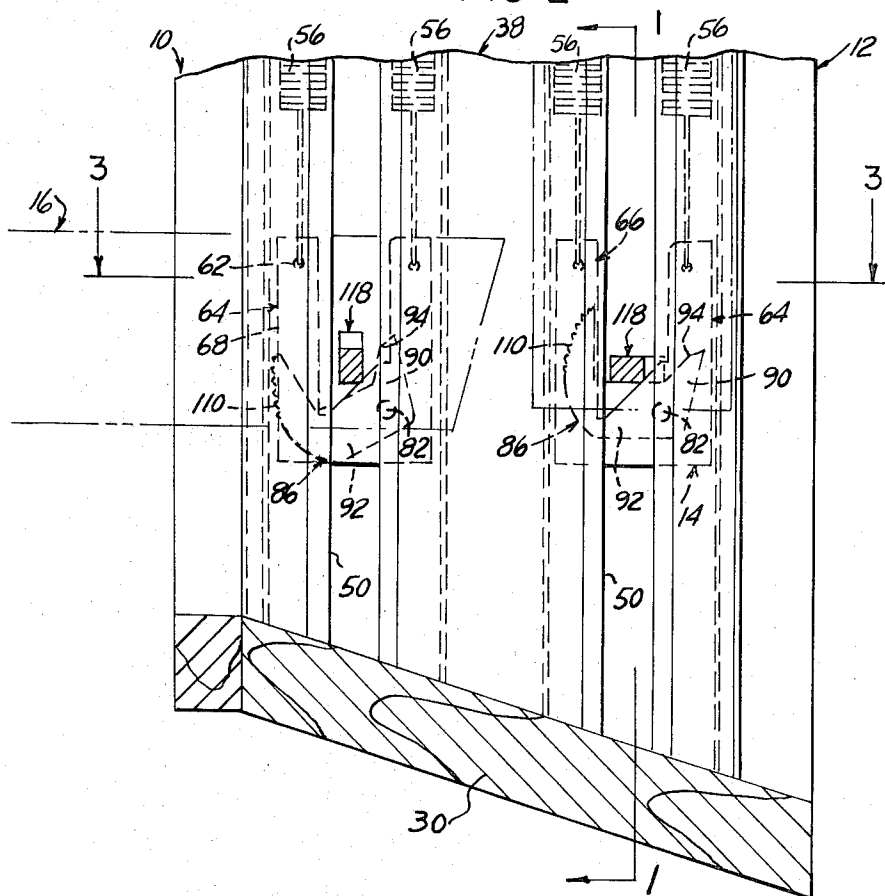
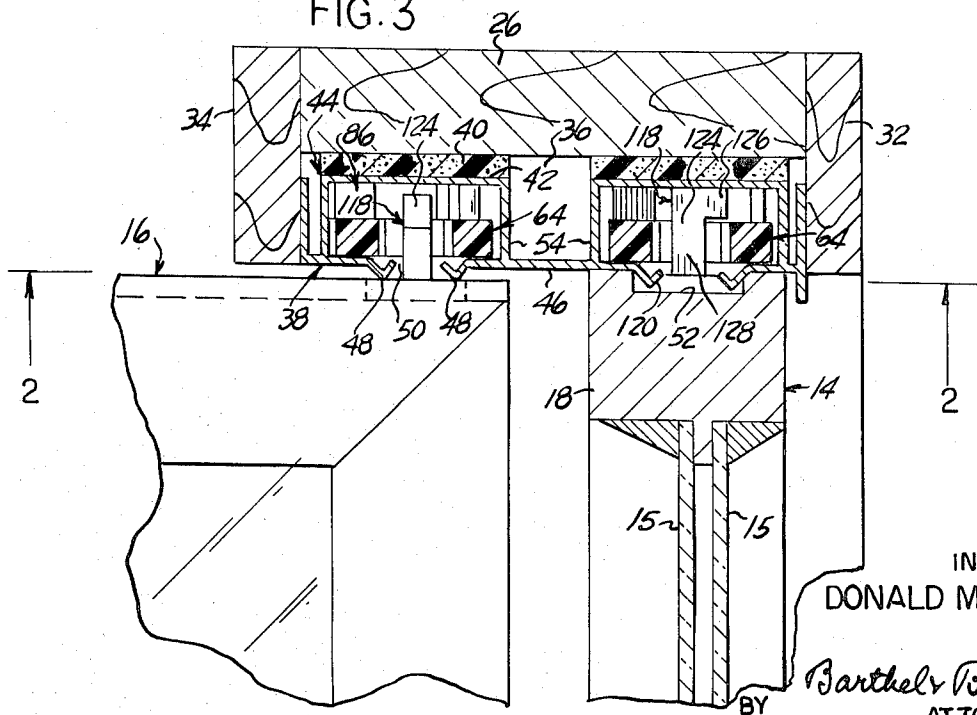


