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SPRING COUNTERBALANCE

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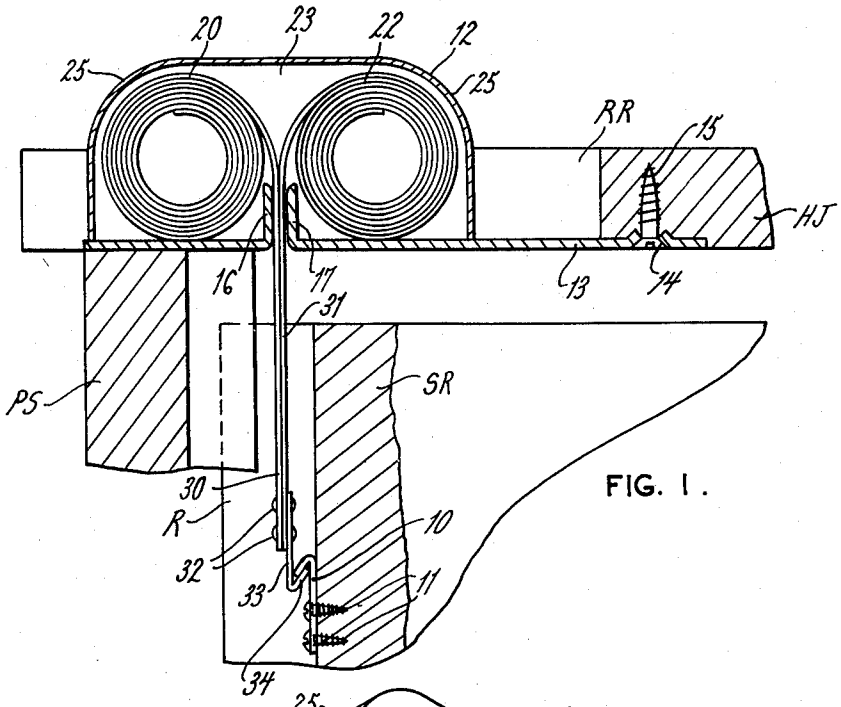

FIG. 1.

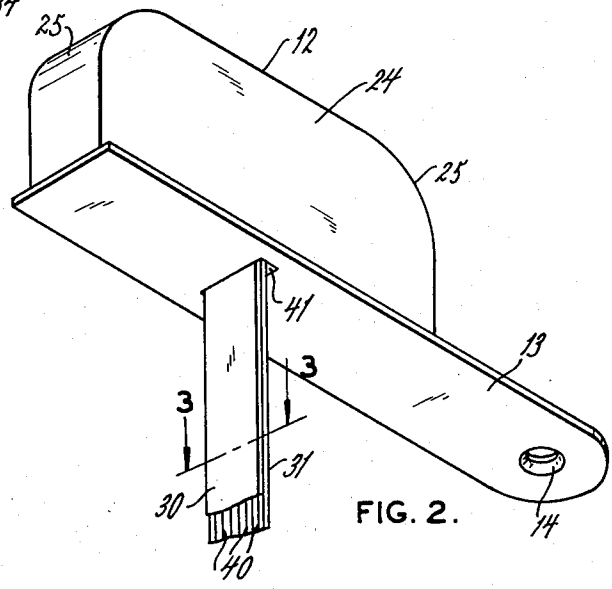

FIG. 2.

FIG. 3.

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SPRING COUNTERBALANCE

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6 Claims. (Cl. 16—197)

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This invention relates to improvements in spring elements for balances, and more particularly to a spring counterbalance assembly for sliding window sash.

Currently available balancing means for sliding window sash employ coil springs, usually a single such spring, suitably enclosed, being located adjacent the sashway structure, and the spring attached as by a flat metal tape, to a point of operative connection with the sash. Prevalent spring units for this purpose require an inordinate space externally of the head jamb or the frame structure, often entailing considerable labor for the removal of masonry, plaster, or other wall materials in order to provide a pocket adequate to accommodate the spring housing. Other recognized shortcomings of prevalent spring counterbalances, include a substantial variation in spring loading between open and closed positions of the sash served by the spring. Still other prevalent difficulties with spring counterbalances now available to the trade, include a likelihood of breakage of either or both the spring and the connecting tape. It is accordingly a principal and general objective of the present developments to obviate, or at least to minimize the shortcomings noted.

