June 25, 1957 G. B. HAAS 2,796,630

SELF-LOCKING SASH BALANCE

Filed Sept. 15, 1955 2 Sheets-Sheet 1

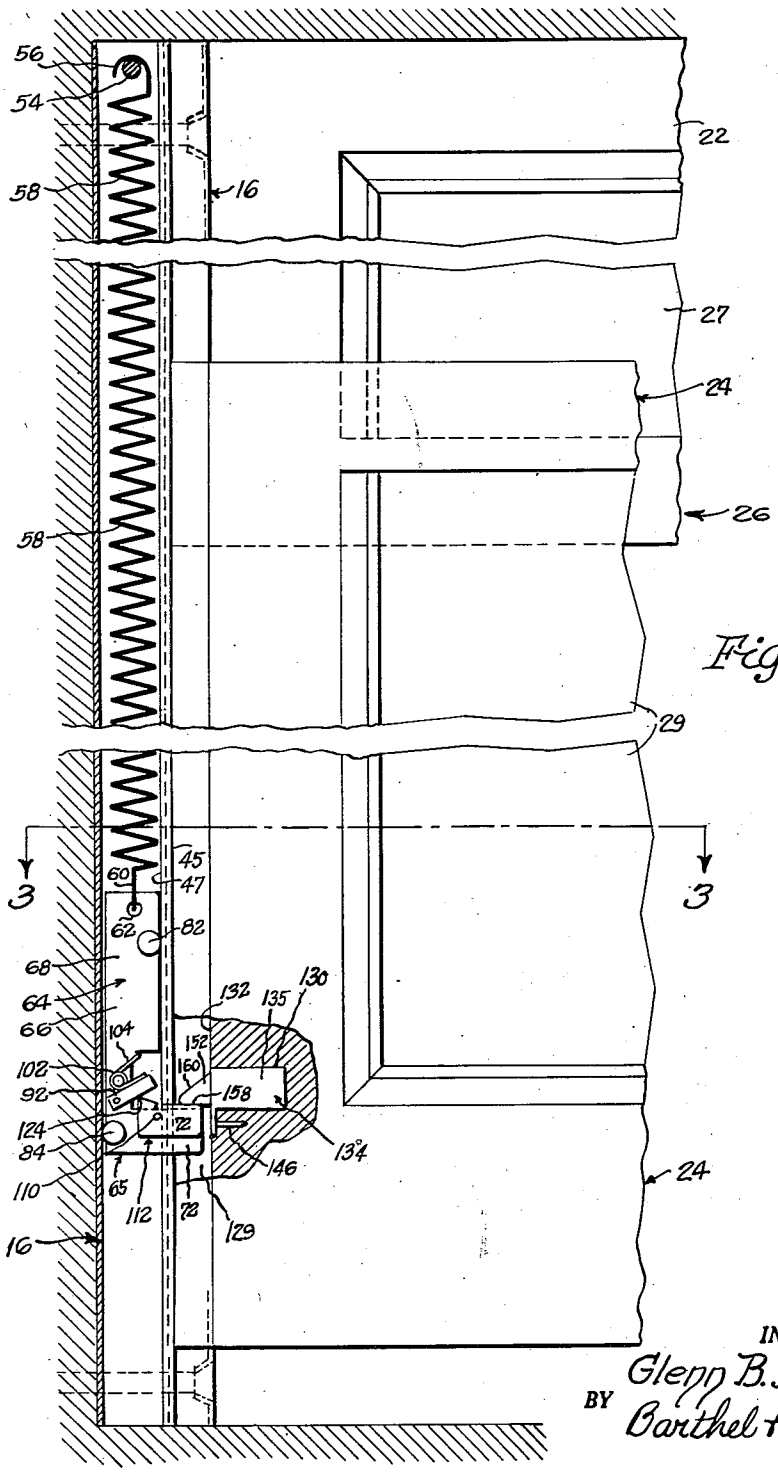

Fig. 1.

