Sept. 2, 1947. E. PEREMI ET AL 2,426,945

WINDOW BALANCER

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Fig. 1.

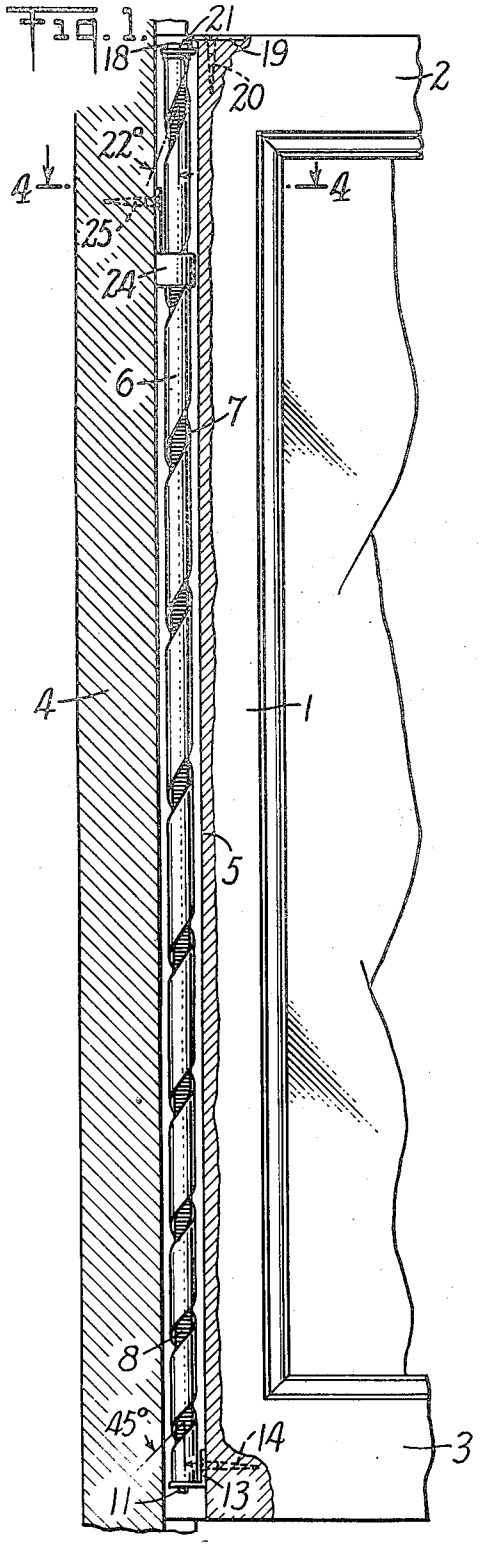
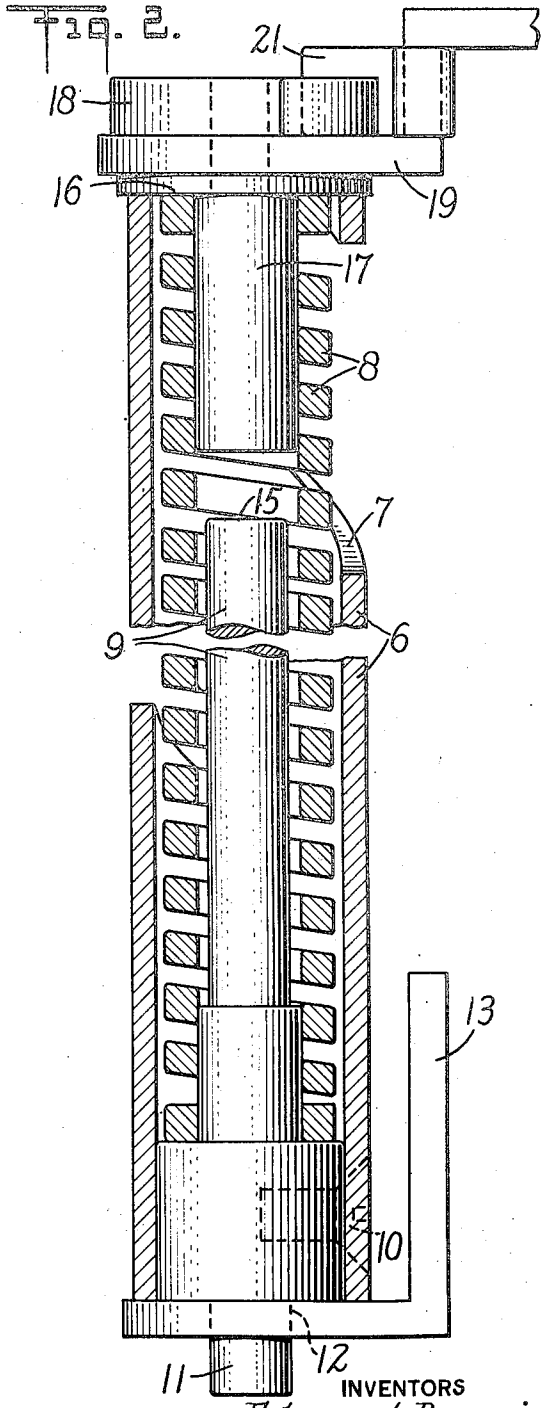


