Feb. 6, 1951 L. A. MACKLANBURG ET AL 2,540,746

SASH BALANCE MECHANISM

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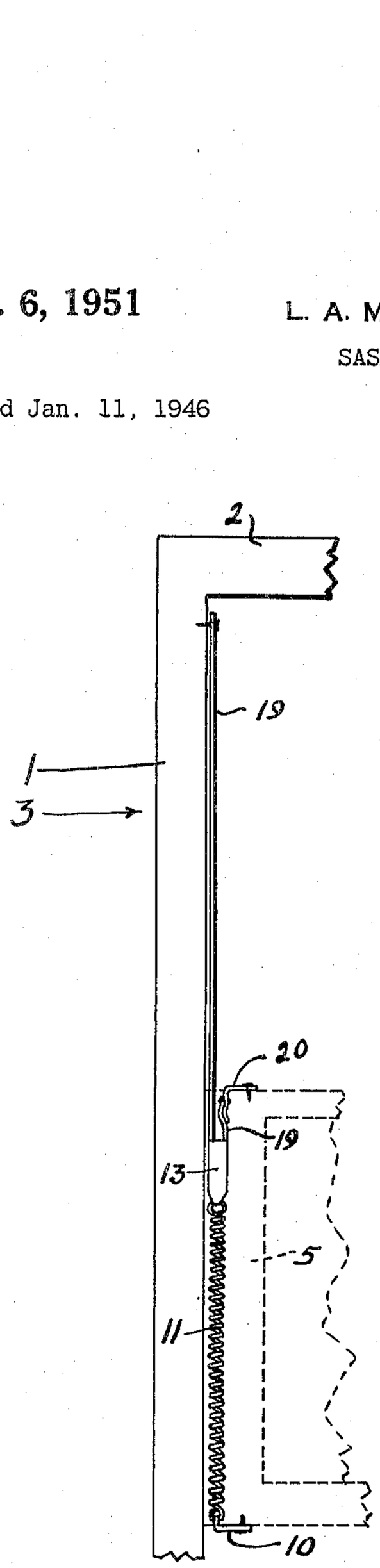

