May 19, 1964 P. O. ROBARDS 3,133,323

WINDOW CONSTRUCTION

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Fig. 1

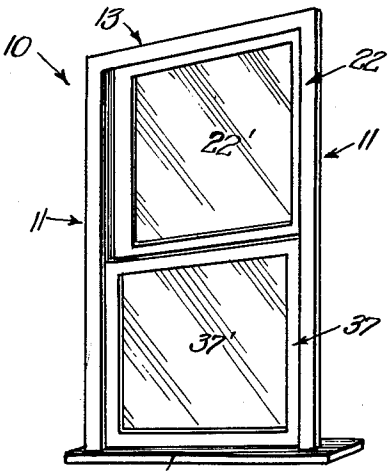


Fig. 2

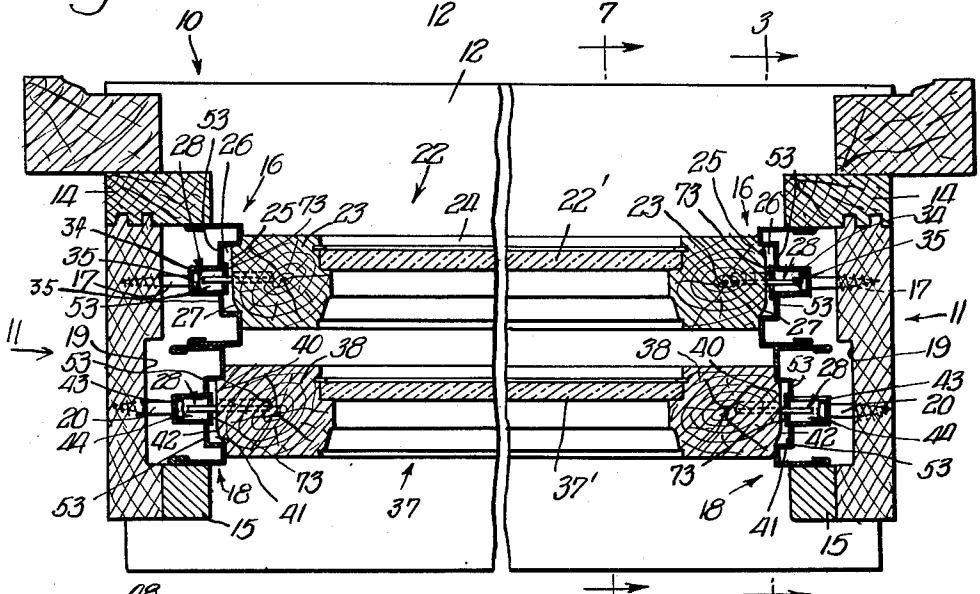


Fig. 10

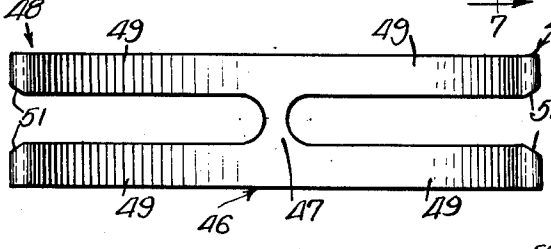


Fig. 11

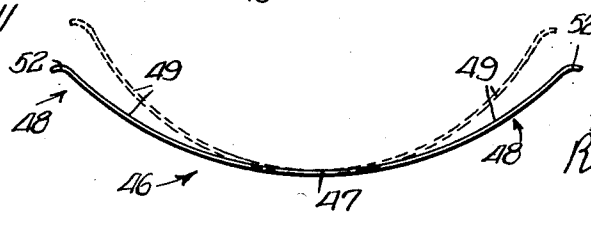
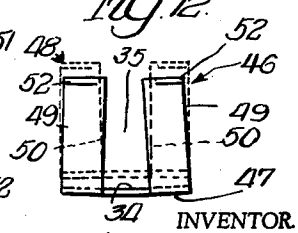