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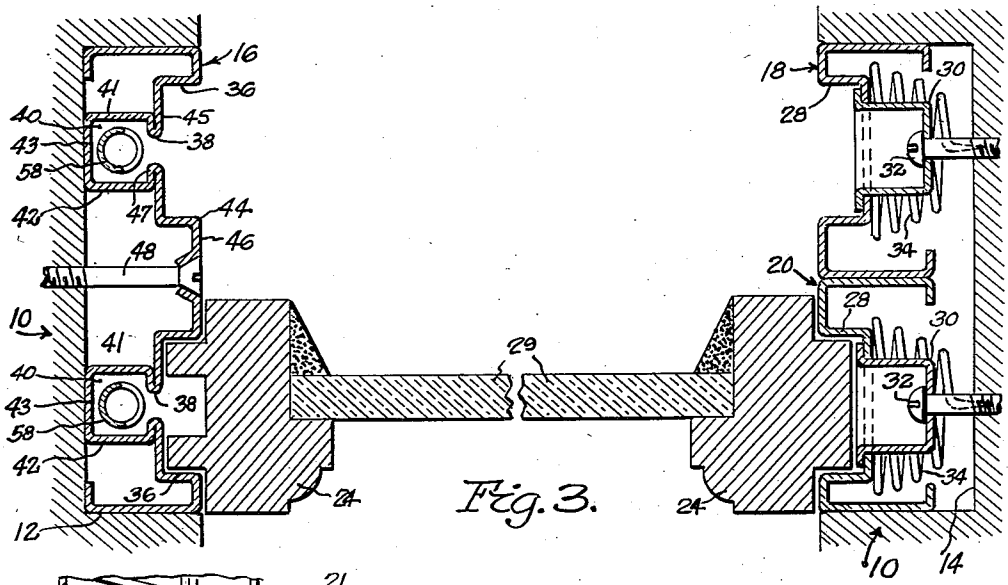

Fig. 3.

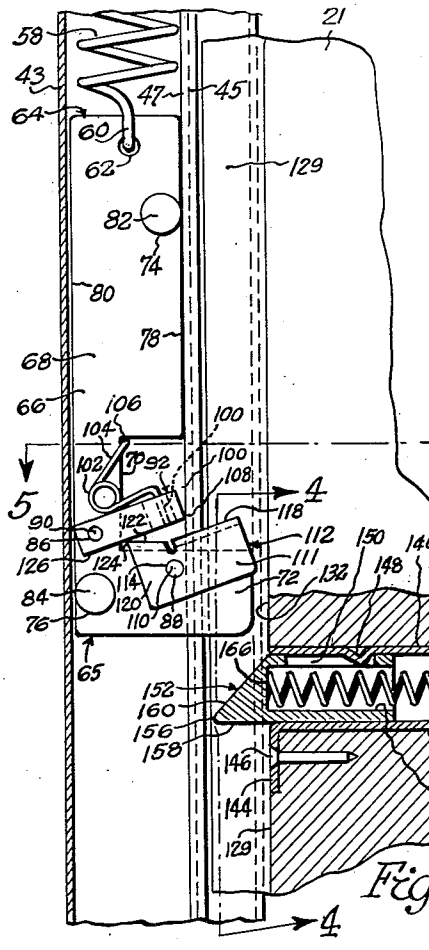

Fig. 2.

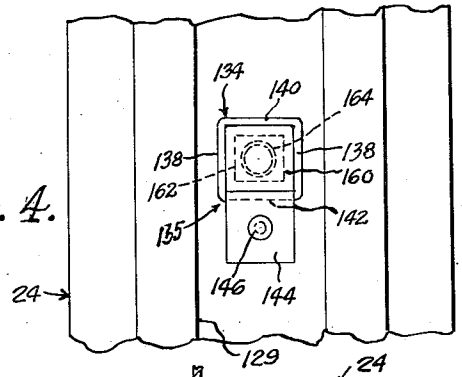

Fig. 4.

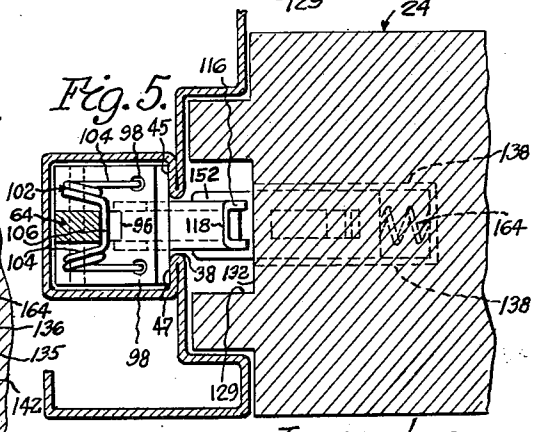

Fig. 5.

