

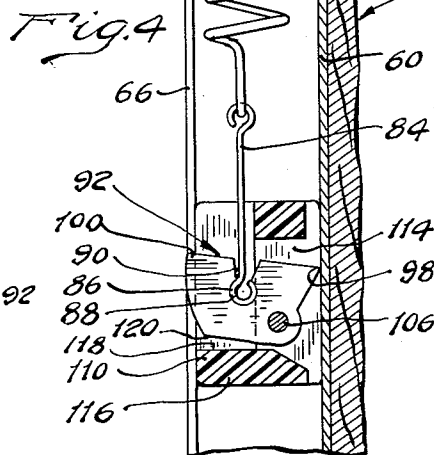
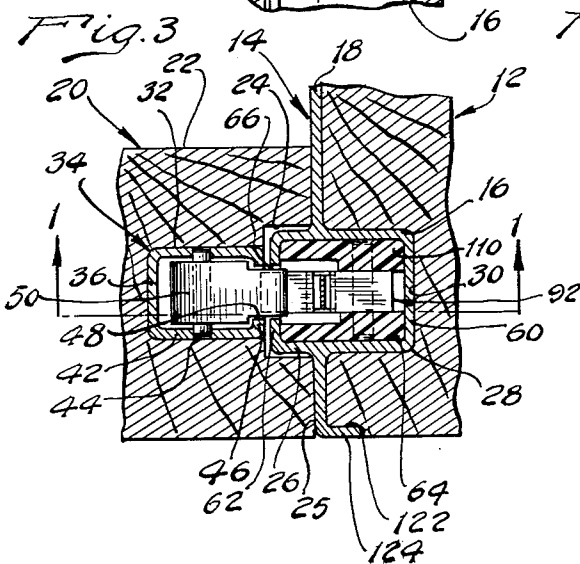
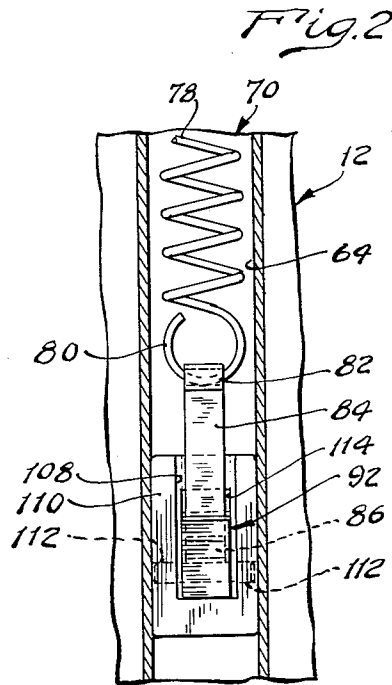
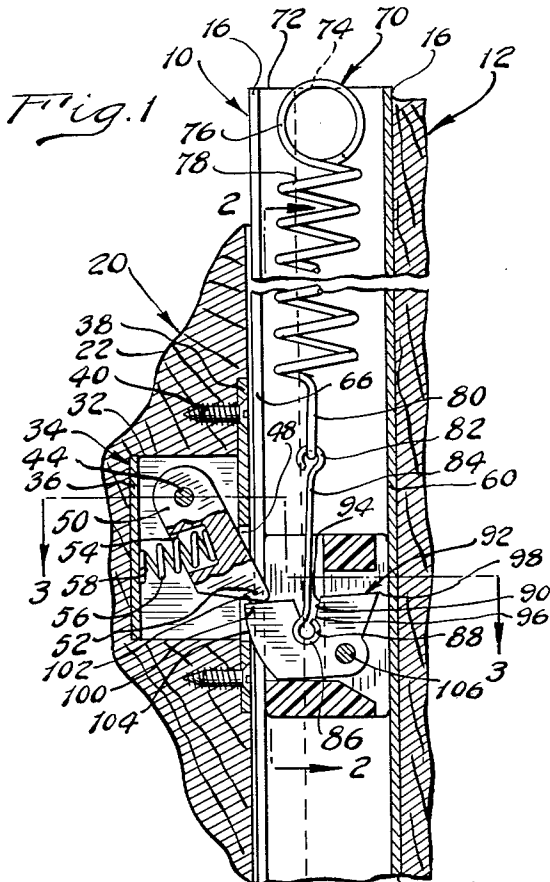
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AUTOMATICALLY-LOCKING SASH BALANCE

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AUTOMATICALLY-LOCKING SASH BALANCE
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This invention relates to sash balances and, in particular, to automatically-locking sash balances for removable sash windows.