Fig. 2.



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Fig. 3.

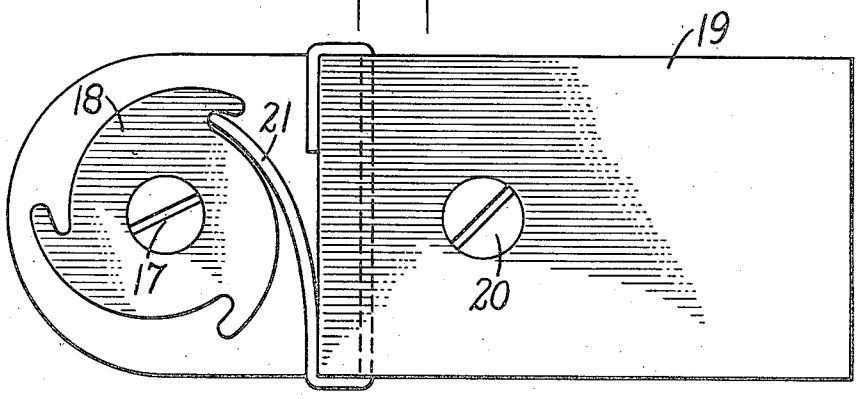


Fig. 4.

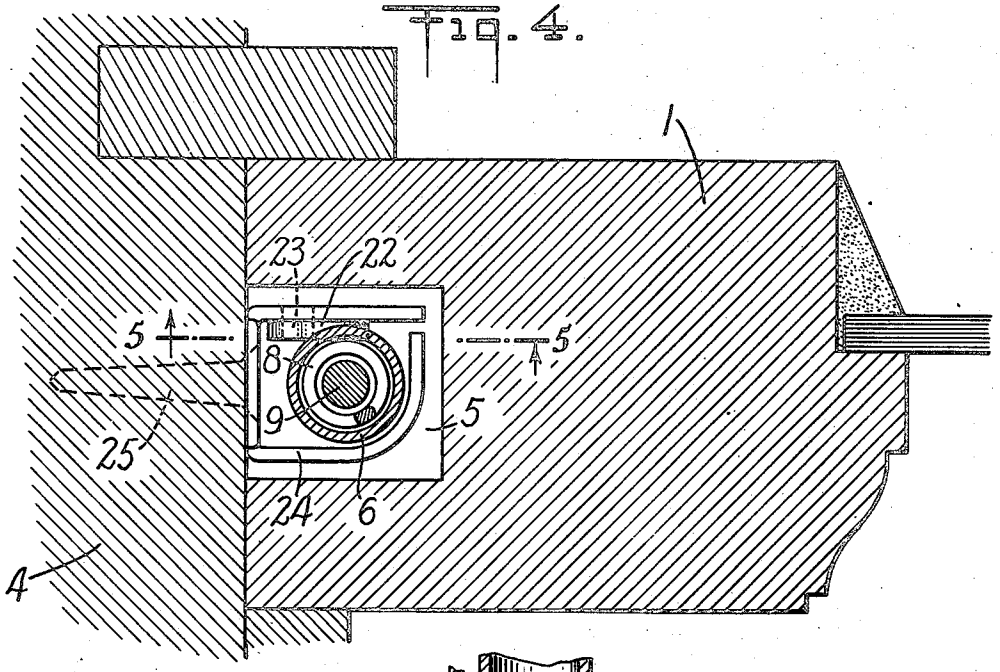
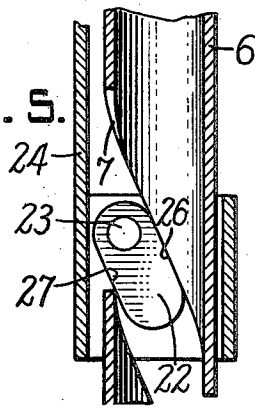


Fig. 5.