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SELF-LOCKING SASH BALANCE

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Application September 15, 1955, Serial No. 534,518

3 Claims. (Cl. 16—197)

This invention relates to sash balances and, in particular, to spring sash balances for removable double-hung sliding sash windows.

One object of this invention is to provide a spring sash balance for removable double-hung sliding sash windows wherein the sash balance is automatically secured in its attained position with its spring in full tension at the location where the sash is removed, yet wherein the sash may be replaced in any position without having to replace it in its original position from which it was removed, the sash automatically unlocking the sash balance and immediately reapplying the tension of the balancing spring to the sash when the sash is slid in either direction to its original position.

Another object is to provide a self-locking spring sash balance for removable sash windows, as set forth in the preceding object, wherein the sash contains a yieldable operating abutment having a plunger therein which evades the sash balance locking detent so as to avoid unlocking this detent when the sash is slid past it in one direction, yet which positively engages and unlocks the detent when slid into engagement with it in the opposite direction.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawing, wherein:

Figure 1 is a vertical section taken in a plane parallel to the window pane of a removable double-hung sliding sash window equipped with a self-locking sash balance, with the yieldable operating abutment thereof holding the sash balance parts in their unlocked positions;

Figure 2 is an enlarged fragmentary elevation of the lower left-hand corner of Figure 1, showing the sash balance parts in their locked positions, with the yieldable detent-operating abutment in longitudinal section therebelow;

Figure 3 is a horizontal section taken along the line 3—3 in Figure 1;

Figure 4 is a fragmentary vertical section taken along the line 4—4 in Figure 2, showing the yieldable detent-operating abutment in end elevation; and

Figure 5 is a horizontal section taken along the line 5—5 in Figure 2.

Referring to the drawings in detail, Figure 1 shows in vertical section the left-hand side of a window frame, generally designated **10**, having recesses **12** and **14** in the opposite sides thereof (Figure 3) for receiving stationary and yieldingly movable elongated hollow metallic sash guides **16** and **18–20** respectively, slidably receiving the correspondingly ribbed side rails **21** of the upper and lower sashes **22** and **24** respectively of a double-hung sash window, generally designated **26**, having window panes **27** and **29** respectively therein. The movable sash guides **18** and **20** are formed of rolled sheet metal of roughly channel-shaped cross-section, the details of which are beyond the scope of the present invention. The movable sash guides **18** and **20**, for the purposes of the present invention, may be said to possess sash guide grooves or

channels **28** apertured at intervals to receive cups **30** which in turn are centrally apertured to receive stop screws **32** seated in the window frame **10**. Conical coil springs **34** encircle the cups **30** and engage the movable sash guides **18** and **20** to urge them outward against the sides of their respective upper or lower window sash **22** or **24**, as the case may be.

The stationary sash guide **16**, mounted in the recess **12**, is of double width accommodating both the upper and lower sashes **22** and **24** in separate spaced guide grooves or channels **36** (Figure 3) with central slots **38** therein leading into the spring chamber **40** of an elongated box-shaped spring housing portion **42** having side walls **41** and a rearward wall **43**. The latter is preferably integral with the front portion **44** of the stationary sash guide **16** containing the sash guide channels **36**, and has partition walls **45** separating it therefrom on opposite sides of each slot **38**, the partition walls **45** having inner contact surfaces **47**. The front portion **44** contains a parting strip **46**, also preferably integral with the remainder of the front **44** and drilled at intervals to receive screws **48** by which the stationary sash guide **16** is anchored to the window frame **10**.

Each spring housing **42** at its upper end is drilled to receive a spring anchorage pin **54** to which the hooked upper end **56** of an elongated tension balancing spring **58** is fixedly secured. The lower hooked end **60** of the balancing spring **58** (Figures 1 and 2) is hooked into a hole **62** in the upper end of an approximately L-shaped lock carrier, generally designated **64**, forming the support for the sash balance locking device, generally designated **65**. The lock carrier **64** is in the form of a plate **66**, preferably of metal, having a vertical bar portion **68** with a rectangular notch **70** separating it from a horizontal bar portion **72** which projects laterally beyond the vertical bar portion **68**. The plate **66** near its upper and lower ends is drilled with holes **74** and **76** respectively intersecting the front and rear edges **78** and **80** thereof to receive short transverse pins **82** and **84** of plastic or other suitable material, the pins **82** and **84** being of cylindrical form projecting slightly beyond the edges **78** and **80** so as to engage the front and rear walls of the spring housing **42**. The plate **66** rearwardly of the notch **70** near the lower corner thereof is provided with a hole **86** and the horizontal bar portion **72** immediately below the notch **70** is likewise provided with a hole **88**.

