Sept. 21, 1965 A. E. WEIDNER 3,206,795

SELF-LOCKING AUTOMATICALLY-RELEASING SASH BALANCE

Filed May 6, 1963 2 Sheets-Sheet 1

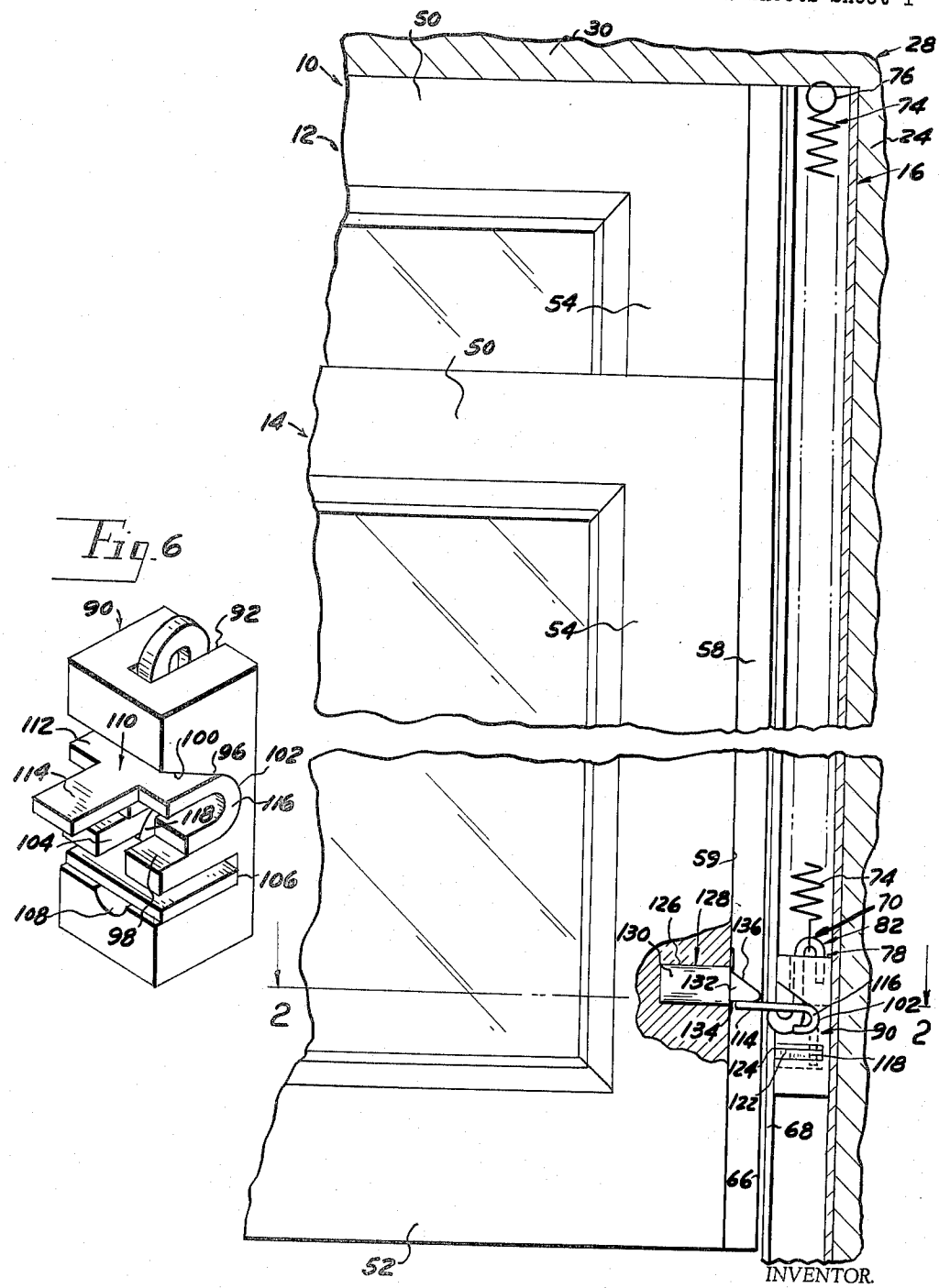


Fig. 6

Fig. 1