There have heretofore been produced for certain other special fields of usage, coil springs of a flat or nearly flat metal stock characterized by registering convolutions, and by an almost uniform pull whether the spring coil be nearly fully wound, or nearly completely unwound. Springs of this type are sometimes referred to as compensating springs. However, the extended lengths of springs of this type exhibit a tendency to assume a bowed aspect, and under other conditions exhibit a tendency to twist, i. e., to curl about the longitudinal axis of the extended spring strip. These factors have rendered compensating types of spring not too well suited for use in counterbalancing window sash. Accordingly, a further and important object of the present invention is realized in a spring assembly such as will enable the use of compensating-load springs in a manner to maintain in substantially planar relation, that length of the spring or springs extended into the sashway.

A further objective improvement, reflected in a lower assembly cost and minimum service requirements, lies in the use of a plurality, usually a pair, of compensating springs, in adjacence but in relatively reversed mutual relation.

A further advantage, realized in an advanced

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embodiment of the present invention, consists of improved provisions which may be integral with the spring elements per se, for maintaining adjacent lengths of the compensating spring strip in mutual registry. This phase of the improvements applies both to the extended spring lengths, as well as to the adjacent convolutions thereof.

The foregoing and numerous other objectives and advantages will more clearly appear from the following detailed description of a currently preferred embodiment of the invention, particularly when considered in connection with the accompanying drawing, in which:

Fig. 1 is a vertical sectional elevation, the sectional portions of which are taken lengthwise through a horizontally disposed spring housing, located in the upper left hand portion of a sliding window sash assembly, and showing one manner of connection of the counterbalance spring means to the sash;

Fig. 2 is an elevational view in perspective, of a balance spring unit embodying the present improvements, as same would appear out of assembly with the window frame structure, the extended spring ends or tapes being partly broken away for clarity of certain features, and

Fig. 3 is a transverse sectional view of the connecting spring ends or tapes, particularly as viewed along line 3—3 of Fig. 2.

Referring now by characters of reference to the drawing, and first to Fig. 1, there is indicated at SR an upper portion of a sash rail, the sash for brevity of present description being considered as conventional, and provided with a vertical rout or groove R, secured to the inner face of which is one element 10 of a detachable tape or spring connector, attached as by screws 11.

It will be understood that the sash may be slidably guided by and between the adjacent pulley stiles, beads and other fixed elements, herein referred to collectively as constituting the sashway. A fragmentary part of the pulley stile is indicated at PS, and horizontally at the top of the window frame structure is a head jamb HJ, which is or may be regarded as conventional.

For mounting of the spring counterbalance assembly, the head jamb is provided with a rectangular aperture RR, into which is interfitted the spring housing 12. This housing or casing may be formed of pressed sheet metal, and is suitably attached, as by welding, to a base or mounting plate 13. This base element is of greater area than the opening RR, so as to provide a bottom closure for the opening RR as well

as a support for the spring housing and contents. Plate 13 is provided with one or a plurality of screw openings 14 to receive a mounting screw or screws 15 engaging the head jamb.

The casing 12, with advantageous distinction over prevalent spring balance assemblies, is of a horizontally elongate proportion. This design considerably minimizes the amount of wall material sometimes needed to be removed above the head jamb, in order to accommodate the spring assembly. As will appear from Fig. 1, the height of the member 12 above the jamb need be of no more than the usual thickness of the latter. This factor is of cost importance, particularly in case a brick wall or one of concrete, tile and other ceramic materials must be drilled or cut away to accommodate the spring assembly.

As will best appear from Fig. 1, plate 13 is provided with a pair of spaced, vertical, internal flanges 16 and 17, the spacing of which is such as to form therebetween a rectangular guide passage for the paired tapes, later described, issuing through such passage into the sashway.

Within the casing 12—13 are located a pair of coil springs 20 and 22, each of which is formed of a single length of a substantial flat metal stock of suitable temper. It will be noted from Fig. 1, that the arrangement of these springs (which may in structure be identical) is such that if viewed from a given side of the casing, the two are relatively reversed.

Thus the spring 20 may be considered in Fig. 1 as a clockwise spring, while the companion spring 22 may be considered counterclockwise. Both springs are mounted in floating relation within housing 12—13, i. e. no part of either spring is anchored or attached to a pivot pin, arbor or winding drum, the spring action and loading being in the present embodiment derived entirely from the tendency of the springs to recoil when the convolutions are extended. It should be understood, however, that it is expressly within the intendment of the present developments to utilize, under certain special conditions, a pair of conventional springs in a relatively reversed juxtaposed relation.

The inside spacing of the two sides of the casing 12, indicated at 23 and 24, conforms somewhat closely to the width of the springs, yet with sufficient working clearance between the sides of the coils and the inside faces of the sides of member 12. Thus, as the spring ends are retracted, or as they issue from the enclosure, those portions of the springs within the housing are guided to registering relation, and are substantially in the same plane at all times.