Pivotally mounted upon a transverse pin **90** seated in the hole **86** is a U-shaped locking member or detent **92** (Figures 2 and 5), the ends of the pin **90** being received in aligned holes **94** on opposite sides of a central notch **96** extending inwardly from the rearward edge thereof. The notch **96** is formed with a width slightly greater than the thickness of the plate **68**, so as to receive the latter and swing freely relatively thereto. The forward portion of the locking detent **92** is provided with a pair of laterally-spaced holes **98** which receive the bent lower ends **100** of a double-armed spring **102**, the opposite arms **104** of which lie on opposite sides of the plate **68** and are interconnected by a bridge portion **106**. The spring **102** and the locking detent **92** thus project into the notch **70** of the plate **68** with the bridge portion **106** engaging the rearward edge of the notch **70** (Figure 2). The detent **92** has a relatively sharp forward edge portion **108** which is adapted to swing into locking engagement with the inside surfaces **47** of the partition walls **45**.

Mounted in the transverse hole **88** in the plate **66** is a pivot pin **110** (Figure 2) upon which a lock-tripping lever **112** is pivotally mounted. The lock-tripping lever **112** is of U-shaped or channel-shaped cross-section with aligned holes **114** in its opposite side walls **116** receiving the pivot pin **110**. The connecting portion or web **118**

terminates at the holes 114 and forms the forward arm of the lever 112. The latter is provided with a pair of rearward arms 120 with upwardly and rearwardly-inclined upper edges 122 terminating in contact points 124 which engage the lower surface 126 of the locking detent 92. From Figure 4 it will be seen that the connecting or web portion 118 of the tripping lever 112 overlies the horizontal bar portion 72 of the plate 66 and engages the upper edge 128 thereof in the balancing or unlocked position of the locking device 65, and swings upward away from it in the locked position thereof (Figure 2). The horizontal bar portion 72 of the plate 66 and the web portion 118 of the tripping lever 112 project through their respective slots 38 into the path of travel of the sash side rail 21, which at its edge is provided with a longitudinal groove 129 and near its lower end is provided with a socket or recess 130 (Figures 1 and 2) flush with the bottom surface 132 of the groove 129.

Mounted in the recess or socket 130 (Figure 2) is a yieldable detent-operating abutment, generally designated 134, having a cup-shaped abutment housing 135 of approximately square cross-section (Figures 2 and 4) with an end wall 136, side walls 138 and upper and lower walls 140 and 142 respectively. The lower wall 142 is provided with an integral extension 144 bent at right angles thereto and recessed into the bottom surface 132 of the groove 129 and held in position by a fastener 146. The upper wall 140 is indented to form an inwardly-extending projection 148 which projects into a slot 150 in the top of a hollow movable abutment or plunger 152 of cross-section corresponding to the cross-section of the chamber 154 within the housing 135 and reciprocably mounted therein. The plunger 152 has a forward or nose portion 156 having on its lower side an abutment surface 158 which is substantially perpendicular to the extension 144 and on its upper side a cam surface 160 which is inclined relatively thereto (Figure 2). The plunger 152 behind the nose portion 156 contains a socket 162 open at its rearward end and receiving a helical compression spring 164, the forward end of which engages the bottom 166 of the socket 162 and the rearward end the bottom wall 136 of the housing 135. Thus, the coil spring 164 normally urges the nose portion 156 of the plunger 152 outwardly into the groove 129 in the sash side rail 21 into the position shown in Figure 2, its reciprocation being limited by the engagement of the projection 148 with the rearward end of the slot 150 in the top of the plunger 152.

In the operation of the invention, let it be assumed that the lower sash 24 of the double-hung window 26 is to be removed for cleaning or other purposes and has been pulled downward almost to its lowermost position (Figure 1) so that the tension balancing spring 58 is almost fully extended and the locking device 65 is near the lower end of its path of travel. In this position, the abutment surface 158 of the nose portion 156 of the plunger 152 is in engagement with the web portion 118 of the lock tripping lever 112 and has pushed it downward against the upper edge 128 of the horizontal bar portion 72 of the plate 66 (Figure 1). In this position of the lock tripping lever 112, the contact points 124 on the upper ends of the rear arms 120 have swung upward around the pivot pin 110 and by their engagement with the lower surface 126 of the locking detent 92 have pushed the latter upward against the urge of the double-armed spring 102, swinging the locking edge 108 rearwardly away from and out of engagement with the inner surfaces 47 of the partition walls 45 on opposite sides of the central slot 38 through which the lever 112 and horizontal bar portion 72 project (Figure 5).