Fig. 12



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Fig. 3

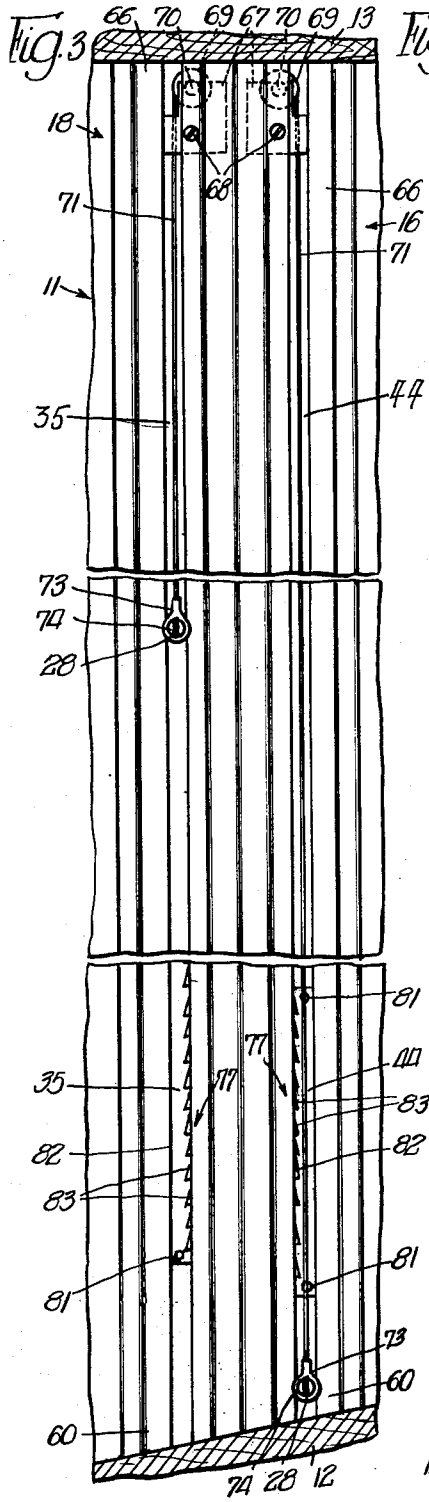


Fig. 4

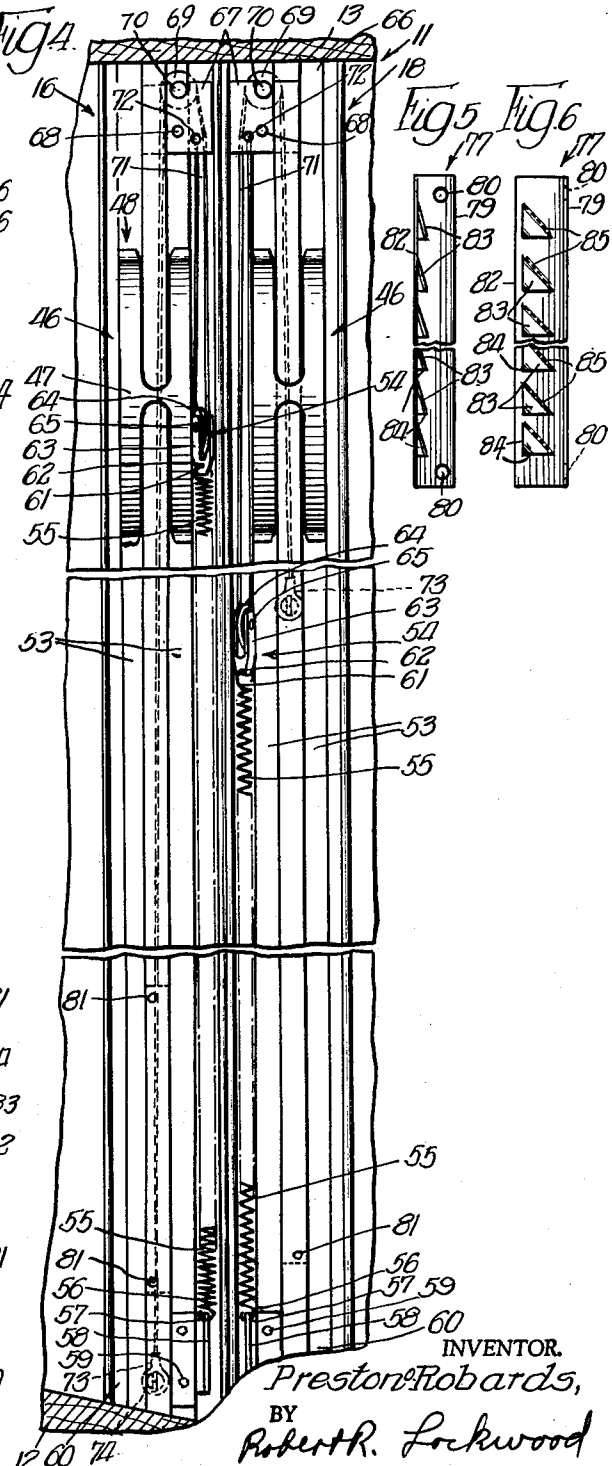


Fig. 5

Fig. 6

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Fig. 7

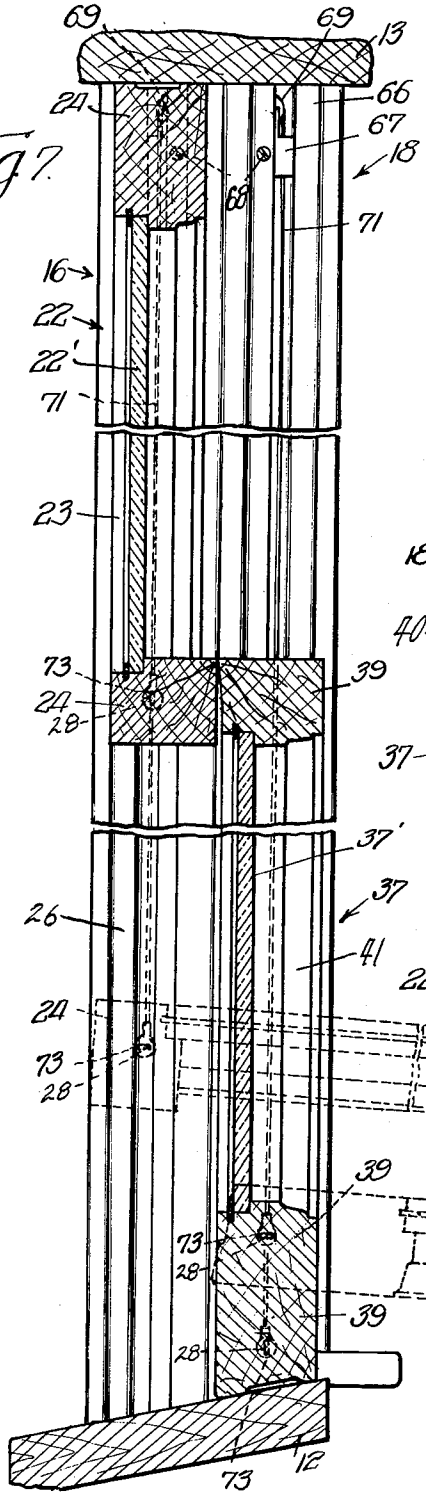


Fig. 8

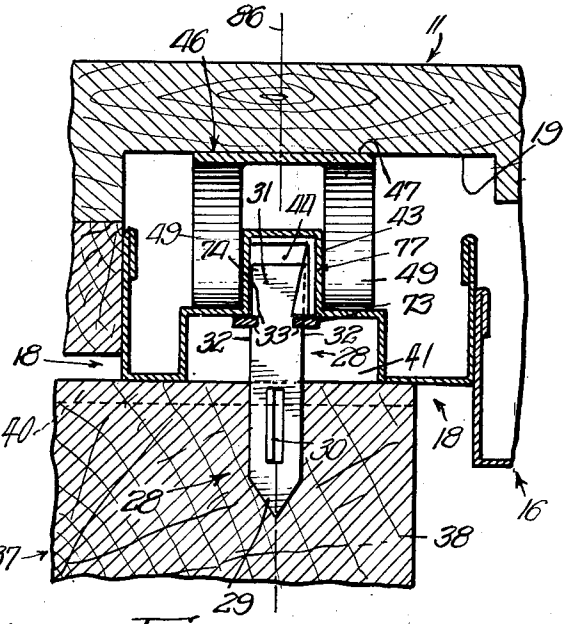
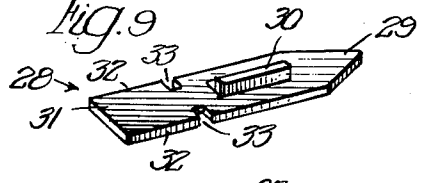


Fig. 9



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United States Patent Office 3,133,323 Patented May 19, 1964

3,133,323

WINDOW CONSTRUCTION

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Filed Aug. 15, 1962, Ser. No. 217,102
11 Claims. (Cl. 20—42)

This invention relates, generally, to the construction of windows, such as those used in dwelling houses and the like. It has particular relation to windows of the kind and character disclosed in U.S. Patent No. 2,828,514 issued April 1, 1958, to M. J. Nardulli.

