

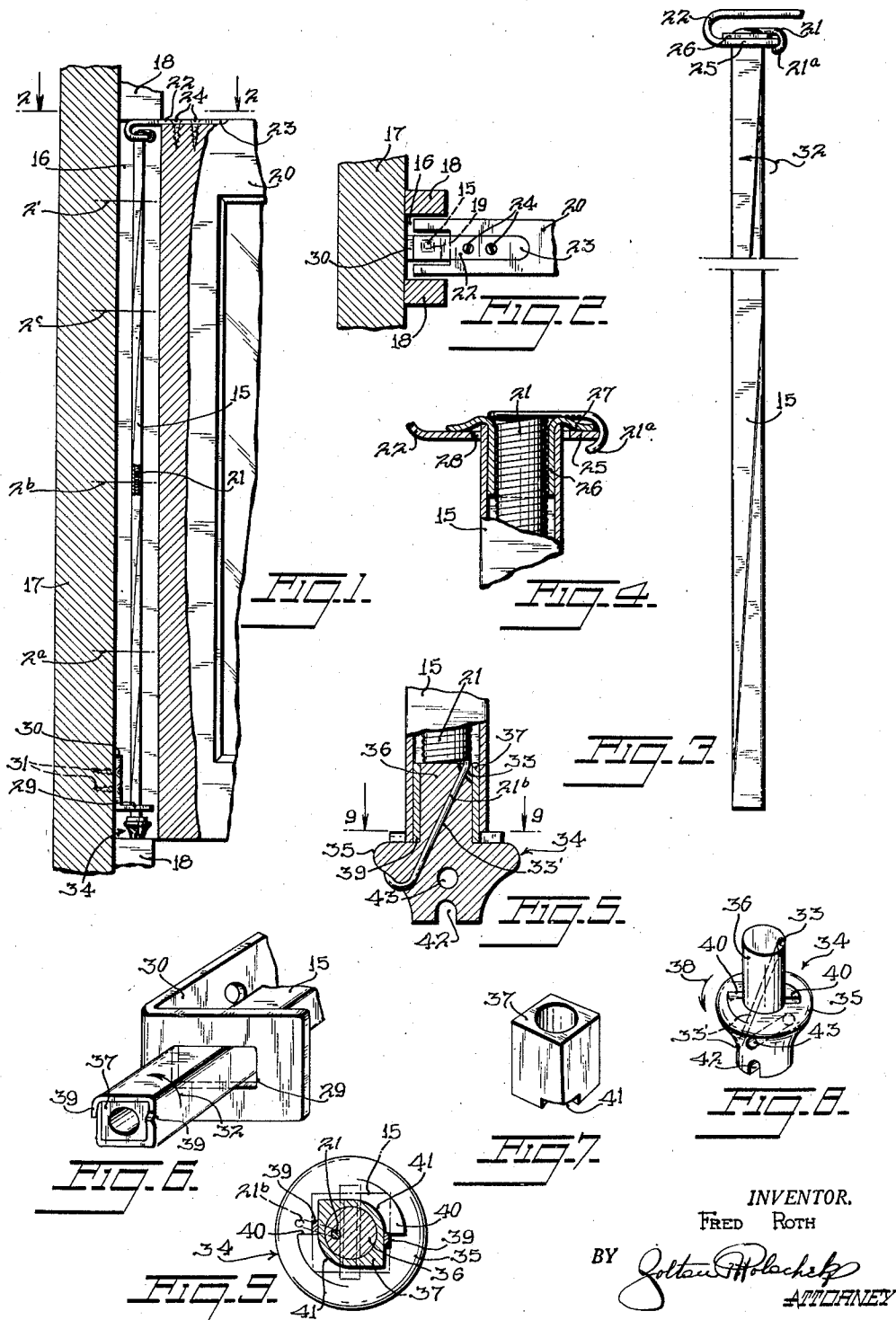
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COUNTERBALANCED SPRING FOR SLIDABLE WINDOWS

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COUNTERBALANCED SPRING FOR SLIDABLE
WINDOWS

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This invention relates to torsion-spring counterbalances for facilitating the lifting, and the cushioning of the drop, of slidable units of some weight such as window sashes.