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UNITED STATES PATENT OFFICE

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WINDOW BALANCER

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Application November 14, 1944, Serial No. 563,398

10 Claims. (Cl. 16—197)

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This invention relates to a window balancer.

An object of the invention resides in the provision of a window balancer which is located between the sash and the window frame and which is so mounted that it will at all times be located within the vertical confines of the sash in the raised, lowered, or intermediate positions of the sash.

It is a further object of the invention to so construct the window balancer that the weight of the sash will be counterbalanced with an equalizing force, regardless of the extent to which the sash is raised or lowered.

A further object of the invention resides in so constructing the balancer that the sash will be balanced by a torsion spring in cooperation with a connection between the balancer, frame and sash, which is such that an inclined plane will resist the free movement of the sash with a variable resistance having a substantially definite relationship to the variable resistance of the torsion spring.

It is a further object of the invention to so construct the balancer that the torsion spring may be placed under variable initial resistances as are required in the balancing of the particular sash to which the balancer is applied.

A further object of the invention resides in so constructing the device that it may be cheaply constructed and easily installed.

It is a still further object of the invention to so construct the balancer that any binding action or resistance between the element that is attached to the frame and the cooperating element that is attached to the sash will be substantially reduced.

As other objects of the invention will appear as the description progresses, it is thought unnecessary to here point them out in detail.

In the drawings one embodiment of the invention is disclosed and its application to a window sash and frame is likewise disclosed.

Figure 1 is an elevation of the window balancer showing its general construction and disclosing the manner in which it is applied to the sash and the frame and cooperates with both, portion of the sash and frame being broken away and shown in section;

Figure 2 is an enlarged vertical sectional view of the balancer;

Figure 3 is an enlarged top plan view showing the spring adjusting means;

Figure 4 is an enlarged horizontal sectional view on the line 4—4 of Figure 1, showing the relationship of the window balancer, the sash and the frame; and

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Figure 5 is a vertical sectional view on the line 5—5 of Figure 4, showing the relationship between the guide shoe and the inclined plane in the helical trackway or tube.

A side rail 1 and top and bottom rails 2 and 3 respectively of a sash are illustrated in the drawing, as is also a portion of the jamb 4 of the window frame, the sash being provided with a recess 5 that extends preferably from end to end thereof. The window balancer is located within this recess.

It is, of course, to be understood that it is preferable to use a balancer on each side of the sash, but that it is possible to use one on only one side of the sash.

For convenience of illustration and description the application of the window balancer will be described in connection with one side of the sash, but when two balancers are used it will be understood that the second duplicates the first.

The window balancer includes essentially a tube-like member 6, which is provided with a helical groove or trackway 7 that extends substantially from end to end thereof, or at least sufficiently to accommodate the movements of the sash. A torsion spring 8 is located within the tube 6 and extends substantially from end to end thereof. This spring is secured to the lower end of a rod 9, which rod is in turn secured, by means such as a set screw 10, within and to the lower end of the tube 6, and is provided with an extended trunnion bearing 11, which is freely mounted at 12 for rotation within a bracket 13. This bracket 13 is adapted to be secured by means such as a screw 14 to lower rail 3 of the sash.

The upper end of the rod 9 terminates at 15 short of the end of the spring, and the spring abuts at 16 against a bearing member on a stud 17 and is secured thereto. Secured to the upper end of the stud 17 is a ratchet 18, between which and the bearing member 17 a bracket 19 is located. This bracket is secured by means such as a screw 20 to the upper rail of the sash and carries a spring pawl 21 which engages the ratchet.

It will be seen that this arrangement locates the tube 6 and its cooperating parts entirely within the vertical confines of the sash so that it travels upwardly and downwardly with the sash and is never exposed to view. The angularity of the groove or trackway 7 varies as in effect an inclined plane from top to bottom of the tube, the angle that the groove forms with the vertical axis decreasing from the lower end of the tube toward the upper end, gradually, and the vertical distances between the convolutions of

the groove gradually increasing from bottom to top of the tube as shown in Figure 1.