Among the objects of this invention are: To provide for counterbalancing an upwardly slidable window sash in a new and improved manner; to interconnect a coil tension spring and a window sash for counterbalancing the latter in such manner as to permit relatively great movement of the window sash for a relatively small expansion or contraction of the spring; to employ for this purpose a cord and pulley arrangement; to provide such counterbalancing means for attachment to each side of the window sash; to mount the window sash for rotation about a horizontal axis in order to permit cleaning of the window pane and to prevent movement of the window sash when it is rotated, the upward movement being caused as the result of force exerted by the counterbalancing means; to provide a stationary ratch along one or both sides of the window sash for cooperation with a pawl or pawls extending laterally from one or both sides of the window sash when the window is rotated from its normal position; to anchor one end of the cord that forms a part of the counterbalancing means to the pawl individual thereto; to slidably mount the window sash in sash mounting channels extending along the spaced vertical side members of a window frame with one or both channels being movable toward the other and biased for such movement by improved biasing means; and to provide the improved biasing means in the form of a bowed spring the central portion of which bears against a side member of the window frame and the end portions of which are bifurcated and bear against the adjacent sash mounting channel.

In the drawings:

FIG. 1 is a perspective view of a window frame provided with upper and lower window sashes with the construction being generally as disclosed in the patent above referred to, the view being taken looking from the inside outwardly.

FIG. 2 is a horizontal sectional view, at an enlarged scale, taken in different planes to show different window sash structures and cooperating frame in a single view.

FIG. 3 is a vertical sectional view taken generally along the line 3—3 of FIG. 2 to show the construction of the window sash mounting channels with the window sashes omitted but showing in section the pawls that extend laterally from the lower ends of the window sashes into guide grooves in the sash mounting channels.

FIG. 4 is a view, similar to FIG. 3, but taken from the opposite side of the sash mounting channels to show the construction at the rear thereof.

FIG. 5 is a vertical elevational view of a ratch that is employed for preventing upward movement of the window sashes when they are rotated for cleaning purposes.

FIG. 6 is a view, in side elevation, of the ratch shown in FIG. 5.

FIG. 7 is a vertical sectional view taken generally along the line 7—7 of FIG. 2 and showing by conventional broken lines the upper and lower sashes rotated about horizontal axes to permit cleaning of the window panes thereof on their outer sides.

FIG. 8 is a horizontal sectional view at an enlarged scale showing how one of the pawls cooperates with the associated ratch when the window sash individual thereto is rotated about a horizontal axis for cleaning purposes as shown in FIG. 7.

FIG. 9 is a perspective view of the pawl shown in FIG. 8.

FIG. 10 is a plan view of a bow spring, a number of which are employed for biasing the sash mounting channels toward each other.

FIG. 11 is a view, in side elevation, of the bow spring shown in FIG. 10 and showing by broken lines the unstressed positions of the bifurcated ends of the bow spring.

FIG. 12 is a view, in end elevation, of the bow spring shown in FIGS. 10 and 11.

Referring now particularly to FIG. 1 of the drawings, it will be observed that the reference character 10 designates, generally, a window frame which is formed by vertical side members or jambs 11—11 with a window sill 12 at the bottom and a frame top member 13 at the upper end. As shown in FIG. 2 the window frame 10 includes outer stops 14—14 extending along the forward sides of the vertical side members 11—11 and inner stops 15—15 along the inner sides thereof.