The invention has been made with the idea of providing improvements in torsion-spring counterbalancing mechanism capable of being readily installed in the case of the ordinary sliding window sash by connection of a part of the counterbalance to such sash and connection of another part of the counterbalance to the window frame, and at the same time to provide a novel and improved torsion-spring counterbalance characterized by the inclusion, among others, of the features now to be mentioned or to become apparent in the course of the detailed description of an embodiment now favored as given below.

Various types of counterbalances of the kind to which the present invention relates have been proposed. These generally have included a torsion-spring housing structure placed in an elongate recess longitudinally extended in the direction of sliding movement of the window sash; this recess being commonly established inwardly from the vertical frame member of the window frame, in a space marked off in part by the frame guides and in part by a longitudinal recess mortised in a vertical marginal portion of the window frame.

All or substantially all of the prior proposals for a torsion-spring counterbalance have comprised a long torsion coil-spring connected to a means for acting to wind up the spring as the sash is lowered and to relieve the tension of the spring as the sash is raised.

A feature of the present invention, preferably in a construction generally of the kind just described, is the provision of a spinnable sleeve within which the spring is housed, with such sleeve closed all around and all along the length thereof, for completely protecting the spring mechanically and for otherwise prolonging its life by preventing its deterioration from dust accumulations or moisture.

Another feature of the invention is to provide such a housing, and at the same time to avoid the use of a convoluted elongate strip for connection to vary the tension of the spring by screw-like motion of said strip relative to the spring housing. Such screw-strip is an unnecessary extra part, and an additional complexity, and, moreover, a problem is presented in that if the strip material of which the extra part is made

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is too thin dependable operation is impossible, whereas if the strip is too thick the weight and cost of the complete device is unnecessarily high, and it has too great bulk, particularly in view of the practicable lateral dimensional limits of the recess having to be provided for affording the device its necessary field of operation.

Another feature of the invention is to provide in the new combination pursuant to the invention, an efficient, simple, dependable and conveniently and readily operable means for adjusting the tension of the spring as, for instance, by means of an ordinary screw driver.

A further feature of the invention in the latter connection is to provide an adjusting means having the advantages stated, yet one which is easy of employment even when it is found that the normal tension of the spring should be relieved, rather than, as most usually will be the case, having to be increased.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawing, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawing forming a material part of this disclosure:

Fig. 1 is a fragmentary view, partially in side elevation and partially in section, of a window frame and a lower sliding sash therein, with a now preferred embodiment of the invention installed, said sash being shown fully raised.

Fig. 2 is a horizontal section, taken on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary side elevational view, on an enlarged scale, of certain parts seen in Fig. 1; this view particularly for showing clearly a characteristic housing pursuant to the invention, it being noted in this connection that the upper and lower portions of the housing here shown correspond, respectively, to that portion of the housing which starts at the top thereof and continues down to the dot and dash line 2' of Fig. 1, and to that portion of the housing which starts at the bottom thereof and continues upward to the dot and dash line 2^a of Fig. 1.

Fig. 4 is a further enlarged vertical sectional detail view, showing the upper end of the housing and an upper bracket taking that end of the housing, to which bracket the upper end of the spring is connected.

Fig. 5 is a similar view, showing the lower end of the housing, and means carried thereby engaged with the lower end of the spring and

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adjustable to modify the tension of the latter, said means here including a ratchet device.

Fig. 6 is also a much enlarged view, this being a bottom perspective partially showing the lower mounting bracket, and also illustrating the bottom end of the housing and a plug element of said means after being partially broken away.

Fig. 7 is a top perspective view, showing said plug element.

Fig. 8 is a similar view, showing another part of said means.

Fig. 9 is a horizontal section, taken on the line 9-9 of Fig. 5.