One object of this invention is to provide an automatically-locking sash balance for removable sash windows having a tilting locking member which automatically tilts into locking engagement with the sash balance casing upon removal of the sash, regardless of the state of tension of the sash balancing spring or the location at which the sash is removed; and wherein reinsertion of the sash and re-engagement with a portion of the sash balance automatically tilts the locking member into disengagement with the sash balance casing so as to restore the application of the balancing spring tension to the sash.

Another object is to provide an automatically-locking sash balance of the foregoing character wherein the sash balancing spring is connected to the tilting locking member through a pivoting link which prevents breakage at the connection between the sash balancing spring and the locking member and also confines the tilting of the locking member to substantially a single plane so as to enhance its locking action as well as to insure that its trigger portion properly engages the trigger tripping device on the sash, thereby unlocking the sash balance and reapplying the tension of the sash balancing spring when the sash is lowered to the location where the trigger-tripping device engages the trigger portion of the locking member.

Another object is to provide an automatically-locking sash balance as set forth in the object immediately preceding, wherein the pivoting connecting link between the sash balancing spring and the tilting locking member is inserted in a narrow-mouthed slot extending into the locking member from at least one side thereof and preferably therethrough so as to enable the lower end of the link to be inserted in the locking member from one side or from either side, as the case may be, thereby facilitating the assembly of the sash balance and reducing the cost of production.

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

FIGURE 1 is an enlarged fragmentary vertical section through a portion of a window frame and an adjacent portion of a removable sash, together with a sash balance equipped with a tilting locking member and pivoted link connection to a sash balancing spring, and a tripping device in the sash frame, taken along the line 1-1 in FIGURE 3;

FIGURE 2 is a vertical longitudinal section taken along the line 2-2 in FIGURE 1, in a plane at right angles thereto;

FIGURE 3 is a horizontal cross-section taken along the line 3-3 in FIGURE 1; and

FIGURE 4 is a view similar to FIGURE 1, but with the sash removed and the sash balance automatically locked to the sash balance casing, according to the invention.

Referring to the drawing in detail, FIGURES 1 to 4 inclusive show in longitudinal vertical section a portion of a removable sliding sash window installation, generally designated 10, as consisting generally of a window frame 12 containing a sash guide 14 having a hollow rib or elongated sash balance casing 16 and an adjoining elongated flat or plate portion 18 in which the rib 16 is

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located and with which, in the form chosen for illustration of the invention, it is integral. The sash guide 14, including the hollow rib 16, is conveniently made by extrusion of a suitable metal, such as aluminum or aluminum alloy, in a manner well-known to those skilled in the metal extrusion art.

Slidably engaging the sash guide 14 and grooved to receive the rib 16 is a removable sliding sash, generally designated 20, shown only fragmentarily and containing the usual glass window pane (not shown). The vertical side rail 22 of the sash 20 has a guide groove 24 receiving the outwardly-projecting portion 26 of the hollow rib 16, flanked by its front surface or edge 25. The inwardly-projecting portion 28 of the hollow rib 16 is seated in a groove 30 in the window frame 12. The vertical side rail 22 of the removable sliding sash 20 contains a recess 32 extending inwardly from the guide groove 24, which recess in turn contains a sash balance trigger-tripping device, generally designated 34 (FIGURES 1 and 3).