Immediately to the rear of the outer stops 14—14 and extending along the inner sides of the vertical side members 11—11 are upper window sash mounting channels that are indicated, generally, at 16—16. They are mounted to move toward and away from each other and for this purpose screws 17—17 are provided which extend into the respective vertical side members 11—11. Also movably mounted toward each other on the vertical side members 11—11 are lower window sash mounting channels that are indicated, generally, at 18—18. They are offset outwardly slightly from the upper window sash mounting channels 16—16 and for this purpose grooves 19—19 are formed in the inner sides of the vertical side members 11—11. Screws 20—20 serve to limit the movement of the lower window sash mounting channels 18—18 toward each other.

Slidably mounted in the upper window sash mounting channels 16—16 is an upper window sash that is indicated, generally, at 22 and is provided with a window pane 22'. The upper window sash 22 is formed of wood and includes side stiles 23—23 that are interconnected by top and bottom check rails 24—24. This is a conventional window construction and conventional means are provided for holding the window panes 22' in position. The side stiles 23—23 are provided with outwardly longitudinally extending tongues 25—25 that extend into and slide along tongue receiving grooves 26—26 that are formed along the inner sides of the upper window sash mounting channels 16—16. Cam surfaces 27—27 are provided along the inner sides of the tongues 25—25 for the purpose of camming the upper window sash mounting channels 16—16 outwardly to facilitate rotation of the upper window sash 22 about a horizontal axis as described in the patent above referred to.

In order to guide the upper window sash 22 in its movement along the tongue receiving grooves 26—26 pawls 28—28 are provided in and extend laterally from the lower ends of the side stiles 23—23 of the upper window sash 22.

FIGS. 8 and 9 show more clearly the details of construction of one of the pawls 28. Here it will be observed that the pawl 28 is provided with a pointed end 29 to facilitate its being driven into the body of the respective side stile. In addition a lug 30 is struck therefrom to assist in holding the pawl 28 in position once it has been driven into the stile. It will be understood that other constructions for facilitating driving of the pawl 28 and

holding it in place can be employed. The pawl 28 has a flat end portion 31 at the other end which is provided with parallel sides 32—32 for a purpose that will be apparent presently. Notches 33—33 are provided in opposite sides of the flat end portion 31 to permit connection thereto of a cable end fitting that forms a part of the counterbalancing means to be described.

Referring again to FIG. 2 is will be observed that the pawls 28—28 have the flat end portions 31—31 extending upwardly and extending into pawl receiving groove forming portions 34—34 that define pawl receiving grooves 35—35 therein. While the tongues 25—25 of the upper window sash 22 in cooperation with the tongue receiving grooves 26—26 serve to guide the upper window sash 22 in its movement along the upper window sash mounting channels 16—16, it will be understood that the pawls 34—34 assist in this guiding action for the lower end of the window sash 22 to a limited extent. The reason for offsetting the upper window sash mounting channels 16—16 inwardly a limited extent beyond the lower window sash mounting channels 18—18 is to facilitate the rotation of the upper window sash 22 about a horizontal axis extending through the pawls 28—28 without interfering with the lower window sash mounting channels 18—18.

A lower window sash, shown generally at 37, is slidably mounted in the lower window sash mounting channels 18—18. It has a window pane 37' and is formed by side stiles 38—38 which are slightly wider than the side stiles 23—23 in order to accommodate the offset relationship of the lower window sash mounting channels 18—18 while still providing the same width for the window pane 37' that is provided for the window pane 22'. The lower window sash 37 also includes top and bottom check rails 39—39. The side stiles 38—38 are provided with outwardly and longitudinally extending tongues 40—40 for slidable mounting in tongue receiving grooves 41—41 in the lower window sash mounting channels 18—18. Cam surfaces 42—42 are provided along the inner sides of the tongues 40—40 for the purpose, as described hereinbefore, of moving the respective lower window sash mounting channels 18—18 outwardly when the lower window sash 37 is rotated about a horizontal axis to permit cleaning of the outer side of its window pane 37'. Near the lower end of each of the side stiles 38—38 there is provided a pawl 28, constructed as described hereinbefore. The pawls 28—28 in the lower ends of the side stiles 38—38 extend into pawl receiving groove forming portions 43—43 which define vertically extending pawl receiving grooves 44—44. They function as described hereinbefore for the pawl receiving grooves 35—35 in guiding the pawls 28—28 in the vertical movement of the lower window sash 37 in addition to the guiding action provided by the tongues 40—40 in the tongue receiving grooves 41—41.