Referring to the drawings more in detail, the housing 15, a tube of square outline cross sectionally, twisted or extruded to have the spiral or convoluted form shown, has its field of operation in a recess 16 provided in part by the inner side of a side casing of a window frame 17 between a pair of guides 18, and in part provided by the interior walls which result from mortising, as indicated at 19, the adjacent side of a window sash 20.

In a construction such as now will be described, the housing 15 coacts with the other parts to give an ideal counterbalance, when (with the housing about 18" long, of an outside width approximately $\frac{1}{8}$ ", and of a wall thickness of about $\frac{1}{16}$ "), it has the number of complete convolutions, indicated in Fig. 1, as one extending from the bottom of the housing to the dot and dash line 2^a, another from said line to the dot and dash line 2^b, another from the line 2^b to the dot and dash line 2^c, and another from the line 2^c to the top of the housing.

The spring enclosed in the housing 15 is a long coil spring 21, the upper end of which, marked 21^a in Fig. 4, is hooked over an edge portion of an upper bracket 22, which bracket is made of a reversely bent length of strip material the upper or main length of which is set in a groove 23 cut in the top of sash 20 and secured to the sash as by means of screws 24. As will be noted from Fig. 2, the bracket 22 is desirably of a width such that its upper or main length, before being bent down and then inward to continue as a lower and shorter length 25, is of a width sufficient substantially to close the upper end of the recess 16; the bracket 22 being formed, and mounted on the sash 20, however, so as not to scrape against the vertical casing member of the window frame 17.

As shown most clearly in Fig. 4, an ordinary eyelet 26, in non-upset condition, is hung in the top of housing 15 by suspension from the eyelet's flange 27 as such flange rests on the length 25 of the bracket 22. With the upper end of the housing 15 inserted into a circular aperture 28 formed in the shorter length 25 of the bracket 22, and with the eyelet 26 on the bracket 22 and in the housing as just described, the upper end coils of the spring 21 extend through the hollow shank of the eyelet. The diameter of the aperture 28 is equal to the distance from a corner of housing 15 to the diagonally opposite corner thereof.

Before describing a means carried at the lower end of the housing 15, the main components of which means is shown in Fig. 5, it may be explained that one purpose of this means is to lock the lower end of the spring 21 to the lower end of the housing, so that during rotation of the latter, as in the direction shown by the arrow 32 (Figs. 3 and 6) while the sash 20 is being raised, the spring 21 is relieved of tension, and so that during rotation of the housing in the

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opposite direction while the sash is being lowered, the spring is again wound up.

In Fig. 1 it is the lower sash which is illustrated, and the same is shown in its raised position; so that now the housing 15 has completed its rotation in the direction of the arrow 32, and the lower end of the housing is but a short distance below the level of an aperture 29 in a bracket 30. The last referred to rotation of the housing 15 was caused by endwise travel thereof in an upward direction through the aperture 29; and, similarly, during lowering of the sash to its bottom position in the window frame, the housing 15 is rotated in the direction opposite to that of the arrow 32.

The lower end of the spring 21, as shown at 21^b in Fig. 5, is passed into a vestibular milled-out notch 33 and thence through an aperture 33' bored slantwise through a bottom-cap 34 for the housing, below which the spring end is bent into hook engagement with the underside of the main disc-like portion 35 of cap 34.

The cap 34 has an upstanding cylindrical shank 36 rotatably mounted in the cylindrical bore of a plug 37 of square outline cross sectionally and which plug is longitudinally slidably fitted into the interior of the housing 15 at its bottom.

The upper annular surface of the disc-like portion 35 of the cap 34 is drawn up against the bottom of the housing 15 by the tension of the spring 21. This spring tension also acts to hold the plug 37 down in the lower end portion of the housing due to the fact that the bottom convolution of the spring rests on the upper end of said plug.

Also included in the means carried at the lower end of the housing 15 is a ratchet device whereby the cap 34 will become locked after being manually turned in a direction to give a normal tension to the spring 21 to suit the original installation, and to increase the tension of the spring as later may be required at intervals over a long period of use of the counterbalance.