The window balancer will, of course, successfully operate with grooves of different angularity. It has been found, however, and this is set forth by way of example rather than by way of limitation, that a successful angularity and angle variation exists when the angle adjacent the bottom of the groove is 45°, as is indicated in the drawing, and when the angularity gradually decreases toward a point adjacent the top of the groove to 22°.

A shoe **22** is pivoted at **23** to a bracket **24**, which is attached, by means such as a screw **25**, to the jamb **4** of the window frame and loosely surrounds the tube **6**, as indicated in Figures 4 and 5 of the drawings, thus permitting a certain degree of relative horizontal movement between the bracket and the tube **6** to take care of any unevennesses that may exist between the sash and the various portions of the jamb as the sash is raised and lowered.

This shoe **22** has relatively long bearing surfaces **26** and **27**, as will be seen in Figure 5 of the drawings, so that it has an extensive contact with the edge of the helical groove when the sash is being either raised or lowered. The pivot of the shoe **22** at **23** permits the shoe to adjust itself to the angular variation of the groove **7**, thus reducing, or in any event, preventing the increasing of the friction between the shoe and the helical groove as the angularity of the groove varies. The torsion spring **8** may be given the desired initial tension by axial adjustment through the ratchet **18** by a simple rotation of the ratchet which, in effect, winds the spring on the silencing rod **9**, the lower end of the spring being held stationary by the means heretofore described, and the upper end being positioned by the stud **17** rigid with the ratchet **18**.

During the lowering of the sash the spring will be placed under gradually increasing tension and at the same time the angle of inclination with the vertical of that portion of the groove **7** with which the shoe **22** engages will gradually decrease while the distance between the convolutions of the groove **7** will increase. When the sash is raised the tension of the spring will gradually decrease while the angularity will gradually increase and the distance between the convolutions will decrease. The result will be that the sash in all of its positions will be balanced with substantially a weight equalizing force.

As the angularity of the groove **7** varies the shoe **22** will ride on its pivot **23** to accommodate itself to the angular variation of the groove to maintain a surface contact between the groove and the shoe when the sash is being moved in either direction.

The tube **6** may be formed in any desirable manner, but it has been found convenient to form it of a piece of sheet metal wound into tubular form to produce the groove **7**.

While a particular embodiment of the invention has been illustrated and described, it is, of course, to be understood that many details of the construction may be varied without departing from the spirit of the invention or exceeding the scope of the claims, and these variations will become at once apparent to one skilled in the art.

We claim:

1. In a window balancer, a rotatable and longitudinally movable tube having a helical groove extending lengthwise thereof, a coil spring arranged longitudinally within said tube and attached to the tube adjacent one of its ends, means for anchoring the spring at its other end and independent of the tube, a bracket adapted to be secured to a window frame, a shoe having a relatively long rectilineal side having contact with the edge of said groove, and means pivoting said shoe at one of its ends to said bracket, with its other end free to follow said edge of said groove by movement about said pivot as said tube is moved longitudinally.

2. In a window balancer, a rotatably and longitudinally movable tube having a helical groove extending lengthwise thereof, a coil spring arranged longitudinally within said tube and attached to the tube adjacent one of its ends, means for anchoring the spring at its other end and independent of the tube, a bracket adapted to be secured to a window frame, a shoe, having relatively long rectilinear parallel sides, engaged with the edges of said groove, and means pivoting said shoe at one of its ends to said bracket, said pivot means being located beyond the outer face of said tube.

3. In a window balancer, a rotatably and longitudinally movable tube having a helical groove extending lengthwise thereof, a coil spring arranged longitudinally within said tube and attached to the tube adjacent one of its ends, means for anchoring the spring at its other end and independent of the tube, a bracket adapted to be secured to a window frame, a shoe having relatively long rectilinear parallel sides and curved ends, engaged with the edges of said groove, and means pivoting said shoe at one of its ends to said bracket, said pivot means being located beyond the outer face of said tube.