FIG. 3



INVENTOR
DONALD M. TROUT

BY *Barthel & Hughes*
ATTORNEYS

AUTOMATICALLY-LOCKING POSITIVELY-UNLOCKED SASH BALANCE

SUMMARY OF INVENTION

The invention is particularly directed to the approximately U-shaped slide body with the approximately J-shaped bent locking lever tiltably mounted on a pivot spaced laterally away from the central axis of the slide body and actuated by the engagement and rotation of a flat-sided trunnion key secured to the sash. The invention is characterized by its ability to positively lock the sash balancing spring at whatever its attained position over a great variation in the width of the spring casing, such as occurs in the manufacture and use of vinyl plastic sash guides, the resilience of which results in its being deformed laterally during locking. The present locking device requires no auxiliary spring to insure its operating properly but is forcibly and positively cammed from its locked position into its unlocked position by the positive camming action of the flat-sided trunnion key on the flat edge of the operating arm of the locking lever in response to the tilting of the sash. Locking is positively carried out by the present locking device without slippage relatively to the inherently slippery vinyl plastic spring casing. Locking takes place over a large area of the spring casing side wall and becomes effective within only a slight angle of tilt, such as approximately 15 degrees. The present invention requires no lining up of its component parts and does not need to be bottomed before unlocking, as in some prior sash balance locking devices. The weight of the window sash while tilting assists the locking action of the locking device, and the latter is usable either with a single sash balancing spring for ordinary sash installations or with twin sash balancing springs for heavy sash installations.

BACKGROUND OF INVENTION

Vinyl plastic sash guides for double-hung tiltable sliding sash window installations, while less expensive than metal sash guides, nevertheless raise certain problems of their own. They are subject to considerable variation in dimensions, particularly in their widths, thus creating great demands upon the range of operability of prior automatically-locking sash balances used in connection therewith, a disadvantage which is increased by the naturally slippery surfaces of such sash guides creating slippage during locking. Certain prior sash balance locking devices have also required the presence of auxiliary springs among their components, in addition to the elongated sash balancing spring itself. Such auxiliary springs are subject to fatigue and eventually breakage, which in turn renders them inoperative; and the replacement of such broken auxiliary springs is difficult because of the inaccessibility thereof within the sash balance spring casing. The present invention, by providing a positive action forcibly unlocking the locking device without the use of auxiliary springs, eliminates these disadvantages of prior sash balance locking devices. In the drawings,

FIG. 1 is a vertical section through a double-hung tiltable sliding sash window installation equipped with an automatically-locking positively-unlocked sash balance, according to one form of the present invention, looking in the direction of the arrows 1—1 in FIG. 2,

with the sash balancing springs and locking device in their unlocked free-sliding positions;

FIG. 2 is a vertical section taken along the line 2—2 in FIGS. 1 and 3 in the plane at right angles thereto and with the right-hand sash balance unlocked in its vertically-sliding position but with the left-hand sash balance locked in the tilted position of the sash;

FIG. 3 is a horizontal section taken along the line 3—3 in FIG. 2;

FIG. 4 is a front elevation, upon an enlarged scale, of the locking device shown in FIGS. 1, 2 and 3, with the locking lever in its unlocked position;

FIG. 5 is a top plan view taken along the line 5—5 in FIG. 4;

FIG. 6 is a view similar to FIG. 4 but showing the locking lever in its locked position in either of two different widths of the sash balancing spring casing; and illustrating its motion from its locked position toward its unlocked position.

FIG. 7 is a front elevation of the locking lever, removed from the locking device of FIGS. 4 and 6; and

FIG. 8 is a front elevation, partly in section, of one of the trunnion keys used to actuate the locking device of the present invention, looking in the direction of the arrows 8—8 in FIG. 1.