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Fig. 2

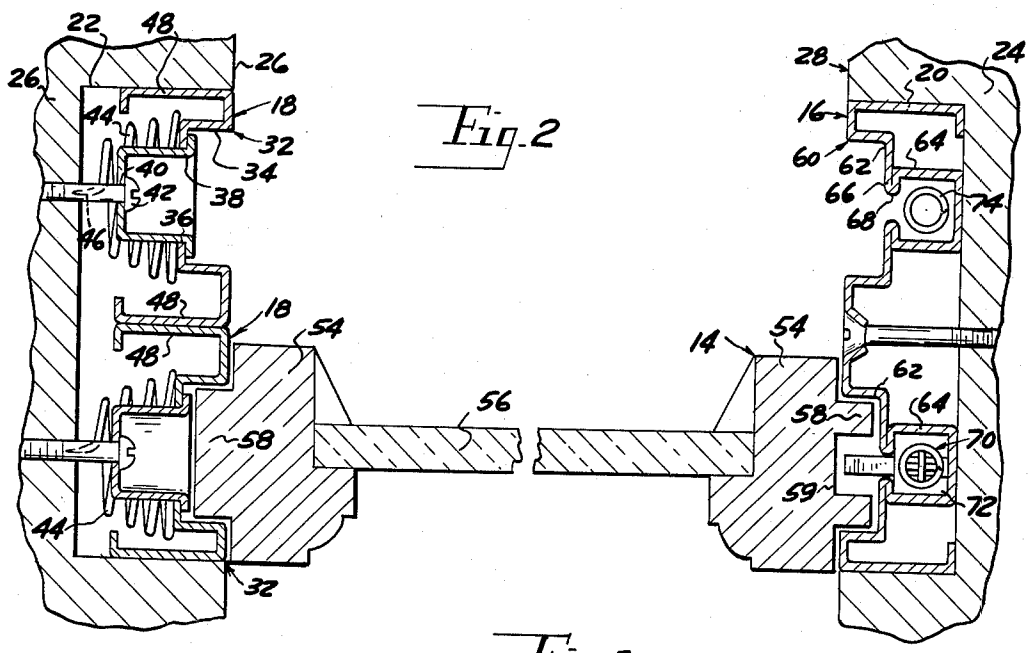


Fig. 3

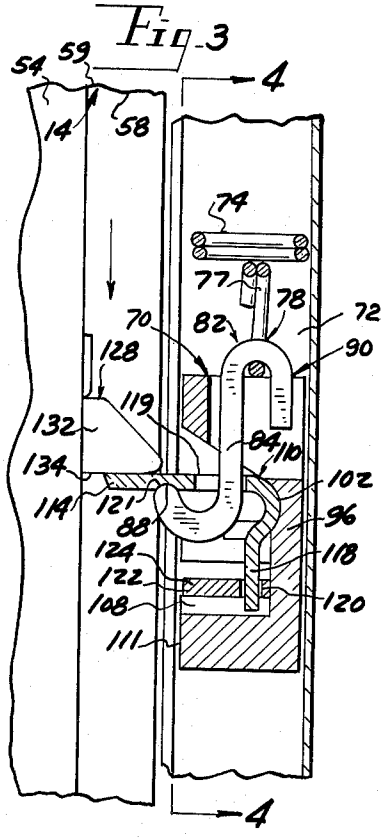


Fig. 5

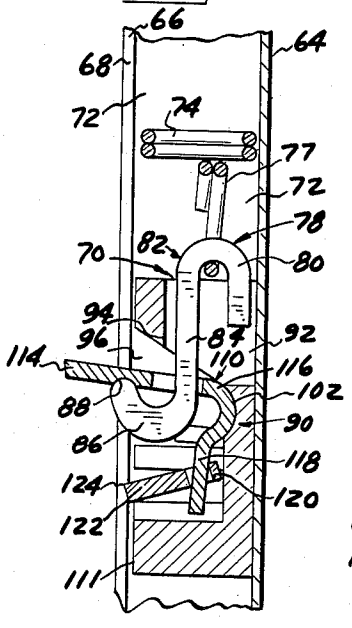
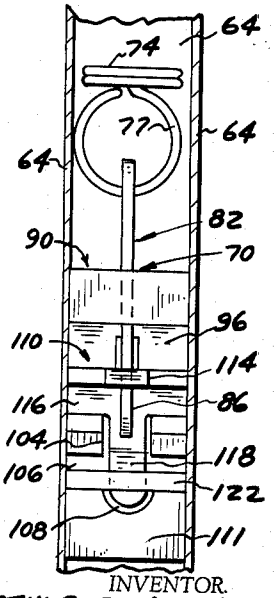