4. In a window balancer, a rotatably and longitudinally movable tube having a helical groove extending lengthwise thereof, a coil spring arranged longitudinally within said tube and attached to the tube adjacent one of its ends, means for anchoring the spring at its other end and independent of the tube, a bracket adapted to be secured to a window frame, a shoe having relatively long rectilinear parallel sides and curved ends engaged with the edges of said groove, and means pivoting said shoe at one of its ends to said bracket, said pivot means being located beyond the outer face of said tube, the angle of inclination of said groove to the vertical decreasing from adjacent one end of the tube toward the other end thereof.

5. In a window balancer, a rotatably and longitudinally movable tube having a helical groove extending longitudinally thereof, a rod located within and secured to said tube, a helical spring secured to said rod at one of its ends and surrounding the same, a bracket having a horizontal portion and a vertical portion, a bearing plate abutting said horizontal portion of said bracket and independent of said tube, the adjacent end of said spring being secured to said bearing plate, a ratchet rigid with said bearing plate and supported by the horizontal portion of said bracket, and a spring pawl for said ratchet secured to the vertical portion of said bracket.

6. In a window balancer, a bracket, a rod rotatably mounted in said bracket, a bracket spaced from the first mentioned bracket, a stud rotatably supported by the second mentioned bracket, a coil spring surrounding said rod and stud and secured at its ends to said rod and said stud, a tube having a helical groove therein extending

longitudinally thereof secured to said rod, a shoe adapted to be secured to a window frame and located within said groove and adapted to ride therein, a ratchet secured to the upper end of said stud and having peripheral teeth therein, and a spring actuated detent adapted to be rigidly associated with a window sash adjacent said ratchet and to engage said ratchet teeth.

7. In a window balancer, a bracket, a rod rotatably mounted in said bracket, a bracket spaced from the first mentioned bracket, a stud rotatably supported by the second mentioned bracket, a coil spring surrounding said rod and stud and secured at its ends to said rod and said stud, a tube having a helical groove therein extending longitudinally thereof secured to said rod, a shoe adapted to be secured to a window frame and located within said groove and adapted to ride therein, a ratchet secured to the upper end of said stud and having peripheral teeth therein, and a spring actuated detent adapted to be rigidly associated with a window sash adjacent said ratchet and to engage said ratchet teeth, said stud and ratchet assembly having a tool receiving recess therein by means of which the torsion of the spring may be varied.

8. In a window balancer, a bracket, a rod rotatably mounted in said bracket, a bracket spaced from the first mentioned bracket, a stud rotatably supported by the second mentioned bracket, a coil spring surrounding said rod and stud and secured at its ends to said rod and said stud, a tube having a helical groove therein extending longitudinally thereof secured to said rod, a shoe adapted to be secured to a window frame and located within said groove and adapted to ride therein, a ratchet secured to the upper end of said stud and having peripheral teeth therein, and a spring actuated detent adapted to be rigidly associated with a window sash adjacent said ratchet and to engage said ratchet teeth, said rod having an enlargement at its lower end for the reception of the lower end of said spring.

9. In a window balancer, a bracket, a rod rotatably mounted in said bracket, a bracket spaced from the first mentioned bracket, a stud rotatably supported by the second mentioned bracket, a coil spring surrounding said rod and stud and secured at its ends to said rod and said stud, a tube having a helical groove therein extending

longitudinally thereof secured to said rod, a shoe adapted to be secured to a window frame and located within said groove and adapted to ride therein, a ratchet secured to the upper end of said stud and having peripheral teeth therein, and a spring actuated detent adapted to be rigidly associated with a window sash adjacent said ratchet and to engage said ratchet teeth, said stud having a bearing member for said spring secured thereto and located below the adjacent bracket.

10. In a window balancer, a bracket, a rod rotatably mounted in said bracket, a bracket spaced from the first mentioned bracket, a stud rotatably supported by the second mentioned bracket, a coil spring surrounding said rod and stud and secured at its end to said rod and said stud, a tube having a helical groove therein extending longitudinally thereof secured to said rod, a shoe adapted to be secured to a window frame and located within said groove and adapted to ride therein, a ratchet secured to the upper end of said stud and having peripheral teeth therein, and a spring actuated detent adapted to be rigidly associated with a window sash adjacent said ratchet and to engage said ratchet teeth, said rod having an enlargement adjacent its lower end for the reception of the lower end of said spring and said stud having a bearing member for said spring adjacent its upper end.

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