

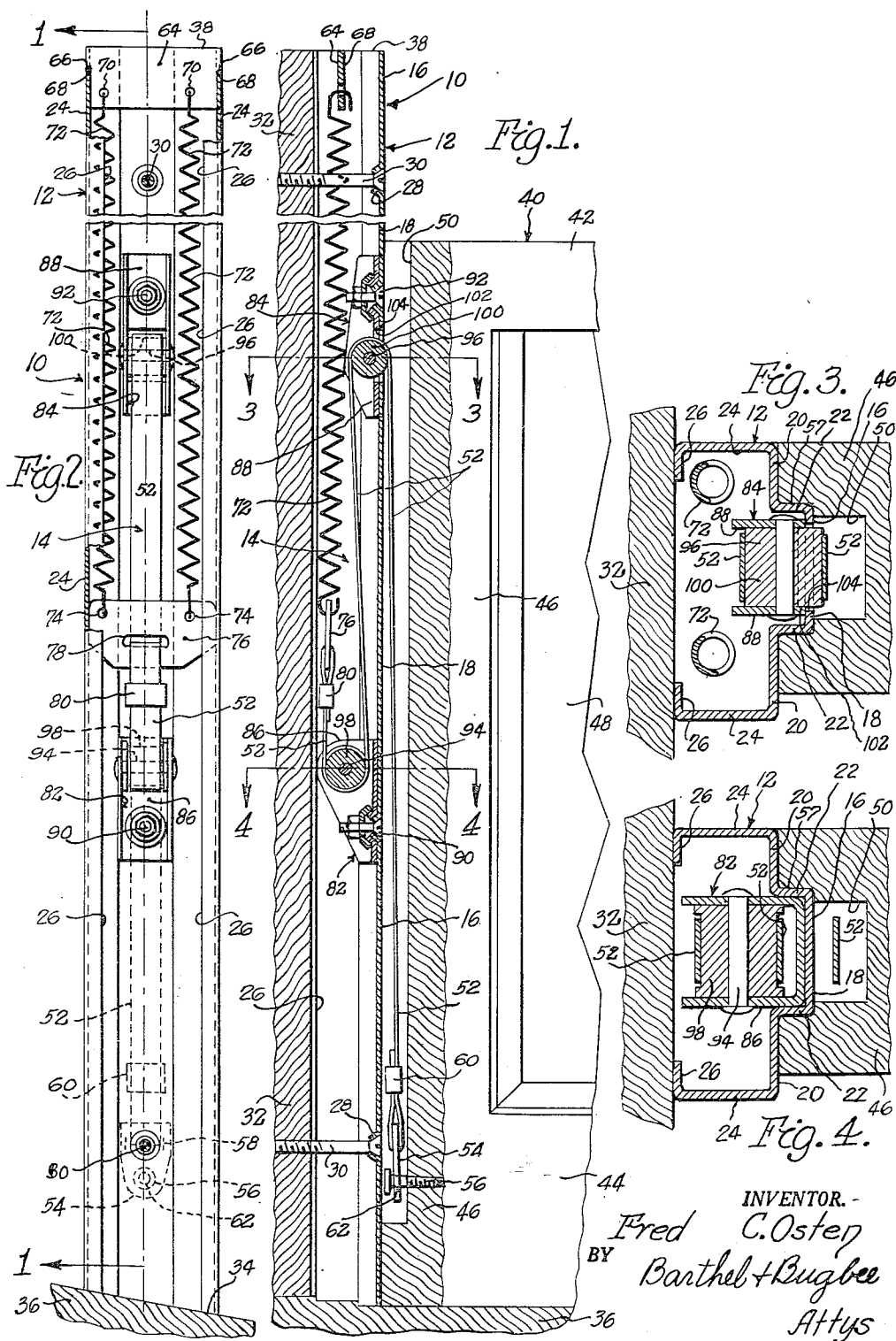
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SPRING SASH BALANCE

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SPRING SASH BALANCE

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This invention relates to builders' hardware and, in particular, to sash balances.

One object of this invention is to provide a spring sash balance which economizes on the space hitherto required for installation of the sash balance by enabling the sash balance to be housed entirely within the channel sash guide on each side of the window, instead of requiring separate space at the top of the window frame.