Fig. 4



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SELF-LOCKING AUTOMATICALLY-RELEASING SASH BALANCE

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6 Claims. (Cl. 16—197)

This invention relates to sash balances and, in particular, to self-locking sash balances for removable sliding sash windows.

One object of this invention is to provide a self-locking automatically-releasing sash balance for removable sliding sash windows wherein the locking mechanism is housed within a guide block which is slidable vertically within the sash balance spring casing in such a manner that the moving parts are completely protected against loss or damage.

Another object is to provide a self-locking sash balance of the foregoing character which eliminates the use of pivot pins requiring drilling of holes to receive them, with consequent difficulty and expense of assembly and danger of displacement and loss; the present invention instead providing a pivoting mechanism which is easily assembled and is held in position by the sash balance casing without danger of displacement or loss.

Another object is to provide a self-locking automatically-releasing sash balance of the foregoing character wherein locking is accomplished without the need for auxiliary springs within the locking assembly, such springs being necessarily small and weak because of the limited space available to accommodate them, and consequently likely to break or otherwise fail and thereby render the sash balance inoperative.

Another object is to provide a self-locking automatically-releasing sash balance of the foregoing character wherein the moving parts are of simple but rugged mechanical construction which are easily stamped or formed from sheet metal and quickly assembled by inexperienced operators.

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 a vertical section, partly in front elevation, through a double-hung sliding sash installation equipped with a self-locking automatically-releasing sash balance according to one form of the invention, with the locking unit in its unlocked position with the sash installed;

FIGURE 2 is a horizontal section taken along the line 2—2 in FIGURE 1, and including the opposite side of the sliding sash installation not shown in FIGURE 1;

FIGURE 3 is an enlarged fragmentary vertical section through the locking unit shown in the lower right-hand corner of FIGURE 1, with the locking unit also in its unlocked position with the sash installed;

FIGURE 4 is a vertical section taken along the line 4—4 in FIGURE 3;

FIGURE 5 is a view similar to FIGURE 3 but with the sash removed and the sash balance automatically locked; and

FIGURE 6 is an enlarged perspective view of the locking unit in its unlocked position, as shown in FIGURES 1, 3 and 4.

Referring to the drawings in detail, FIGURES 1 and 2 show a double-hung removable sliding sash window installation, generally designated 10, including upper and lower sliding sashes 12 and 14 slidably mounted in one side on fixed sash guides 16 and on the other side in yieldingly mounted sash guides 18 installed in recesses 20 and 22 respectively within the opposite side members 24 and 26 of a window frame, generally designated 28. The window frame 28 has the usual sloping bottom sill which, however, is omitted to conserve space and also a top member 30 interconnecting the window frame side members 24 and 26. The construction is shown in diagrammatic form in FIGURES 1 and 2 in order to simplify the showing.