To remove the sash 24, the operator grasps it and pushes it sidewise to the right (Figure 3), thereby pushing the movable sash guide 20 to the right and compressing its springs 30. In this manner, the left-hand side rail 21 which has been slidably received in the channel 36 of the stationary sash guide 16 is moved out of this channel 36 so that it can be swung in a direction perpendicular to the plane of the window pane 29. The sash 24, thus freed from engagement with the stationary guide channel 36, may be pulled outward to detach its right-hand side rail 21 from the guide channel 28 of the movable sash guide 20 (Figure 3) so as to completely remove the sash 24 from the window frame 10.

The instant the side rail 21 is withdrawn from the guide channel 36 of the stationary sash guide 16, the abutment portion 158 of the plunger 152 slides off the web 118 of the lock tripping lever 112, freeing the latter and causing the parts to move from the position of Figure 1 to that of Figure 2. Under the influence of the double-armed spring 102, the locking member or detent 92 is then swung downward around its pivot pin 90, bringing its locking edge 108 into gripping engagement with the inner surfaces 47 of the partition walls 45 on opposite sides of the central slot 38.

At the same time, the downward swinging of the locking detent 92 into its locking position causes the upper and lower pins 82 and 84 to swing into engagement with the forward or partition walls 45 and rearward wall 43 (Figure 2), firmly locking the plate 66 in its attained position and temporarily preventing the balancing spring 58 from pulling it upward until the sash is reinserted. Meanwhile, the downward swinging of the locking detent 92 under the influence of the double-armed spring 102 rocks the lock tripping lever 112 in a counterclockwise direction around its pivot pin 110 by engagement of the lower surface 126 with the contact points 124, causing the web portion 118 of the lever 112 to swing upward away from the upper edge 128 of the horizontal bar portion 72 of the plate 66, ready for reinsertion of the sash 24 and engagement by the abutment portion 132 of the side rail 21 thereof. These parts are now in the relative positions shown in Figure 2, and the presence of the window sash 24 can be ignored because its groove 129 exerts no effect upon the lock-tripping lever 112.

The sash 24 can be reinstalled at any location in its sash guides 16 and 20 by placing its left-hand side rail 21 in its respective guide channel 28 of the movable sash guide 20, pushing the latter inward to the right (Figure 3) to displace it sufficiently far to enable the left-hand side rail 21 to re-enter its respective guide channel 36 in the stationary sash guide 16. Assuming that the sash 24 has been reinstalled in this manner, in a position, for example, below the projecting horizontal bar portion 72 and tripping lever 112 (Figure 2), the sash 24, which has been urged into the guide channel 36 by the movable sash guide springs 30, is slid upward by the operator until the inclined abutment surface 166 of the plunger 152 engages the lower edge of the horizontal bar portion 72 of the plate 66. Continued upward sliding of the sash 24 causes the bar portion 72 in pushing against the inclined surface 166 to push the plunger 152 inward into its chamber 154 until its nose portion 160 passes the end of the bar portion 72 and also moves upward past the unlocking lever 112 to a position above the latter. To unlock the locking device 65 from engagement with the spring housing 42 and free the balancing spring 58 thereof, the sash 24 is now slid downward by the operator until the abutment surface 158 at the lower side of the operating plunger 152 reengages the web portion 118 at the outer end of the lock tripping lever 112, swinging it downward against the upper edge 128 of the horizontal bar portion 72 of the plate 66 from the position of Figure 5 into the position of Figure 4. This action, in swinging the tripping lever 112 clockwise around its pivot pin 110, causes the upwardly-swinging contact points 124 on the rearward arms 120 thereof to engage the bottom surface 126 of the locking detent 92 and swing the contact edge 108 thereof upward out of engagement with the inner surfaces 47 of the partition walls 45 on opposite sides of the central slot 38.