Another object is to provide a spring sash balance mounted wholly within the channel sash guide and occupying the major part of the length of the sash guide, so that springs of great length can be used, with the result that a more even balancing force is obtained than is possible with spring sash balances having only short springs or confined within a housing space of half the window height or less, as in many prior installations.

Another object is to provide a spring sash balance mounted wholly within the channel sash guide, and employing multiple pulleys so constructed and arranged that the balancing springs, as well as the movable attachment member of the sash balance tape to these springs, are provided with sufficient space within the sash guide to clear the pulleys during operation of the sash balance.

Another object is to provide a spring sash balance mounted wholly within the channel sash guide, so constructed and arranged that the mounting screws for the sash channel guides do not interfere with the working parts of the sash balance in their vertical travel.

Another object is to provide a combination sash guide and balance wherein the interior of the channel sash guide serves not only as a housing and guideway for the moving parts of the sash balance but also as a backbone for sustaining the pull of the balancing or tensioning spring.

Another object is to provide a combination sash guide and balance wherein the entire assembly is a single unit capable of being manufactured, sold and mounted as a single unit rather than in separate units, thereby facilitating mounting of the sash guide and balance and reducing the cost of installation.

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 central vertical section through the sash balance according to one form of the present invention, taken along the line 1—1 in Figure 2, with the upper portion omitted, except for the extreme upper end, in order to conserve space;

Figure 2 is a rear elevation of the sash guide and sash balance shown in Figure 1, with the same portion omitted, and with certain flanges broken away to disclose the internal construction more clearly;

Figure 3 is an enlarged horizontal cross-section taken along the line 3—3 in Figure 1, through the axle of the upper pulley; and

Figure 4 is a horizontal cross-section taken along the line 4—4 in Figure 1 through the axle of the lower pulley.

Spring sash balances of the rotary drum type hitherto

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devised have almost wholly replaced the sash weights, cords and pulleys previously used, because of the smaller amounts of space required for spring sash balances than for sash weights and pulleys. In recent years, however, builders have complained that even these rotary drum spring sash balances occupy more space than can be conveniently allotted to them, as well as increasing the labor costs required in providing such space and in installing such sash balances. Spring sash balances hitherto developed for mounting in the side rails of the sashes themselves have been generally unsatisfactory because of the complicated mechanism required in accommodating such a sash balance in such a short vertical space, and the short spring to which such sash balances have been limited by the limited space available for housing them has resulted in the obtaining of a very uneven balancing force, as well as in the production of excessive friction. The same defects have arisen in sash balances of the block and tackle type employing multiple pulleys with multiple courses of sash tape or cord trained around these multiple pulleys in the short space available for them. This is true, whether the sash balance has been attemptedly housed within a recess in the side rails of the sashes or in the side portions of the window frame, because such prior installations have occupied only approximately one-half or less of the vertical height of the window frame.

The sash balance of the present invention solves these problems and eliminates these difficulties by housing the sash balance entirely within the channel metal side rails now increasingly used by builders in order to insure smooth opening and closing of the double-hung sliding sash used in the majority of dwellings constructed at the present day. The present sash balance utilizes the major portion of the length of the entire sash guide, hence requires only two pulleys for each sash balance and enables the use of springs of greater length than have hitherto been capable of use, because of the limited length of space hitherto made available for such sash balances. The present sash balance consequently provides a more even balancing force over a longer range of travel of the sash than has hitherto been provided by spring sash balances, and its parts are so constructed and arranged that they are capable of passing one another during their travel within the channel sash guide as the sash moves upward or downward. The working parts of the present sash balance are also arranged in such a manner that the mounting screws for the sash guides do not interfere in any way with the operation of the sash balance. Finally, the present invention enables the sash balance and sash guide to be manufactured, sold and mounted in a single unit, thereby reducing the amount of skill of labor required and consequently reducing the cost of the installation. The sash balance of the present invention requires no additional housing space within the window frame or sash because it merely occupies space which is already available in the interior of the channel metal sash guide regularly installed and required for the sash installation.