The yieldingly-mounted sash guides 18 are duplicates of one another mounted side by side for yieldingly receiving the upper and lower sliding sashes 12 and 14, the upper sash being omitted in FIGURE 2 because it is above the section plane. Each yieldingly-mounted sash guide 18 consists of a rolled or extruded metal sash guide channel 32 having a channel guide portion 34 with vertically-spaced holes 36 into which flanged fastener cups 38 are inserted. The bottom of each sash cup 38 contains a hole 40 through which the shank of a screw or other fastener 42 passes on its way into the window frame side member 26. Disposed adjacent and between the fastener cups 38 are vertically-spaced compression coil springs 44, the outer ends 46 of which are pointed in order to penetrate the window frame side member 26, which is ordinarily of wood. The outer end of each coil spring 44 engages the inner side of the sash guide channel 32 and yieldingly urges it toward the sash. The guide channels 32 on their outer sides are provided with spaced parallel flanges 48. The outer flanges 48 slidably engage the adjacent sides of the recess 22, whereas the inner flanges 48 slidably engage one another (FIGURE 2). Each sash 12 or 14 consists of top and bottom rails 50 and 52 respectively (FIGURE 1) interconnected by side rails 54 and forming a rectangular sash frame, the central opening of which receives a window pane 56. Each of the side sash rails 54 (FIGURE 2) is provided with an outwardly-projecting rib or guide portion 58 which slidably engages the channel guide portion 34 of the adjacent sash guide channel 32. The right-hand vertical sash rail 54 contains a vertical groove 59 of rectangular cross-section within its respective guide rib 58.

The stationary sash guide 16 (FIGURES 1 and 2) may be formed in separate relative sliding units like the resiliently-mounted sash guides 18 on the opposite side of the window frame 28, but for simplicity of showing, FIGURE 2 illustrates it as a one-piece double guide unit 60 including two guide channel portions 62, each having integral spring sash balance casing portion 64 of rectangular cross-section joined to its respective guide channel portion by a reversely-bent entrance flange 66 defining an entrance slot 68 running substantially the entire height of the guide channel 60. The guide channels 32 and 60 are either rolled from sheet metal by conventional rolling processes, or extruded by likewise conventional processes, a suitable material being aluminum.

The sash balance casing portions 64 house the self-locking automatically-releasing sash balances, generally designated 70, mounted within the sash balance or spring casing 72 containing the sash balancing tension spring 74. The upper end of the sash balancing spring 74 is provided with a loop 76 which is hooked over the upper end of its spring casing portion 64 within its respective sash guide channel 60. The lower end of the balancing spring 74 (FIGURES 1 and 3 to 5 inclusive) is also provided with a loop 77 connected to the sash balance locking device, generally designated 78, by being hooked through the upper inverted U-shaped portion 80 of an approximately S-shaped operating link 82 having an approximately J-shaped part including a straight intermediate portion or shank 84 connecting it to a lower upright U-shaped portion 86 having a rounded fulcrum or pivot end 88. The operating link 82 is mounted in a sliding guide block or lock carrier, generally desig-

nated 90, which is vertically-slidably mounted within the spring chamber 72 and its inverted U-shaped upper portion 80 is received within an upper slot or first recess 92, whereas its intermediate portion 84 extends downwardly through a hole 94 into an intermediate or second recess 96. The intermediate recess 96 (FIGURES 1 and 6) is in the form of a horizontal notch of approximately V-shaped cross-section with a horizontal lower surface 98 and an inclined upper surface 100 joined to one another by a rounded rearward fulcrum surface 102. Immediately below the intermediate recess 96 and joined to it by a connecting passageway or slot 104 is a parallel-sided lower horizontal slot or third recess 106 having a rounded groove 108 extending inwardly from the front surface 11 of the guide block 90.

Pivotally mounted in the intermediate recess 96 is a lock-operaintg angle lever, generally designated 110 (FIGURES 3 and 6) having an upper trigger arm 112 with a narrow tongue or trigger portion 114 extending forwardly therefrom through the entrance slot 68 of the spring casing portion 64. The angle lever 110 also includes a reversely-curved approximately semi-cylindrical intermediate pivot portion 116 which is shaped to fit and pivotally engage the curved rearward fulcrum surface 102 of the upper recess 96. Both the portions 102 and 116 are of approximately U-shaped cross-section. Extending downwardly from the intermediate portion 116 is a lower lock-actuating arm 118 of narrower width so as to extend downwardly through the passageway 104 into the lower slot or recess 106 and with its rounded lower end extending into the rounded groove 108, which provides clearance for the swinging of the lower arm 118. The angle lever 110 has a slot 119 through which the connecting portion 84 of the link 82 extends, and also has a rounded depression 121 on the under side of the tongue 114 spaced away from the pivot portion 116 for pivotally receiving the rounded upper end 88 of the lower U-shaped portion 86. The lower arm 118 passes through a coupling portion consisting of a hole 120 in a rectangular locking plate or blade 122, which has a sharp forward upper locking edge 124 extending thereacross and adapted to indentingly engage the inner surface of the forward wall 66 of the spring casing portion 64.