Referring to the drawings in detail, FIGS. 1 and 2 show a double-hung tiltable sliding sash window installation, generally designated 10, including a window frame 12 within which two tiltable upper and lower sliding sashes 14 and 16 are slidably mounted. The upper and lower sashes 14 and 16 are substantial duplicates of one another, containing either single or double panes 15, hence only the lower sash 16 is shown in FIG. 1, for purposes of simplification. Each sash 14 or 16 has side rails 18 and each is slidable vertically and pivotally and removably mounted in a pair of combined elongated vertical sash guides and balancing spring units 20. Each sash 14 or 16 is provided with a bottom rail 22 and top rail or meeting rail 24. The window frame 12 is of conventional construction and has the usual side members 26 interconnected at top and bottom by top and bottom members 28 and 30 respectively (FIG. 1), the bottom member 30 (FIG. 2) being the downwardly and outwardly-inclined window sill. The side members 26 (FIG. 3) are provided with outer and inner edge members 32 and 34 respectively and in cooperation therewith provide an elongated vertical recess 36 of rectangular or channel cross-section which receives the combined sash guide and balancing spring unit 20.

In particular each of the combined sash guide and balancing spring units 20 (FIG. 3) includes a double sash guide unit 38 which is resiliently mounted in each of the recesses 36 by means of elongated vertical resilient pads 40 of synthetic foam rubber or foam plastic adhesively secured to the inner surfaces of the frame side members 26 and similarly secured to the rear walls 42 of each of the pairs of channel spring casings 44 of each sash guide unit 38. The spring casings 44 are preferably formed integral with the front plate 46 of the sash guide unit 38, such as by being extruded unitarily therewith from synthetic vinyl plastic. Integral with the front plate 46 and projecting therefrom are laterally-spaced guide ribs 48 separated from one another by an elongated vertical slot or aperture 50 and entering into an elongated vertical guide groove 52 in the vertical side rails 18 of each sash 14 or 16.

Each spring casing portion 44 is provided with laterally-spaced parallel opposite side walls 54 which connect its rearward wall 42 to the front plate 46. Mounted in each spring casing portion 44 is at least one elongated sash-balancing tension spring 56 (FIG. 1) having its upper loop 58 secured to the top thereof and its L-shaped lower loop 60 hooked into a hole 62 in the upper end of an approximately U-shaped slide body or lock carrier 64 forming one component of a vertically-slidable locking device, generally designated 66. The slide body 64 has two laterally-spaced vertical arms 68 interconnected by a bridge portion 70 (FIG. 4). The arms 68 and the bridge portion 70 define an elongated approximately U-shaped opening or notch 72 having parallel opposite sides 74 and 75 of different lengths and an inclined bottom 76. For the ordinary single-pane sliding sash, a single balancing spring 56 is adequate to counterbalance the weight thereof, but for the heavier double pane sliding sash two such balancing springs 56 are preferably employed (FIG. 2), each with its lower loop 60 hooked into correspondingly-located holes 62 in the upper ends of the arms 68 in the slide body or lock carrier 66. Each slide body 64 is provided with integral spacing lugs 78 disposed perpendicularly thereto near the four corners thereof, for the purpose of increasing the thickness of the slide body 64 so that it fills the space between the rear wall 42 and front plate 46 while permitting the lock 64 to slide freely therein without excessive wobble. The slide body 64 is conveniently formed from the long-wearing synthetic plastic known commercially as nylon.

Projecting perpendicularly to the slide body 64 in a manner similar to the spacing lugs 78 and at a location offset laterally from the central axis 80 of the slide body 64 is a pivot lug or pin 82 located slightly below the inclined bottom 76 of the notch 72. The inclined bottom 76 is connected to the opposite sides 74 and 75 by short perpendicular portions 84 (FIG. 4). Pivotaly mounted upon the pivot lug 82 is an approximately J-shaped bent locking lever, generally designated 86, having a hole 88 therein receiving the pivot lug or pin 82. The locking lever 86 (FIG. 7) consists of an inclined cam arm 90 on one side of the pivot hole 88 and a bent locking arm 92 on the opposite side thereof. The cam arm 90 has an inclined cam edge 94 with portions 96 and 98 arranged at obtuse angles to one another. The locking arm 92, on the other hand, has inner and outer portions 100 and 102 respectively disposed approximately at right angles to one another. The inner portion 100 has a flat contact edge 104, whereas the outer portion 102 has an inner edge 106 and has an outer edge 108 with an excentric arcuate portion 110 centered at a point 112 offset from the center 114 of the hole 88. The arcuate portion 110 is provided with multiple sharp serrations 116. The remaining edges of the bent locking arm 92 lie inside a shorter radius from the center 114 than any point on the serrated arcuate portion 110, and will therefore always clear the side walls 54 of the spring casing portion 44 during the swinging of the locking lever 86.