Referring to the drawings in detail, Figures 1 and 2 show a combination sash guide and sash balance, generally designated 10, as consisting generally of a channel sash guide 12 within which is mounted the sash balance 14 of the present invention. The sash guide 12, as shown in Figures 3 and 4, is of a channel construction with a central rib 16 having central and lateral portions 18 and 20 interconnected by portions 22 perpendicular to the central and lateral portions 16 and 20 (Figure 4). Integral with the lateral portions 20 are parallel side portions 24 perpendicular thereto and the side portions 24 at their rearward edges are provided with perpendicular flanges 26. The sash guide 12, of which there is one on each side of the window opening, is provided with two or more

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holes 28 for receiving the mounting screws 30, the ends of which are lodged in the window frame side members 32. The lower end or edge 34 of the sash guide 12 is inclined to fit the correspondingly-inclined window sill 36 whereas the upper end 38 thereof is square with the axis of the sash guide 12, to fit the upper window frame horizontal member (not shown). The lower sash 40, which is to be balanced by the spring sash balance 14, is of the conventional type with top and bottom rails 42 and 44 and side rails 46 with the central window pane 48 disposed in the central opening thereof in the usual manner. The side rails 46, only one of which is shown, are provided with vertical grooves 50 for housing the sash balance tape 52, stirrup 54 and anchorage screw 56 (Figure 1) without interference with the sash guide 12, in addition to the vertical grooves 57 regularly provided for the sash guide ribs 16. The stirrup 54 is slotted as at 58 to receive the looped lower end of the sash tape 52, which is secured, after being doubled back on itself, by a clip or clamp 60. The stirrup and the sash guide 12 are preferably of non-ferrous metal, such as aluminum, in order to reduce corrosion and weathering, and the stirrup 54 is in the form of a tab having a hole 62 through which the anchoring screw 56 passes on its way into the sash side rail 46.

The sash balance 14, besides the tape 52, includes a spring anchorage 64 in the form of a plate having outwardly-extending shoulders 66 lodged in slots 68 in the opposite side portions 24 at the upper ends thereof (Figure 2). The spring anchorage 64 has a pair of laterally-spaced holes 70 which serve to receive the hooked upper ends of elongated tensioning or balancing springs 72. The springs 72 although shown with their upper portions omitted, along with the adjacent structure, are actually one foot or more in length, so that a long even pull is provided over a long range of travel upward or downward of the sash 40.

The lower ends of the balance springs 72 are also hooked and pass through laterally-spaced holes 74 in a tape connection plate 76. The latter is of approximately the internal width of the sash guide 12 (Figure 2) and is slotted as at 78 to receive the upper end of the sash balance tape 52, which, like the lower end thereof, is doubled over and similarly secured by a clip or clamp 80. The sash balance tape 52 is of strong flexible material such as metal or synthetic plastic, and is trained around lower and upper pulley units 82 and 84 respectively. The pulley units 82 and 84 consist of pulley brackets 86 and 88 respectively secured by fasteners 90 and 92 to the central portion 18 of the sash guide 12. The pulley brackets 82 and 84 have parallel side wings carrying axles 94 and 96 upon which are rotatably mounted pulleys 98 and 100 respectively. The upper pulley 100 is mounted in and projects outward through a pair of aligned slots 102 and 104 in the pulley bracket 88 and sash guide central portion 18 and the sash balance tape 52 passes outward over the pulley 100 through the same openings 102 and 104 (Figure 1 and 3).

The mounting of the upper pulley 100 so that it lies within the slots 102 and 104 and projects outwardly as shown in Figure 1 also provides space between the upper pulley 100 and the rear flanges 26 of the channel sash guide 12 for the passage of the balancing springs 72 and the tape connection plate 76 (Figure 1), so that there is no interference between these parts during the operation of the sash balance 14 as the sash 40 is moved upward or downward. Moreover, the use of a pair of balancing springs 72 spaced laterally apart from one another places the springs 72 in locations where they pass on opposite sides of the upper pulley 100 without interference therewith. As a further consequence of this construction, the fasteners 30 by which the combined unit 10 is secured to the window frame side members 32 pass through a central space unoccupied by any moving mechanism and consequently without interference with such mechanism.