The trigger-tripping device 34 has a substantially tubular casing 36 with a face plate or mounting plate 38 drilled to receive fasteners 40 by which the trigger-tripping device 34 is held in position. The casing 36 is of rectangular cross-section (FIGURE 3) with opposite parallel side walls 42 drilled in alignment to receive a pivot pin 44, the front wall 46 having an elongated slot 48 therein. Pivotally mounted upon the pivot pin 44 is a swinging dog or catch 50 in the form of an arm having an angled pointed tip 52 projecting through the slot 48. The catch 50 is inclined downwardly in its casing 36 through the opening 48 and the angled tip 52 has its lower surface inclined relatively to the straight upper surface of the arm 50 (FIGURE 1). The catch 50 in its rearward surface is provided with a socket 54 in which is mounted the outer end of a compression spring 56, the rearward end of which engages the rearward wall 58 of the casing 36 as an abutment. By this means, the pointed tip 52 of the catch 50 is constantly urged outwardly through the slot 48 but is adapted to yield inwardly by overcoming the force of the spring 56 so as to swing into the chamber within the casing 36 under the circumstances explained below in connection with the operation of the invention.

The hollow guide rib or sash balance casing 16 is, as stated above, of rectangular cross-section (FIGURE 3) located in the approximate mid-portion of the plate 18, and has a rear wall 60 within the groove 30 of the window frame 12. The hollow rib 16 in the approximate center of its forwardly-projecting portion 26 is provided with a front wall 62 running from end to end of the rib 16, which contains an elongated chamber 64. The front wall 62 is provided with a slot 66 likewise running from end to end of the wall 62 and extending into the chamber 64 of the hollow guide rib 16.

The hollow guide rib 16 forms the elongated tubular casing of a sash balance, generally designated 70, housed therein. The sash balance 70 operatively coacts with the trigger-tripping device 34 in a manner explained below in connection with the operation of the invention. Hooked over the upper end 72 of the hollow guide rib or sash balance 16 is the spirally-wound end portion 74 of the loop or eye 76 at the upper end of an elongated helical tension sash balancing spring 78, the loop or eye 80 at the lower end of which pivotally receives the hook loop 82 on the upper end of a connection link 84. The latter at its lower end has a cylindrical connection loop or male pivot bearing portion 86. The lower loop 86 is seated in the approximately cylindrical bearing bore portion or second pivot element 88 of a keyhole slot 90 in the upper edge of a tilting locking member, generally designated 92. The upper portion or entrance passageway 94 of the key-

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hole slot 90 diverges upwardly from its junction 96 with the cylindrical bearing bore portion 88 so as to provide a narrowed entrance therebetween (FIGURE 1). The latter prevents escape of the cylindrical bearing loop 86 from the cylindrical bearing bore portion 88 of the keyhole slot 90 while permitting rocking of the tilting rocking member or plate 92 as a result of the converging or flared upper portion 94 of the keyhole slot 90.

The tilting sash-locking plate 92 at its rearward upper corner is provided with a sharp transverse locking edge 98 and on its front upper corner is provided with a laterally-projecting trigger portion 100 having a sash-engaging abutment surface 102 on its upper side engageable with the tapered pointed tip 52 of the trigger-tripping device 34. The sash locking plate 92 below the trigger-tripping portion or corner 100 is provided with a rounded catch-deflecting surface 104.

Rearwardly of and below the keyhole slot 90, the locking plate 92 at a location below the sharp locking edge 98 is bored transversely to receive a pivot pin or first pivot member 106 upon which the locking plate 92 is tiltably mounted (FIGURES 1 and 4). The locking plate 92 is tiltably mounted in a parallel-walled notch 108 in the upper end of a reciprocable guide block or lock carrier 110 reciprocally mounted in the chamber 64 within the hollow guide rib or sash guide casing 16. The opposite ends of the pivot pin 106 are seated in aligned bores 112 (FIGURE 2) in the reciprocable guide block 110 on opposite sides of the notch 108 in such a manner that the trigger portion 100 of the sash-locking plate 92 projects outward through the slot 66 of the guide rib 16 into the path of the pointed angled tip 52 of the catch 50 when the sharp locking edge 98 of the sash-locking plate 92 is in locking engagement with the rearward wall 60 of the casing or guide rib 16.