Assume that the direction of turn of the cap 34 to increase the tension of the spring is that indicated by the arrow 38 of Fig. 8. The cap 34, after being given any number of half turns desired, for setting up the desired normal spring tension, will then become locked in its adjusted position, due to the provision at the bottom edge of the housing 15 of a pair of ratchet teeth 39 and a pair of dogs 40 formed on the upper annular surface of the main disc-like portion 35 of cap 34. Such dogs, like the teeth 39, have vertical front abutments or breasts, and tapering backs.

It will be noted that the width of the breasts of the dogs 40 is greater than the widths of the breasts of teeth 39. This is desirable to permit said teeth to be mere bottom prolongations of the housing walls in view of the small wall thickness of the housing.

In order to provide clearway passages through the plug 37 for the dogs 40 during turning of the cap 34, diagonally opposite corner portions of said plug at its bottom are cut away as shown at 41 in Figs. 7 and 9.

Cap 34 below its main disc-like portion 35 is continued downward by a reduced extension having a kerf 42, for application of a screw driver to turn the cap 34 in a direction to add tension to the spring 21.

Should it ever be required manually to relieve the tension of the spring 21, a hooked tool (not

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shown) may be used to pull the cap 34 downward sufficiently relative to the housing 15 to clear the dogs 40 from the teeth 39, for reverse turning of the cap. A transverse hole 43 is bored through the cap, as shown in Figs. 5 and 8, to allow use of the tool just described.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. In a window counterbalance having a hollow tube square in cross-section rotatively supported at its top end within a recess formed along the side of a window sash and having its bottom end slidably projected through a square opening formed in a bracket mounted on a window frame alongside the sash to cause the tube to be rotated in one direction and the other as the sash is raised and lowered and a coil spring within the tube to be tensioned when the sash is lowered and relieved of its tension when the sash is raised, means for adjustably connecting the lower end of the spring to the lower end of the tube so that the starting tension on the spring can be adjusted, comprising a plug square in cross-section disposed in the lower end of the tube and formed with a concentric circular hole, a cap formed with a top circular shank rotatively extended into said circular hole, said cap being formed with an aperture within which the bottom end of said spring is secured to cause the spring to be wound up when the cap is manually turned in one direction, means facilitating rotation of said cap in a direction to wind up said spring, and means releasably holding said cap in a desired rotative position in which said spring will be properly tensioned.

2. In a window counterbalance having a hollow tube square in cross-section rotatively supported at its top end within a recess formed along the side of a window sash and having its bottom end slidably projected through a square opening formed in a bracket mounted on a window frame alongside the sash to cause the tube to be rotated in one direction and the other as the sash is raised and lowered and a coil spring within the tube to be tensioned when the sash is lowered and relieved of its tension when the sash is raised, means for adjustably connecting the lower end of the spring to the lower end of the tube so that the starting tension on the spring can be adjusted, comprising a plug square in cross-section disposed in the lower end of the tube and formed with a concentric circular hole, a cap formed with a top circular shank rotatively extended into said circular hole, said cap being formed with an aperture within which the bottom end of said spring is secured to cause the spring to be wound up when the cap is manually turned in one direction, means facilitating rotation of said cap in a direction to wind up said spring, and means releasably holding said cap in a desired rotative position in which said spring will be properly tensioned, and a disc-like portion formed on said cap beneath said circular shank engaging the bottom of the tube preventing said cap from being drawn into the tube under the tension of the spring.