FIGS. 10, 11 and 12 show a preferred construction for a spring for biasing the sash mounting channels 16—16 and 18—18 toward each other and into engagement with the respective side stiles 23—23 and 38—38 of the upper and lower window sashes 22 and 37. Here it will be observed that a bow spring, shown generally at 46, is provided. The number of bow springs 46 that are interposed between each of the sash mounting channels 16—16 and 18—18 and the juxtaposed inner sides of the vertical side members or jambs 11—11 depends upon the lengths of the sash mounting channels 16—16 and 18—18. For illustrative purposes it is pointed out that a bow spring 46 is provided near the top and near the bottom of each sash mounting channel and that a third bow spring 46 is provided midway between the ends. Additional bow springs 46 are provided as desired.

Each bow spring 46 is formed of a one piece spring steel having a central portion 47 that is arranged to bear against the respective inner side of the vertical side member or jamb 11—11. The bow spring 46 has bifurcated end portions 48—48 with the arms 49—49 of each being deformed toward each other as seen in FIG. 12 for the purpose of gripping the outer sides 50—50 of the juxtaposed pawl receiving groove forming portion 34 which defines the groove 35. It will be understood that the arms 49—49 bear against the juxtaposed sides of the pawl receiving groove forming portions 43—43. The bifurcated end portions 48—48 are chamfered at 51—51 on the inner sides of the distal ends of the arms 49—49 to facilitate application to the respective pawl receiving groove forming portion 34 or 43 as the case may be. The reason for deforming the arms 49—49 toward each other is to cause them to grip the sides 50—50 of the portions 34 or 43 to hold the bow springs 46 in position along the sash mounting channels 16—16 and 18—18 while acting to bias them outwardly away from the inner sides of the vertical side members or jambs 11—11. The arms 49—49 have curved end portions 52—52 which are arranged to bear against surfaces 53—53 that are located along the outer sides of those portions that define the tongue receiving grooves 26—26 and 41—41.

As pointed out above, the unstressed positions of the arms 49—49 of the bow springs 46 are shown by broken lines in FIG. 11. Their stressed positions are shown by the full lines. This construction makes it possible to have a relatively long bow spring 46 with the result that there is no concentration of stress at any point therealong. As a result it is possible to provide the desired biasing action against the channels 16—16 and 18—18 well within the elastic limits of the bow springs 46 and at the same time provide a sufficient biasing action against the side stiles 23—23 and 38—38 of the window sashes 22 and 37 to hold the respective tongues 25—25 and 40—40 in the respective tongue receiving grooves 26—26 and 41—41.

It is desirable to counterbalance the window sashes 22 and 37 for the purpose of holding them in their respective closed positions and facilitating their movement to any open position. For this purpose counterbalancing means, shown generally at 54 in FIGS. 3 and 4, are provided. Since the construction of the counterbalancing means 54 for the upper and lower window sashes 22 and 37 is the same, the description of one will suffice for both. The counterbalancing means 54 includes a coil tension spring 55 and it will be understood that the construction is duplicated on each side of the respective window sash 22 and 37, although a single counterbalancing means 54 can be employed if desired. However, more effective operation is obtained when counterbalancing means 54 are provided on each side for each of the window sashes 22 and 37.

As shown in FIG. 4 the coil tension spring 55 extends upwardly along the respective sash mounting channel 16 or 18 with the lower end 56 anchored at 57 to an angle clip 58 which is secured by rivets or screws 59—59 to the lower end 60 of the respective channel 16 or 18. The upper end 61 of each coil tension spring 55 is anchored at 62 to a movable pulley block 63 which carries a first pulley 64 that is rotatable on trunnions 65. Near the upper end 66 of each of the channels 16 and 18 there is mounted a stationary pulley block 67 which is secured in position by a screw or rivet 68. A second pulley 69 is provided with trunnions 70 for rotatable mounting on the stationary pulley block 67. An inextensible cord or cable 71 is anchored at 72 to each stationary pulley block 67 and it extends downwardly to be trained over the first pulley 64 and then upwardly to be trained over the second pulley 69. Thence the cord or cable 71 extends downwardly through the respective groove 35 or 44 where it is provided with a cable end fitting 73 having an opening 74 of such diameter as to permit the entrance of the flat end portion 31 of the respective pawl 28. As shown in FIG. 8 the cable end fitting 73 extends into the notches 33—33 and thus a simple and efficient means is provided for con-

necting each window sash 22 and 37 to the respective counterbalancing means 54.