As will be seen from FIGURES 1 and 4, the mounting of the pivot pin 106 slightly below and to the rear of the cylindrical portion 88 of the keyhole slot 90 provides a locking lever arm for the locking plate 92 having a length equal to the distance between the axis of the pivot pin 106 and a vertical line dropped from the center of the cylindrical portion 88. The locking plate 98 is preferably of sintered powdered metal such as carbonized sintered powdered iron for convenience of manufacture, thereby providing, in effect, a steel locking plate 92. The reciprocable block 110, on the other hand, is preferably made of a tough material such as the polymeric amide synthetic plastic known commercially as nylon. The notch 108 in the front upper portion of the guide block 110 communicates with a slot 114 extending through the remainder of the block 110 to the rear thereof (FIGURE 4). Below the notch 108, the guide block 110 has a bottom wall or lower bridge portion 116 with an approximately flat top surface 118 which acts as a stop when engaged by the bottom edge 120 of the locking plate 92 (FIGURE 1) when the locking plate 92 is in turn engaged by the angled tip 52 of the catch 50 with the sash 20 in position within the window frame 12. The latter is recessed at 122 (FIGURE 3) to receive a flange 124 of the front plate 18 of the sash guide 14.

In the operation of the invention, let it be assumed that the removable sliding sash 20 has been inserted in the window frame 12 with its guide groove 24 embracing the forward portion 26 of the hollow guide rib 16 and with the catch 50 of the trigger-tripping device 34 engaging the abutment surface 102 of the trigger portion 100 of the locking plate 92 (FIGURE 1). This condition occurs when the sash 20 has been reinserted in the window frame 12 at a location wherein the catch 50 is above the locking plate 92 and wherein the sash 20 has been pulled downward to cause the lower side of the pointed tip 52 of the catch 50 to engage and tilt the locking plate 92 around its pivot pin 106 so as to disengage its sharp locking edge 98 from locking engagement with the rear wall 60 of the hollow rib 16. The parts are now in

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the relative positions shown in FIGURE 1, with the locking plate 92 in its unlocked position and with the sash balancing spring 78 applying its balancing force to the sash 20 through the trigger-tripping device 34. The catch 50 is limited in its outer swinging by engagement with the upper end of the slot 48 from projecting through the slot 66 in the guide rib 16 too far into the interior of the latter.

Let it now be assumed that the operator has removed the sash 20 by pushing it to the left against the spring-mounted opposing sash guide (not shown) (FIGURES 1 and 3) so as to enable the front surfaces 25 of the sash rail 22 to be brought out to the plane of the front wall 62 of the hollow guide rib 16, whereupon the sash 20 is swung outward or inward relatively to the window frame 62 so that the front edge 25 passes over and beyond the guide rib portion 26, so that it can then be removed. Such a spring-mounted opposing sash guide is disclosed in my co-pending application Serial No. 611,509, filed September 24, 1956, now Patent No. 2,903,736, dated September 15, 1959, for Automatically-Locking Sash Balance for Removable Sash Windows, upon which the present invention is an improvement. The instant the sash 20 is pushed to the left, disengaging its pointed tip from the upper abutment edge 102 of the trigger portion 100 of the locking plate 92, the balancing spring 78 through its connecting link 84 with the locking plate 92, jerks the latter upward in a clockwise direction around its pivot pin 106 by reason of the lever arm provided between the pivot pin 106 and the cylindrical bearing groove 88 containing the lower cylindrical loop 86 of the link 84. This action (FIGURE 4) causes the sharp locking edge or prong 98 on the rearward upper corner of the locking plate 92 to dig into the relatively softer metal of the back wall 60 of the hollow guide rib 16 and consequently maintaining the balancing spring 78 in its tensioned condition.

When the sash 20 is reinserted in the window frame 12 by reversing the foregoing procedure, with the catch 50 of the trigger-tripping device 34 above the location occupied by the guide block 108 and locking plate 92, the sliding downward of the sash 20 causes the pointed tip 52 to engage and push downward upon the abutment surface 102 of the trigger portion 100 of the locking plate 92 (FIGURE 1), tilting the locking plate 92 in a counter-clockwise direction around its pivot pin 106 in the guide block 108. This action disengages the locking prong or sharp edge 98 from locking engagement with the rear wall 60 of the hollow guide rib 16 (FIGURE 1) and thus reapplies the tension of the balancing spring 28 to the sash 20 through the trigger-tripping device 34.