Mounted in a socket 126 in each sash side rail 54 which is nearest the self-locking sash balances 70 and extending inwardly from the groove 59 is a sash balance lock tripping device, generally designated 128, of any suitable type, such as the type 135 shown in FIGURE 2 of the Haas Patent 2,796,630 issued June 25, 1957, for Self-Locking Sash Balance, and disclosed and claimed therein. For the purpose of the present invention, it is sufficient to state that the tripping device 128 consists of a casing 130 within which is mounted a spring-pressed tripping plunger 132 having on its lower side an abutment surface 134 which is parallel to the axis of the tripping plunger 132 and engageable with the upper surface of the trigger portion 114 and on its upper side an inclined cam surface 136 disposed obliquely to the axis of the tripping plunger 132, for purposes set forth below in the description of the operation of the invention

In the operation of the invention, let it be assumed that the upper and lower sashes 12 and 14 are in position within their respective channel sash guides 16 and 18 and that it is desired to remove the lower sash 14 (the upper sash 12 being removable in the same manner as described below). To remove the lower sash 14, the operator raises the sash 14 so that he can grasp the lower and upper horizontal rails 52 and 50 in the fingers of his two hands and push the sash 14 to the left, moving the resiliently-mounted sash guide 18 to the left while compressing its mounting springs 44 (FIGURE 2). When the grooved rib 58 of the right-hand sash rail 54 has cleared the channel 62 in which the guide rib 58 was seated, the operator swings the right-hand side of the sash 14 toward himself so that the sash 14 swings out of the plane of the window frame 28, whereupon he pulls the sash 14 obliquely outward to the right, removing the left-hand guide rib 14 from its respective channel.

Meanwhile, as soon as the abutment surface 134 of the tripping plunger 132 slides off the top surface of the trigger portion 114 of the angle lever 110, the upward pull upon the trigger portion 114 exerted by the S-link 82 of the sash balance locking device 78 by the tension spring 74 yanks the trigger portion 114 upward from the horizontal position of FIGURE 3 to the inclined position of FIGURE 5. This action swings the angle lever 110 around its curved pivot portion 116 within the fulcrum portion 102 of the intermediate recess 96, thereby causing the bent lever 110 to swing in a clockwise direction so that its lower arm 118 pushes the sharp edge 124 of the locking plate 122 to the left (FIGURE 5) so that it indents the inner surface of the front wall 66 of the spring casing portion 64 on opposite sides of the entrance slot 68. As a result, the sash balance locking device 70 is firmly locked in its attained position and cannot fly upward in response to the pull of the cocked tension spring 74.

During operation, as a result of the improved construction according to the present invention, the provision of the separate locking plate 122 operated by the bent lever 110 accomplishes a self-adjusting and self-aligning of the locking plate 122 relatively to the spring sash balance casing wall or entrance flange 66 with its sharp edge makes indenting contact while locking. Because of the fact that the locking plate 122 is a separate element from the pivoted angle lever 110, it can be provided with additional travel over prior self-locking sash balances wherein the locking element is integral with and pivots around a fixed fulcrum in response to motion of the trigger portion thereof. In other words, the action of the locking plate 122 is not confined to swinging around a specific radius or through a specific angle, in contrast to prior devices wherein the locking plate also carries the fulcrum around which it is compelled to operate. Because of the present construction wherein the locking plate 122 is free to move independently of the angle lever 110 to a certain extent, its response is more rapid and greatly reduces the upward jump of certain prior self-locking sash balances where there is a time lag between the release of the locking lever by the removal of the sash and the instant at which the contact edge makes locking engagement with the balancing spring casing, during which time lag the locking member is pulled upward by the tension of the balancing spring before it grips the spring casing.