As shown in FIG. 4 of the drawings a somewhat shorter length of cord or cable 71 is provided for the counterbalancing means 54 that is employed in connection with the upper window sash 22. The reason for this, of course, is that in the normal closed position of the upper window sash 22, the pawls 28—28 which provide the points of attachment for the cable end fittings 73—73 are located at a substantially higher elevation than the pawls 28—28 which extend from the lower window sash 37 in its closed position. Moreover, the coil tension spring 55 that is associated with the counterbalancing means 54 provided for the lower window sash 37 is further extended and, in the closed position, the movable pulley block 63 and the first pulley 64 carried thereby is located at a higher elevation than is the movable pulley block 63 and its first pulley 64 which are associated with the upper window sash 22.

It will be recalled that the sash mounting channels 16—16 and 18—18 are movable outwardly away from each other when the respective window sashes 22 and 37 are rotated to the positions shown in FIG. 7 to permit cleaning of the outside of the window panes 22' and 37'. It will be understood that, if desired, one of each pair of sash mounting channels 16—16 and 18—18 can be fixed relative to the respective vertical side member 11 while only the other sash mounting channel is movable. In such case the bow springs 46 would be interposed between only one of the side members 11 and the associated sash mounting channels 16 and 18. Whichever construction is employed, it is possible to rotate the upper and lower window sashes 22 and 37 to the positions shown by broken lines in FIG. 7 of the drawings. However, in these positions the springs 55 of the counterbalancing means 54 are still under tension with the springs 55 associated with the upper window sash 22 being further tensioned because it is moved downwardly further than its normal position. There is the likelihood that the springs 55 will cause the window sashes 22 and 37 to be moved upwardly inadvertently when these window sashes are swung inwardly to permit cleaning of the outer sides of the window panes 22' and 37'.

With a view to preventing such upward movement when the window sashes 22 and 37 are swung inwardly to the positions shown by broken lines in FIG. 7, ratches 77 are provided in the grooves 35 and 44 near the lower ends 60 of the sash mounting channels 16—16 and 18—18. FIGS. 5 and 6 show in more detail the construction of one of the ratches 77. Here it will be observed that it comprises an angle shaped member that may be formed of relatively thin gauge stainless steel. One of the flanges 79 which overlies the bottom of the grooves 35—35 and 44—44 is provided with apertures 80—80 at its ends through which rivets 81—81 extend to hold the ratch 77 in position in its respective groove 35 and 44. Another flange 82 at right angles to the flange 79 has a number of teeth 83 struck therefrom in such manner as to provide sides 84—84 at right angles to each other with each tooth 83 being bent upwardly along a broken line 85 from the body of the flange 82. This construction provides a series of teeth 83 so that, when the window sash, for example the lower window sash 37, is rotated about a horizontal axis 86 as indicated in FIG. 8 the pawls 28 extending from the lower ends of the side stiles 38—38 and along the axis 86 are rotated to positions where the flat end portions 31 extend transversely across the respective groove 44 with one parallel side 32 underlying one of the teeth 83 of the ratch 77. As a result upward movement of the respective window sash under the biasing action of its counterbalancing means 54 is effectively prevented. However, when the window sash 22 or 37 is rotated about its respective horizontal axis 86 from the broken line position shown in FIG. 7 to the normal vertical position, the flat end portion 31 is rotated out of engagement with the tooth 83 of the ratch 77 with which it had been in engagement and normal up and down movement of the window sashes 22 and 37 then can take place.

What is claimed as new is:

1. In a window construction, in combination:
(a) a window frame having spaced vertical side members,
(b) a window sash slidably mounted between said side members of said frame,
(c) counterbalancing means for said window sash including:
(1) a coil tension spring anchored at its lower end adjacent the lower end of one of said vertical side members and extending upwardly therealong,
(2) a movable pulley block connected to the upper end of said spring,
(3) a first pulley journaled on said movable pulley block,
(4) a stationary pulley block anchored adjacent the upper end of said one vertical side member,
(5) a second pulley journaled on said stationary pulley block, and
(6) a cord anchored at one end adjacent said stationary pulley block and trained over said first and second pulleys and anchored at its other end to said window sash,
(d) means mounting said window sash for rotation about a horizontal axis,
(e) a ratch stationarily mounted on said one side member, and
(f) a pawl secured to said window sash and cooperating with said ratch when said window sash is rotated to prevent movement thereof by said coil tension spring.