If, on the other hand, the sash 20 is re-inserted in the window frame 12 at a lower location wherein the trigger-tripping device 34 is below the locked position of the locking plate 92, raising of the sash 20 causes the arcuate forward edge 104 of the locking plate 92 to be engaged by the upper side of the pointed tip 52 of the catch 50, pushing the latter inward into its casing 36 and compressing the spring 56. The continued raising of the sash 20 causes the catch 50 to move outward over the abutment surface 102 the instant the pointed end 52 passes the trigger portion 100. Pulling downward upon the sash 20 then engages the lower edge of the catch tip 52 with the abutment surface 102 of the trigger portion 100 of the locking plate 92, tilting the latter about its pivot pin 106 and disengaging its sharp edge or locking prong 98 from locking engagement with the rear wall 60 of the hollow guide rib 16. This action, as before, immediately re-applies the force of the balancing spring 73 to the sash 20 through the link 84, locking plate 92 and catch 50.

The construction of the present invention employing the connecting link 84 having its pivotal engagement with the locking plate 92 in a slot of approximately circular cross-section results in a much stronger construction than

the flexible cable connection shown in my above-mentioned co-pending application Serial No. 611,509, filed September 24, 1956, in that it reduces the cable breakage occasionally occurring in the flexible cable used in my above-mentioned co-pending application for connecting the balancing spring to the tilting locking member. The present invention, by employing the freely pivoting connecting link 84 avoids the breakage both of the cable clamp and of the cable itself and its connection to the tilting locking member, and also provides a more efficient pivot action since no flexing action of a cable is involved in the pivot action. The provision of the link-connected tilting locking member of the present invention also reduces the cost of production by eliminating the prior operations of bending the connecting cable, applying clamps thereto, threading it into the locking plate and enlarging the lower end to fix it in position. The present invention thus not only reduces the labor cost by eliminating a number of previously-required operations but also obtains uniformity in the quality of assembly of the sash balance.

What I claim is:

1. An automatically-locking sash balance for a removable sliding sash window installation, said balance comprising an elongated hollow casing having an elongated aperture therein, a resilient sash balancing member anchored to said casing and disposed therein, a lock carrier reciprocally mounted in said casing and having a first pivot element thereon, a sash balance locking member tiltably mounted on said first pivot element, said locking member having a second pivot element thereon disposed at a location spaced laterally away from said first pivot element and providing a tilting lever arm therebetween, said locking member also having a trigger portion disposed adjacent said aperture in the path of the sash and tiltable unitarily with said locking member and a locking portion disposed remote from said trigger portion and also tiltable unitarily with said locking member into and out of locking engagement with said casing in response to

tilting of said locking member relatively to said lock carrier, and a connection link secured at one end to said resilient member and having at its opposite end a bearing portion thereon pivotally engaging said second pivot element of said locking member in relatively turning relationship therewith, said resilient member being responsive to the removal of the sash from engagement with said trigger portion for pulling on said connection link and thereby effecting tilting of said locking portion around said first pivot element into locking engagement with said casing.

2. An automatically-locking sash balance, according to claim 1, wherein said connection link comprises an elongated member having at one end a first loop connected to said resilient member and at its opposite end a second loop pivotally engaging said second pivot element of said locking member, said second loop forming said bearing portion of said link.

3. An automatically-locking sash balance, according to claim 1, wherein said second pivot element includes a bearing recess in said locking member and wherein said bearing portion of said connection link is disposed in and rockingly engages said bearing recess.

4. An automatically-locking sash balance, according to claim 3, wherein said bearing recess includes a bearing bore and an entrance passage extending from one edge of said locking member to said bearing bore, said link passing through said entrance passageway.

5. An automatically-locking sash balance, according to claim 4, wherein the opposite sides of said entrance passage diverge from said bearing bore toward said edge of said locking member, whereby to provide clearance for free relative tilting motion between said locking member and said link.

References Cited in the file of this patent

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