3. In a window counterbalance having a hol-

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low tube square in cross-section rotatively supported at its top end within a recess formed along the side of a window sash and having its bottom end slidably projected through a square opening formed in a bracket mounted on a window frame alongside the sash to cause the tube to be rotated in one direction and the other as the sash is raised and lowered and a coil spring within the tube to be tensioned when the sash is lowered and relieved of its tension when the sash is raised, means for adjustably connecting the lower end of the spring to the lower end of the tube so that the starting tension on the spring can be adjusted, comprising a plug square in cross-section disposed in the lower end of the tube and formed with a concentric circular hole, a cap formed with a top circular shank rotatively extended into said circular hole, said cap being formed with an aperture within which the bottom end of said spring is secured to cause the spring to be wound up when the cap is manually turned in one direction, means facilitating rotation of said cap in a direction to wind up said spring, and means releasably holding said cap in a desired rotative position in which said spring will be properly tensioned, and a disc-like portion formed on said cap beneath said circular shank engaging the bottom of the tube preventing said cap from being drawn into the tube under the tension of the spring, said holding means comprising ratchet teeth formed on the bottom end of the tube and facing said disc-like portion, and dogs formed on said disc-like portion and engaging said ratchet teeth so as to freely ride over said teeth when said cap is turned in a direction to wind up the spring.

4. In a window counterbalance having a hollow tube square in cross-section rotatively supported at its top end within a recess formed along the side of a window sash and having its bottom end slidably projected through a square opening formed in a bracket mounted on a window frame alongside the sash to cause the tube to be rotated in one direction and the other as the sash is raised and lowered and a coil spring within the tube to be tensioned when the sash is lowered and relieved of its tension when the sash is raised, means for adjustably connecting the lower end of the spring to the lower end of the tube so that the starting tension on the spring can be adjusted, comprising a plug square in cross-section disposed in the lower end of the tube and formed with a concentric circular hole, a cap formed with a top circular shank rotatively extended into said circular hole, said cap being formed with an aperture within which the bottom end of said spring is secured to cause the spring to be wound up when the cap is manually turned in one direction, means facilitating rotation of said cap in a direction to wind up said spring, and means releasably holding said cap in a desired rotative position in which said spring will be properly tensioned, said cap being formed at its bottom end with a kerf into which a screw driver may be inserted forming the means facilitating rotation of said cap.

5. In a window counterbalance having a hollow tube square in cross-section rotatively supported at its top end within a recess formed along the side of a window sash and having its bottom end slidably projected through a square opening formed in a bracket mounted on a window frame alongside the sash to cause the tube to be rotated in one direction and the other as the sash is raised and lowered and a coil spring within the tube to

be tensioned when the sash is lowered and relieved of its tension when the sash is raised, means for adjustably connecting the lower end of the spring to the lower end of the tube so that the starting tension on the spring can be adjusted, comprising a plug square in cross-section disposed in the lower end of the tube and formed with a concentric circular hole, a cap formed with a top circular shank rotatively extended into said circular hole, said cap being formed with an aperture within which the bottom end of said spring is secured to cause the spring to be wound up when the cap is manually turned in one direction, means facilitating rotation of said cap in a direction to wind up said spring, and means releasably holding said cap in a desired rotative position in which said spring will be properly tensioned, said cap being formed with a transverse hole with which a hooked tool can be engaged for drawing downward on said cap to release said holding means to free said cap to be turned in a direction to relieve the tension on the spring.

6. In a window counterbalance having a hollow tube square in cross-section rotatively supported at its top end within a recess formed along the side of a window sash and having its bottom end slidably projected through a square opening formed in a bracket mounted on a window frame alongside the sash to cause the tube to be rotated in one direction and the other as the sash is raised and lowered and a coil spring within the tube to be tensioned when the sash is lowered and re-

lieved of its tension when the sash is raised, means for adjustably connecting the lower end of the spring to the lower end of the tube so that the starting tension on the spring can be adjusted, comprising a plug square in cross-section disposed in the lower end of the tube and formed with a concentric circular hole, a cap formed with a top circular shank rotatively extended into said circular hole, said cap being formed with an aperture within which the bottom end of said spring is secured to cause the spring to be wound up when the cap is manually turned in one direction, means facilitating rotation of said cap in a direction to wind up said spring, and means releasably holding said cap in a desired rotative position in which said spring will be properly tensioned, said holding means comprising ratchet teeth formed on the bottom end of the tube, and dogs formed on said cap and engaging said ratchet teeth to restrain rotation of the cap in a direction to unwind the spring while permitting free rotation of the cap in a direction to wind the spring.

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