It is a further preference, substantially as shown in Fig. 1, to form the upper end portions of member 12 of arcuate contour as indicated at 25, these portions being curved on radii substantially the same as the normal radius of each wound spring. From this it will appear that each of the springs 20 and 22 is substantially positioned solely by external guidance, so that it operates about a substantially fixed center. This effect is derived by the rounded portions 25 and flanges 16 and 17, as well as other parts of the casing.

It is, of course, possible to realize certain of the advantages of the present counterbalance spring assembly by attaching to the ends of the springs proper, a pair of metal tapes (not shown). Such tapes would be utilized in the same relation, and kept in registry as are the end elements of the springs 20 and 22.

For brevity of present disclosure the extended end portions 30 and 31, while serving as metal connecting tapes, are shown as integral extensions of the spring strip stock, and so function in those lengths which are withdrawn from the casing 12—13.

It is a preference to attach together in an outer end region, the tape or spring elements 30—31, as by one or more rivets 32. As shown, the members 32 also serve to attach to both of the tapes a hook-shaped connector element 33, the hook end 34 of which engages a corresponding relatively inverted hook of the connector element 10. Thus the parts 10 and 33, each of about the width of the tapes or spring ends 30—31, coact to provide a quick-detachable connection between the springs and the sash member SR. This feature is of particular advantage in a removable sash assembly so as to permit retention and anchorage of the spring or tape ends in a position readily to re-engage the removed sash, upon re-application thereof to the sashway.

The springs 20 and 22 are shown, but without restriction, as of compensating-load type, so as to exhibit a nearly uniform sash-lifting effort, whether the sash be raised or lowered. Springs of this type which are available to the trade for other purposes, are usually of a concavo-convex strip section, and are wound with the convex side toward the outside of the coil. Thus, as the paired strips are withdrawn, they will issue in a back-to-back or face-to-face relation as shown by Fig. 3. In utilizing a single spring of this type, mounted for assembly as is spring 20, the issuing end of the strip will tend markedly to bow inwardly toward the center of the sash or sashway. Such unsightly and undesirable deformation results in interference with the moving parts, particularly in window units of certain special construction. Likewise, springs of this type frequently, when used singly, exhibit a tendency to twist about the longitudinal axis of the strip. Both of the noted deforming tendencies are fully overcome by utilizing the paired springs with extended ends in registering, contiguous relation, as shown. The bowing tendency of each spring is in an opposite direction to that of the other, and any twisting tendency of either is directly compensated for by the opposite effect of its companion. Thus the paired springs, possessing all advantages of spring elements of compensating load type, will nevertheless operate at all times in a vertical plane and without distortion.

A further improvement tending to maintain the registering relation of the extended lengths of spring or strip, appears in Fig. 2. The mating faces of the springs 30—31 are each provided for this purpose with a plurality of slightly spaced, parallel, longitudinal, score lines, this formation being indicated at 40 (Fig. 2). These patterns of lengthwise indentation act to prevent lateral slippage of either tape away from the other. The registry of the spring or tape ends 30 or 31 is further promoted by the guiding effect of the opposite ends of the rectangular port and passage 41, Fig. 2, which results from the spacing of flanges 16 and 17 above described.

It is perhaps a more prevalent practice to locate a spring counterbalance in and above the head jamb, as shown and described herein. However, in certain installations, these units may be mounted in one of the vertical stiles, with equal advantages.

The operation of the device is thought to have become fully apparent from the foregoing descrip-

tion of the elements of a preferred embodiment, but it may be noted for completeness, that the characteristics of the paired springs 20 and 22 are such that they will closely counterbalance the associated sash. Now obviously, as the sash is lowered, the strip ends 30—31 will be extended pro tanto, and the successive turns of both springs 20 and 22 will be unwound, there being a certain frictional resistance between adjacent unwound turns of each spring, due to the tendency of these turns to coil and constrict themselves. As the sash is again raised, the opposite action will take place, and as the extended ends 30—31 are retracted into the housing, the springs again assume about the proportion and relation of the convolutions, as shown by Fig. 1.

It will, of course, now be obvious that the provision of the springs in pairs connected to the sash at a common point, provides a desirable reserve in that, if either spring should break or become disconnected for any reason, the remaining spring will still provide a partial balancing load on the sash.

Although the improvements have been described by detailed reference to a single preferred embodiment, the detail of description should be understood in an instructive, rather than in any limiting sense, numerous variants being possible within the fair scope of the claims hereunto appended.