In the operation of the invention, let it be assumed that

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the combined sash guide and sash balance 10 has been mounted in the manner shown in Figure 1, and that the sash balance tape stirrup 54 has been secured to an anchoring screw 56 at the bottom of the slot 50, with the sash in its raised or open position. If the operator wishes to close the window, he pulls the sash 40 downward in the usual way, causing the sash balance tape 52 to be pulled downward by its connection at the stirrup 54 to the anchoring screw 56. As the upper and lower pulley units 82 and 84 are fixed and not traveling or running, the separations of their axles 94 and 96 remain constant. Accordingly, the downward travel of the sash 40 is transmitted through the sash tape 52 around the lower and upper pulleys 98 and 100 to the tape connection plate 76, which travels downward past the upper pulley unit 84 without interference thereon, causing the balancing spring 72 to be stretched and placed under tension.

The elongation of the tensioning springs 72 in this manner causes potential energy to be stored up in the springs which counterbalances the weight of the sash 40. Consequently, when it is desired to open the window, the raising of the sash 40 by the operator is assisted by the pull of the tensioned springs 72, transmitted through the sash balance tapes 52 on opposite sides of the sash 40 around the lower and upper pulleys 98 and 100 respectively.

What I claim is:

1. A combination sash balance and hollow channel sash guide for an edge-grooved vertically-sliding window sash, comprising an elongated hollow channel structure including a hollow front rib having an elongated recess in the back thereof, elongated front flanges extending laterally in opposite directions away from said rib, and elongated side flanges extending rearwardly away from said front flanges, said rib guidingly engaging an edge groove of said sash in sliding relationship therewith; a sash balancing spring anchorage secured to the upper portion of said channel structure, balancing spring means mounted within said channel structure and depending from said spring anchorage, lower and upper pulleys rotatably mounted in vertically-spaced relationship at substantially stationary locations in said recess within said rib, an elongated flexible force-transmitting member secured at its inner end to said spring means and extending around said pulleys outwardly through an opening in said rib, and a sash attachment element secured to the outer end of said flexible member.

2. A combination sash balance and hollow channel sash guide for an edge-grooved vertically-sliding window sash, comprising an elongated hollow channel structure including a hollow front rib having an elongated recess in the back thereof, elongated front flanges extending laterally in opposite directions away from said rib, and elongated side flanges extending rearwardly away from said front flanges, said rib guidingly engaging an edge groove of said sash in sliding relationship therewith; a sash balancing spring anchorage secured to the upper portion of said channel structure, balancing spring means mounted within said channel structure and depending from said spring anchorage, lower and upper pulleys rotatably mounted in vertically-spaced relationship at substantially stationary locations in said recess within said rib, an elongated flexible force-transmitting member secured at its inner end to said spring means and extending around said pulleys outwardly through an opening in said rib, and a sash attachment element secured to the outer end of said flexible member, one of said pulleys being mounted near the midportion of said channel structure and the other pulley being mounted in the lower half of said channel structure.

3. A combination sash balance and hollow channel sash guide for an edge-grooved vertically-sliding window sash, comprising an elongated hollow channel structure including a hollow front rib having an elongated recess in the back thereof, elongated front flanges extending laterally in opposite directions away from said rib, and

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elongated side flanges extending rearwardly away from said front flanges, said rib guidingly engaging an edge groove of said sash in sliding relationship therewith; a sash balancing spring anchorage secured to the upper portion of said channel structure, balancing spring means mounted within said channel structure and depending from said spring anchorage, lower and upper pulleys rotatably mounted in vertically-spaced relationship at substantially stationary locations in said recess within said rib, an elongated flexible force-transmitting member secured at its inner end to said spring means, said flexible member extending downwardly from said spring means, around said lower pulley, then upwardly to and around said upper pulley and then outwardly through an opening in said rib, and a sash attachment element secured to the outer end of said flexible member.