To replace the sash 14, the operator reverses the foregoing procedure by inserting the guide rib 58 of the left-hand side rail 54 in the channel 34 while the right-hand vertical sash rail 54 is outside the window frame 24 so that the window pane 56 is at an angle to the plane of the window frame 24 which it normally occupies. While so doing, the operator pushes to the left upon the sash 14, consequently pushing the adjacent resiliently-mounted sash guide channel 18 to the left, compressing the coil spring 44. While so doing, the operator swings the sash 14 inward until the grooved guide rib 58 clears the entrance to its respective guide channel 62 within the fixed sash guide 16, whereupon he permits the coil spring 42 to push the guide channel 18 to the right, moving the sash 14 to the right until its guide rib 58 enters its respective guide channel 52. If the tripping plunger 132 of the tripping device 128 happens to be above the trigger portion 114 of the locking device 78 (FIGURE 3), the operator merely pulls down upon the sash 14 until the abutment surface 134 engages the trigger portion 114 and pushes it from its inclined position of FIGURE 5 into its horizontal position of FIG-

URE 3. This action swings the bent lever **110** in a counterclockwise direction around its fulcrum surface **102** within the guide block **90**, whereupon the consequent swinging to the right of the lower lever arm **118** pulls the locking plate **122** to the right, disengaging the sharp edeg **124** of the locking plate **122** from its previous indenting locking engagement with the front wall **66** of the sash balance casing portion **64**. With the parts thus in the unlocked positions shown in FIGURE 3, the balancing spring **74** resumes its function of exerting a counterbalancing force counteracting the weight of the window sash **14**. The frictional engagement of the sash guides **16** and **18** upon the guide ribs **58** and adjacent portions of the vertical sash rails **54** hold the sash **14** in its attained position until it is moved upward or downward by the operator to open or close the window.

The upper sash **12** is inserted or removed in a similar manner and consequently requires no duplication of description.

The sash balance installations **70** are illustrated in the drawings as applied to one side only of the window frame **28**, and this is usually sufficient for ordinary windows. For wide windows, it is preferable to provide similar sash balance casing portions **64** within the resiliently-mounted sash guide **18** and equip them with self-locking sash balances **70** in the same manner as described above for the right-hand side of the window frame.

What I claim is:

1. A self-locking automatically-releasing sash balance for removable sliding sash windows, said sash balance comprising

an elongated hollow sash balance casing having an elongated opening extending lengthwise thereof,

a resiilent sash balancing member disposed within said casing and anchored thereto,

a lock carrier mounted in said casing for longitudinal reciprocation therealong and having a fulcrum portion thereon,

a locking element reciprocably mounted on said lock carrier for motion laterally thereof into and out of locking engagement with said casing,

an angle lever having a pivot portion pivotally engaging said fulcrum portion and having a trigger arm projecting from said pivot portion toward said opening and having a lock-actuating arm projecting from said pivot portion into recipricating engagement with said locking element and disposed at an angle to said trigger arm,

and a lever-operating member mounted on said lock carrier for longitudinal movement therealong relatively to said lock carrier,

said lever-operating member having a connection portion secured to said sash balancing member and having a lever-contacting portion swingably engaging said trigger arm at a location thereon spaced away from said pivot portion.

2. A self-locking automatically-releasing sash balance, according to claim **1**, wherein said lever-operating member has a bent portion thereon remote from said connection portion, said lever-contacting portion being disposed on said bent portion.

3. A self-locking automatically-releasing sash balance, according to claim **1**, wherein said lever-operating member has an approximately J-shaped part connected at one end to said sash balancing member and on its other end bearing said lever-contacting portion.

4. A self-locking automatically-releasing sash balance, according to claim **1**, wherein said lever-operating member is approximately S-shaped with an inverted U-shaped portion at one end connected to said sash balancing member and with an upright U-shaped portion at its oher end bearing said lever-contacting portion.

5. A self-locking automatically-releasing sash balance, according to claim **1**, wherein said trigger arm and said lock-actuating arm are disposed approximately at right angles to one another and wherein said lock-actuating arm extends downwardly from said trigger arm into engagement with said locking element.

6. A self-locking automatically-releasing sash balance, according to claim **1**, wherein said locking element includes a coupling portion comprising an aperture in said locking element into which said lock-actuating arm loosely and pivotally extends.

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DONLEY J. STOCKING, *Primary Examiner.*