2. The invention, as set forth in claim 1, wherein the counterbalancing means is provided between each side member and the respective side of the window sash.

3. The invention, as set forth in claim 2, wherein:
(a) a ratch is stationarily mounted on each side member, and
(b) a pawl secured to each vertical side of said window sash cooperates with the ratch individual thereto when said window sash is rotated to prevent movement thereof by the counterbalancing means.

4. The invention, as set forth in claim 3, wherein each cord is anchored to the respective side of the window sash at a location along the horizontal axis about which it is rotatable.

5. In a window construction, in combination:
(a) a window frame having spaced vertical side members,
(b) a window sash slidably mounted between said side members of said frame,
(c) spring means biasing said window sash upwardly,
(d) means mounting said window sash for rotation about a horizontal axis,
(e) a ratch stationarily mounted on each side member, and
(f) a pawl secured to each vertical side of said window sash for cooperation with the ratch individual thereto when said window sash is rotated to prevent movement thereof by said spring means.

6. In a window construction, in combination,
(a) a window frame having spaced vertical side members,
(b) sash mounting channels mounted on said side members at least one of which is movable toward and away from the other channel,
(c) means biasing said one sash mounting channel toward the other channel,
(d) a window sash slidably mounted in said channels,
(e) spring means biasing said window sash upwardly,

(*f*) means mounting said window sash on said sash mounting channels for rotation about a horizontal axis,

(*g*) a ratch stationarily mounted on one of said sash mounting channels, and

(*h*) a pawl secured to said window sash for cooperation with said ratch when said window sash is rotated to prevent movement thereof by said spring means.

7. The invention, as set forth in claim 6, wherein the means biasing the sash mounting channel toward the other channel comprises a bowed spring having bifurcated ends with the intermediate portion reacting against the adjacent side member of the window frame and said bifurcated ends reacting against the adjacent side of said one sash mounting channel.

8. The invention, as set forth in claim 7, wherein:

(*a*) the one sash mounting channel has a vertically extending groove forming portion opening toward the adjacent side of the window sash for receiving the pawl, and

(*b*) the arms of the bifurcated ends of the bowed spring are biased sidewise toward each other into engagement with opposite outer sides of said grove forming portion.

9. In a window construction, in combination,

(*a*) a window frame having spaced vertical side members,

(*b*) sash mounting channels mounted on said side members for limited movement toward and away from each other and each having a groove forming portion opening toward the other,

(*c*) means biasing said sash mounting channels toward each other,

(*d*) a window sash slidably mounted in said channels,

(*e*) a pawl extending laterally from each side of said window sash into the respective groove in the adjacent channel and mounting said window sash for rotation about a horizontal axis,

(*f*) counterbalancing means for said window sash including:

(1) a coil tension spring anchored at its lower end to the lower end of each sash mounting channel and extending upwardly therealong,

(2) a movable pulley block connected to the upper end of each spring,

(3) a first pulley journaled on each movable pulley block,

(4) a stationary pulley block anchored adjacent the upper end of each sash mounting channel,

(5) a second pulley journaled on said stationary pulley block, and

(6) a cord anchored at one end to each second pulley block and trained over the respective first and second pulleys and anchored at its other end to the respective pawl; and

(*g*) a ratch stationarily mounted on each sash mounting channel along said groove therein for cooperating with the respective pawl when said window sash is rotated to prevent upward thereof movement by the coil tension springs.

10. The invention, as set forth in claim 9, wherein the means biasing the sash mounting channels toward each other comprises a plurality of bowed springs having bifurcated ends with their intermediate portions reacting against the respective adjacent side member of the window frame and their bifurcated ends reacting against the respective adjacent side of the sash mounting channels.

11. The invention, as set forth in claim 10, wherein the arms of the bifurcated ends of the bowed springs are biased sidewise toward each other into engagement with the opposite outer sides of the respective groove forming portion.

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