Mounted in the vertical guide groove 52 near the bottom of each sash 14 and 16 (FIGS. 1, 2 and 8) is a trunnion key, generally designated 118, consisting of a base portion 120 secured by fasteners 122 to the sash 14 or 16 within the groove 52 and an approximately L-shaped trunnion arm 124 (FIG. 3) projecting perpendicularly from the base portion 120 through the front

wall aperture 50 into each spring casing. The trunnion arm 124 has a flat-sided end portion 126 which is wider than the shank portion 128 which connects it to the base portion 120. The end portion 126, as is evident from FIG. 3, is narrower in width than the width of the elongated notch 72 in the U-shaped slide body 64 so as to be freely insertable therethrough so that its flat side moves into engagement with the flat edge 104 of the locking lever 86 to the right past the center of pivot pin 82 as far as the corner between the flat edge 104 and the portion 98 of the inclined cam edge 94, as shown in FIG. 2 by the dotted lines to the right of the cross hatched rectangle designated by the reference arrow 118.

In the operation of the invention, let it be assumed that the sash to be removed from the window frame 12 is in a freely sliding vertical position parallel thereto, such as the sash 14 in FIG. 2, and that it is desired to tilt the sash out of the window frame 12 for cleaning or removal, such as the sash 16 in FIG. 2. In its freely sliding vertical position in the sash 14, the weight of the sash 14 is transmitted through the flat-sided broad end portion 126 of the trunnion arm 124 in a horizontal position to the flat contact edge 104 of the bent locking lever 86, thereby swinging the locking lever 86 clockwise in an upward direction in response to the pull of the sash balancing springs 56 upon the slide body 64 of the locking device 66. This action swings the serrated excentric arcuate end portion 110 out of engagement with the adjacent side wall 54 of the spring casing 44, thereby unlocking the locking device 66. Thus, the unlocked sash, which in FIGS. 2 and 3 is the upper sash 14, is free to be raised and lowered relatively to its sash guides 38.

To tilt the sash 14 or 16 out of the plane of the window frame 12, such as is shown by the sash 16 in FIG. 2, the operator grasps the upper portion thereof and swings it downward and inward toward himself around its respective trunnion keys 118. This action swings the flat-sided broad end portion 126 of the trunnion arm 124 from its horizontal position as shown on the right-hand side of FIG. 2 to its vertical position shown on the left-hand side thereof. The weight of the sash 16 then urges it downward causing the flat-sided outer end portion 126 of the trunnion arm 124 to press downward upon the flat contact edge 104 of the locking lever 86, forcing it to swing downward around its respective pivot lug 82 in a counterclockwise direction, thereby jamming the serrations 116 of the outer portion 102 of the locking arm 92 into penetrating engagement with the adjacent side wall 54 of the spring casing 44, whereupon the upward pull of the balancing spring 56 upon the lock carrier or slide body 64 and consequently upon the pivot lug 82 forces the serrations 116 into the adjacent side wall 54 because of the excentric relationship of the arcuate edge 110 to the center 114 of the hole 118 receiving the pivot lug or pin 82. The operator is then in a position to clean both sides of the window pane or panes by lifting the sash 16 and at the same time tilting it laterally of the window frame 12, to swing the trunnion arms 124 of the trunnion keys 118 outward through the entrance openings or slots 50, whereupon the sash 16 may be easily removed from the window frame 12. By the same operation the operator can remove the upper sash 14 from the window frame 12.