4. A combination sash balance and hollow channel sash guide for an edge-grooved vertically-sliding window sash, comprising an elongated hollow channel structure including a hollow front rib having an elongated recess in the back thereof, elongated front flanges extending laterally in opposite directions away from said rib, and elongated side flanges extending rearwardly away from said front flanges, said rib guidingly engaging an edge groove of said sash in sliding relationship therewith; a sash balancing spring anchorage secured to the upper portion of said channel structure, a pair of balancing springs mounted within said channel structure in laterally-spaced relationship on opposite sides of the center line thereof and depending from said spring anchorage, lower and upper pulleys rotatably mounted in vertically-spaced relationship at substantially stationary locations in said recess within said rib, an elongated flexible force-transmitting member secured at its inner end to said springs, said flexible member extending downwardly from said springs around said lower pulley, then upwardly to and around said upper pulley and then outwardly through an opening in said rib, and a sash attachment element secured to the outer end of said flexible member.

5. A combination sash balance and hollow channel sash guide for an edge-grooved vertically-sliding window sash, comprising an elongated hollow channel structure including a hollow front rib having an elongated recess in the back thereof, elongated front flanges extending laterally in opposite directions away from said rib, and elongated side flanges extending rearwardly away from said front flanges, said rib guidingly engaging an edge groove of said sash in sliding relationship therewith; a sash balancing spring anchorage secured to the upper portion of said channel structure, a pair of balancing springs mounted within said channel structure in laterally-spaced relationship on opposite sides of the center line thereof and depending from said spring anchorage, a flexible force-transmitting member connector secured to and interconnecting the lower ends of said springs, lower and upper pulleys rotatably mounted in vertically-spaced relationship at substantially stationary locations in said recess within said rib, an elongated flexible force-transmitting member secured at its inner end to said connector, said flexible member extending downwardly from said springs around said lower pulley, then upwardly to and around said upper pulley and then outwardly through an opening in said rib, and a sash attachment element secured to the outer end of said flexible member.

6. A combination sash balance and hollow channel sash guide for an edge-grooved vertically-sliding window

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sash, comprising an elongated hollow channel structure including a hollow front rib having an elongated recess in the back thereof, elongated front flanges extending laterally in opposite directions away from said rib, and elongated side flanges extending rearwardly away from said front flanges, said rib guidingly engaging an edge groove of said sash in sliding relationship therewith; a sash balancing spring anchorage secured to the upper portion of said channel structure, a pair of balancing springs mounted within said channel structure in laterally-spaced relationship on opposite sides of the center line thereof and depending from said spring anchorage, a flexible force-transmitting member connector secured to and interconnecting the lower ends of said springs, lower and upper pulleys rotatably mounted in vertically-spaced relationship at substantially stationary locations in said recess within said rib, an elongated flexible force-transmitting member secured at its inner end to said connector and extending around said pulleys outwardly through an opening in said rib, and a sash attachment element secured to the outer end of said flexible member, said channel structure also including elongated rear flanges thereon extending laterally toward one another from said side flanges and forming longitudinal guides for said connector in its vertical travel within said channel structure.

7. A combination sash balance and hollow channel sash guide for an edge-grooved vertically-sliding window sash, comprising an elongated hollow channel structure including a hollow front rib having an elongated recess in the back thereof, elongated front flanges extending laterally in opposite directions away from said rib, and elongated side flanges extending rearwardly away from said front flanges, said rib guidingly engaging an edge groove of said sash in sliding relationship therewith; a sash balancing spring anchorage secured to the upper portion of said channel structure, a pair of balancing springs mounted within said channel structure in laterally-spaced relationship on opposite sides of the center line thereof and depending from said spring anchorage, a flexible force-transmitting member connector secured to and interconnecting the lower ends of said springs, lower and upper pulleys rotatably mounted in vertically-spaced relationship at substantially stationary locations in said recess within said rib, an elongated flexible force-transmitting member secured at its inner end to said connector and extending around said pulleys outwardly through an opening in said rib, and a sash attachment element secured to the outer end of said flexible member, said channel structure also including elongated rear flanges thereon extending laterally toward one another from said side flanges and forming longitudinal guides for said connector in its vertical travel within said channel structure, said side flanges and said rear flanges also cooperating with said front flanges to form a pair of elongated troughs facing one another, said springs being disposed in said troughs.

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