This action unlocks and releases the locking device 65

from engagement with the spring housing **42**, freeing the balancing spring **58** so that it immediately exerts its balancing pull upon the sash **24** through the contact of the locking device **65** with the abutment plunger **152**. In this manner, the locking device **65** is maintained in an inoperative position or unlocked status so long as the sash **24** (or the corresponding upper sash **22**) is in its installed position. The locking device **65** thus comes into operation automatically to lock the tensioning spring **58** and itself to the spring housing **42** of the stationary sash guide **16** whenever the sash **22** or **24** is removed from the window frame **10** for cleaning or other purposes.

If, on the other hand, the sash **24** is reinserted in the window frame at a location where the plunger **152** is above the unlocking lever **112**, the sash **24** can be pushed downward immediately to operatively engage the lever **112** and unlock the sash balance in the manner described above. Thus, in the present invention, the sash **24** can be reinstalled at any location in its sash guides without the necessity for aligning any portion of it with the unlocking lever **112**.

The self-locking sash balance shown in the upper portion of Figure 2 is described and claimed per se in the copending Haas application Serial No. 471,760 filed November 29, 1954, for "Self-Locking Automatically-Releasing Sash Balance." It will also be evident that the yieldable abutment **152** may be employed with the self-locking sash balance shown in Figures 1 to 11 inclusive of the copending Haas application Serial No. 422,350, filed April 12, 1954, for "Self-Locking Sash Balance," which subsequently became United States Patent No. 2,747,219, issued May 29, 1956, to enable random replacement of the sash therein shown instead of requiring replacement at a specific location or range of locations, this sash balance employing an internally-gripping locking element released from the outside of the balancing spring. It will also be evident that the same yieldable abutment **152** of the present invention may also be employed with the self-locking sash balance shown in Figures 16 to 18 of the Haas Patent No. 2,747,219, which has an externally-gripping locking element actuated from the outside of the sash balance. In any of these sash balances, the use of the yieldable abutment **152** with its cam portion **160** on one side and its abutment portion **158** on the other side converts the installation from a sash replaceable in a specific range of locations to a sash replaceable in any location, especially locations situated below the externally-projecting operating or contact portion of the locking element of the sash balance which in the co-pending applications is engaged and actuated by an unyielding portion of the sash.

What I claim is:

1. A resilient sash balance for removable sliding sash windows which is automatically locked in its tensioned condition in response to sash removal at a given location and automatically released in response to sash replacement at any location and to sash return to said given location, said sash balance comprising an elongated sash guide structure with an elongated opening therein, an elongated sash balance spring anchored at one end adjacent said structure and extending therealong, a movable support member connected to the other end of said spring,

a support member locking device mounted on said support and lockably engageable with said structure, said locking device having a lock-releasing trigger member projecting through said opening toward the sash, and an abutment member movably mounted upon the sash for motion into and out of trigger-member-intercepting position.

2. A resilient sash balance for removable sliding sash windows which is automatically locked in its tensioned condition in response to sash removal at a given location and automatically released in response to sash replacement at any location and to sash return to said given location, said sash balance comprising an elongated sash guide structure with an elongated opening therein, an elongated sash balance spring anchored at one end adjacent said structure and extending therealong, a movable support member connected to the other end of said spring, a support member locking device mounted on said support and lockably engageable with said structure, said locking device having a lock-releasing trigger member projecting through said opening toward the sash, and an abutment member movably mounted upon the sash for motion into and out of trigger member intercepting position, said abutment member having on one side thereof an abutment portion substantially unyieldingly engageable with said trigger member to release said support-locking device and on the opposite side thereof a cam portion yieldably engageable with one of said members to move said abutment member out of operable engageability with said trigger member.

3. A resilient sash balance for removable sliding sash windows which is automatically locked in its tensioned condition in response to sash removal at a given location and automatically released in response to sash replacement at any location and to sash return to said given location, said sash balance comprising an elongated sash guide structure with an elongated opening therein, an elongated sash balance spring anchored at one end adjacent said structure and extending therealong, a movable support member connected to the other end of said spring, a support member locking device mounted on said support and lockably engageable with said structure, said locking device having a lock-releasing trigger member projecting through said opening toward the sash, and an abutment member movably mounted upon the sash for motion into and out of trigger member intercepting position, said abutment member including a reciprocable plunger with an end having on one side thereof an abutment portion substantially unyieldingly engageable with said trigger member to release said support locking device and on the opposite side thereof a cam portion yieldably engageable with one of said members to move said abutment member out of operable engageability with said trigger member.

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