To reinsert the removed window sash, such as the sash 16, in the window frame 12, the operator reverses

the above-described procedure by tilting the sash 16 laterally until the flat-sided trunnion arms 124 are in line with the entrance openings 50, whereupon he swings the sash 16 into a laterally untilted horizontal position (FIGS. 2 and 3). The operator then presses downward upon the sash 16, and at the same time swings it upward and outward away from himself around its trunnion arms 124 into the vertical window frame 12 while the broadened ends 126 thereof engage the inclined cam edges 94 of the cam arms 90 of the locking levers 86 on the opposite sides of the window frame 12 and cam them downward so as to push the inclined cam arms 90 to the right in FIGS. 2, 4 and 6 around the pivot lugs 82. This action, coupled with the downward pressure exerted by the operator upon the sash 16, swings the locking levers 86 clockwise (FIG. 2) around their respective pivot lugs 82 and forcibly detaches the serrations 116 of their excentric arcuate portions 110 from penetrating engagement with their adjacent side walls 54 of the spring casings 44, thereby freeing the sash 16 to slide freely upward or downward in the position shown for the sash 14 in FIGS. 2 and 3.

The adaptability of the locking device 66 to different widths of spring casings 44 is illustrated in FIG. 6 wherein the serrations 116 of the locking lever 86 in its upper position are shown in engagement with the adjacent side wall 54 of a comparatively narrow spring casing 44, whereas the serrations 116 of the locking lever 86 in its lower position are shown in engagement with the adjacent side wall 54a of a broader spring casing 44.

I claim:

1. An automatically-locking positively-unlocked sash balance construction for a tiltable sliding sash window installation including a window frame, said construction comprising

- an elongated sash guide adapted to be secured to each side of the window frame and adapted to be slidably engaged by the sash,
- a sash balance spring casing disposed adjacent at least one of said sash guides and having an elongated longitudinal aperture therein,
- a sash balance spring disposed within said casing and secured at one end thereto,
- a sash balance spring locking device slidably mounted within said casing and connected to the other end of said spring,
- said locking device including a slide body connected to said spring and having a pivot element thereon,
- said locking device also including a locking lever pivotally mounted intermediate its opposite ends on said pivot element and having at one end a locking portion movable into and out of locking engagement with said casing and having a contact portion disposed between said locking portion and said pivot element,
- and a trunnion member adapted to be secured to each end of the sash,
- at least one of said trunnion members having an end portion extensible through said aperture into said spring casing into operative engagement with said contact portion of said locking lever between said locking portion and said pivot ele-

ment,

said one trunnion member being rotatable in response to swinging of the sash away from its respective sash guides for freeing said locking lever to swing on said pivot element in a locking direction and consequently enabling said locking portion to swing into locking engagement with said spring casing,

said one trunnion member being responsive to swinging of the sash toward its respective sash guides for engaging and swinging said locking lever on said pivot element in an opposite unlocking direction and consequently swinging said locking portion out of locking engagement with said spring casing.

2. An automatically-locking positively-unlocked sash balance construction, according to claim 1, wherein said locking lever at its other end remote from its locking portion has a sash-balance-unlocking cam portion engageable with said one trunnion member, said cam portion having a cam edge inclined upward relatively to said contact portion of said locking lever into the path of travel of said one trunnion member for activation thereby.

3. An automatically-locking positively-unlocked sash balance construction, according to claim 1, wherein said locking lever is a bent lever with said locking portion disposed approximately at right angles to said contact portion of said locking lever.

4. An automatically-locking positively-unlocked sash balance construction, according to claim 1, wherein said locking lever has a bent locking arm with said contact portion disposed adjacent said pivot element and with said locking portion disposed outwardly of said contact portion at substantially right angles thereto.

5. An automatically-locking positively-unlocked sash balance construction, according to claim 4, wherein said locking lever is approximately J-shaped.

6. An automatically-locking positively-unlocked sash balance construction, according to claim 1, wherein said pivot element is offset laterally of the longitudinal axis of said slide body away from said locking portion of said locking lever.

7. An automatically-locking positively-unlocked sash balance construction, according to claim 1, wherein said end portion of said one trunnion member has two substantially flat sides disposed angularly to one another and separately engageable with said locking lever in response to rotation of said one trunnion member.

8. An automatically-locking positively-unlocked sash balance construction, according to claim 1, wherein said locking portion includes an arcuate part disposed transverse to said inner portion of said locking arm.

9. An automatically-locking positively-unlocked sash balance construction, according to claim 8, wherein said arcuate part comprises a section of a circle with its center offset from the center of said pivot element.

10. An automatically-locking positively-unlocked sash balance construction, according to claim 8, wherein said slide body is approximately U-shaped with spaced parallel arms disposed upon opposite sides of said longitudinal opening.

* * * * *