We claim as our invention:

1. In a counterbalance assembly for a sliding window sash, a pair of springs of convolute character, a housing of horizontal elongate character for the springs adapted for mounting close to a sashway serving the window sash, the housing being so formed as to enclose both springs in a substantially co-planar relation, said springs being disposed in relatively reversed positions, the springs including unwound portions which are withdrawable from the housing into the sashway in registering adjacence, detachable connecting means common to the springs for engagement thereof with the sash, the springs being secured together in the region of said sash connection, said springs being of compensating-load type so as to exert a substantially uniform force to the sash at all times, the unwound portions of said springs being operable in a straight planar relation so as to constitute a straight connecting tape.

2. In a counterbalance for sliding window sash, a pair of adjacent coil springs, a horizontally elongate spring housing adapted for fixed location adjacent the sashway, the springs being disposed in relatively reversed positions in said housing, and being connected together at their leading ends, each spring being disposed in floating relation in said housing, a common connector serving the springs for detachable securement thereof to a sliding sash, the springs being so arranged in the housing as to be withdrawable therefrom into the sashway, with the withdrawn lengths of the springs substantially contiguous relation, said springs being of compensating-load type so as to exert a nearly uniform sash-lifting effort to said sash in any position the withdrawn lengths of the springs being operable in a vertical plane, and serving as a straight tape in the sashway.

3. In a spring counterbalance for sliding sash, a horizontally elongate spring housing for location adjacent the path of movement of the sash, a pair of springs of a closely wound convolute character, and each of a concavo-convex cross-section, the springs being disposed in floating relation and in relatively reversed positions within the housing, the springs including unwound portions which are withdrawn from said housing in contiguous relation into the sashway, and a connection common to the springs for attachment thereof to a sliding sash, said springs being of compensating-load type so as to exert a nearly uniform pull to the sash at all times, the unwound portions of said springs being operable in a substantially vertical plane, whereby to serve as a straight tape.

4. A spring counterbalance assembly adapted for sliding window sash, and consisting of a pair of coil springs disposed in relatively reversed positions, a horizontally elongate housing for the springs, for location adjacent a sashway serving the sash, and from which housing the unwound portions of the springs may be withdrawn in contiguous relation, the said springs being of a slightly curved cross-section, each of said springs including a free end portion, such end portions being attached to each other in back-to-back relation, and a connection serving both said spring ends, for attachment thereof to the sash, the springs being of compensating-load type so as to exert a nearly uniform pull to the sash at all times, the unwound portions of said springs being operable in a substantially vertical plane.

5. In a spring counterbalance assembly adapted for use in connection with a sliding window sash and structure forming a sashway therefor, a spring housing including a mounting plate arranged for disposition close to the plane of the lower surface of the head jamb, the housing being of a horizontally elongate character, and of substantially lesser height than length; a pair of closely wound convolute metal springs disposed in the housing and floatingly arranged therein, the springs being of a compensating-load type, said mounting plate being provided with a spring port in the lower portion of the spring housing, through which port the free ends of the springs may issue into the sashway, a pair of spaced guide flanges projected upwardly of said plate and into the housing, the paired springs being relatively oppositely disposed in respect to the housing, the springs each being formed of a strip stock of tempered character and each of a concavo-convex cross-section, the arrangement of springs being such that the unwound portions thereof issuing through said port, are adapted to enter the sashway in back-to-back relation, and are adapted to operate in a vertical plane in said sashway; and a connector for attachment of the springs to the sash served thereby, the compensating springs cooperating to exhibit a nearly uniform sash-lifting effort in any position of said sash.

6. In a spring counterbalance assembly adapted for use in connection with a sliding window sash and structure forming a sashway therefor, a spring housing adapted for attachment to the head jamb of the sliding sash assembly, and including a mounting plate apertured for mounting screws, said plate being arranged for disposition close to the plane of the lower surface of the head jamb, the housing being of a horizontally elongate character, and of substantially lesser height than length; a pair of closely wound convolute metal springs of compensating-load type disposed in the housing and floatingly arranged therein so as to be free for winding and unwinding actuation devoid of restraint by any part of the housing, said mounting plate being provided with a spring port substantially midway of the length and in the lower portion of the spring housing,

through which port the free ends of the springs may issue into the sashway, a pair of spaced guide flanges projected upwardly of said plate and into the housing between said springs, the paired springs being relatively oppositely disposed in respect to the housing in such manner that one spring is of clockwise character and the other said spring counterclockwise, the springs each being formed of a strip stock of tempered character and each of a concavo-convex cross-section, the arrangement of springs being such that the unwound portions thereof issuing through said port, are adapted to enter the sashway in close parallel adjacence, in mutual register, and in back-to-back relation; the free ends of the springs being secured together, and a connector for attachment of the springs to the sash served thereby.

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