FIG. 1

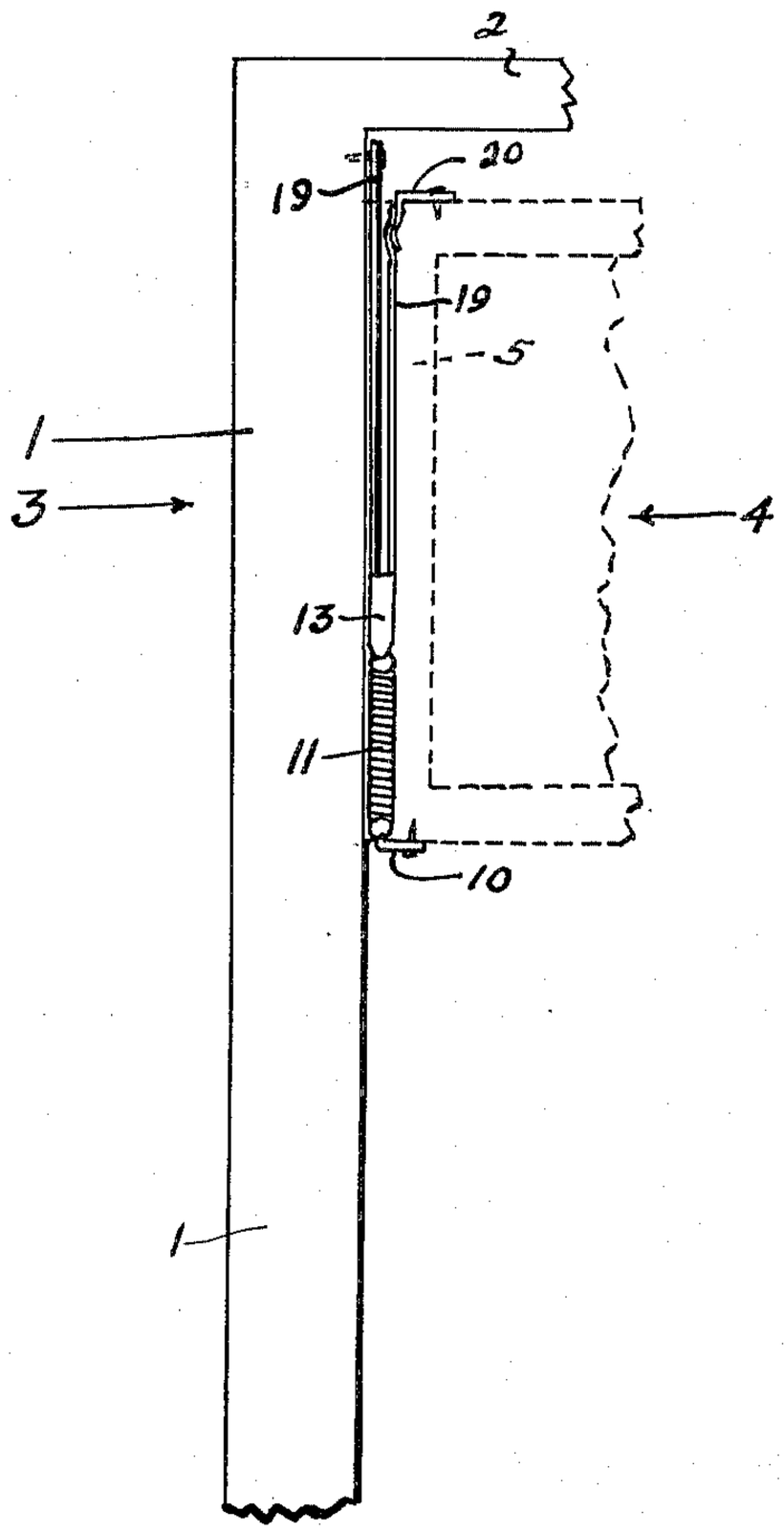

FIG. 2

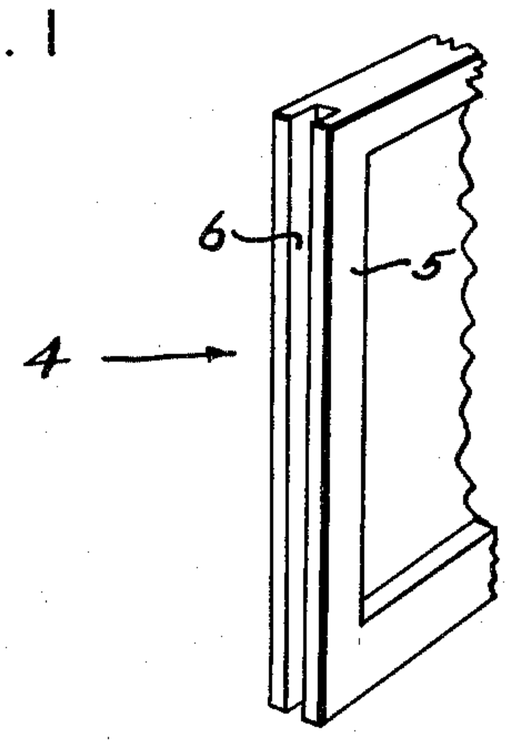

FIG. 3

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SASH BALANCE MECHANISM

Filed Jan. 11, 1946 2 Sheets-Sheet 2

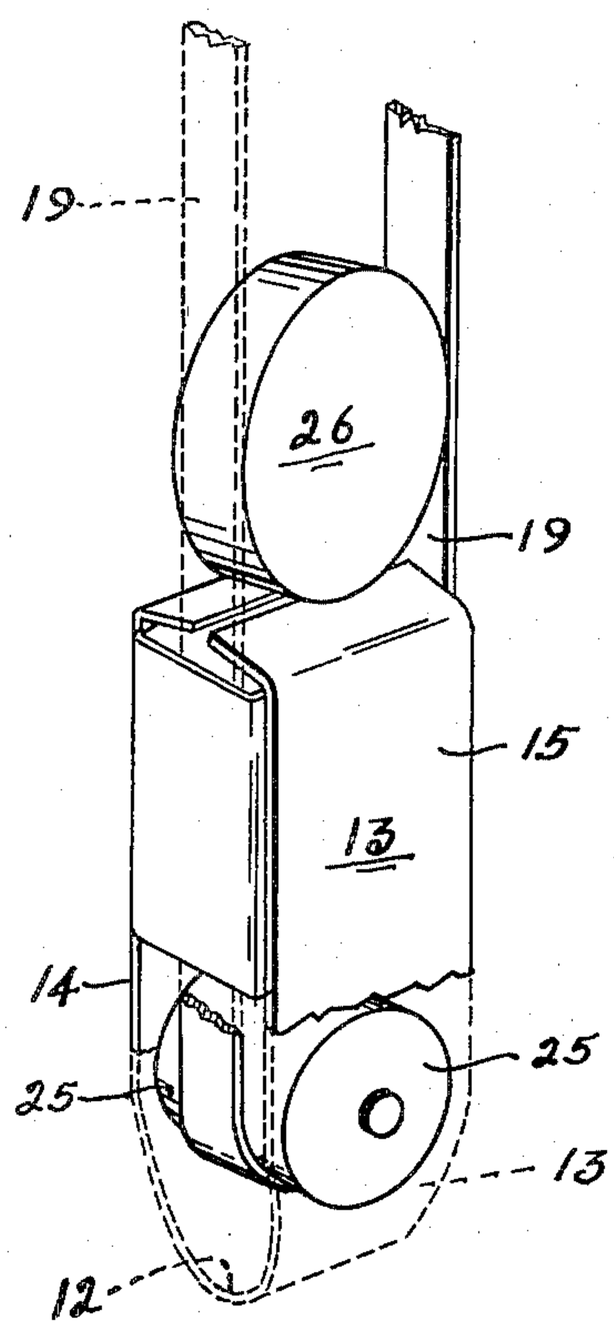

FIG. 5

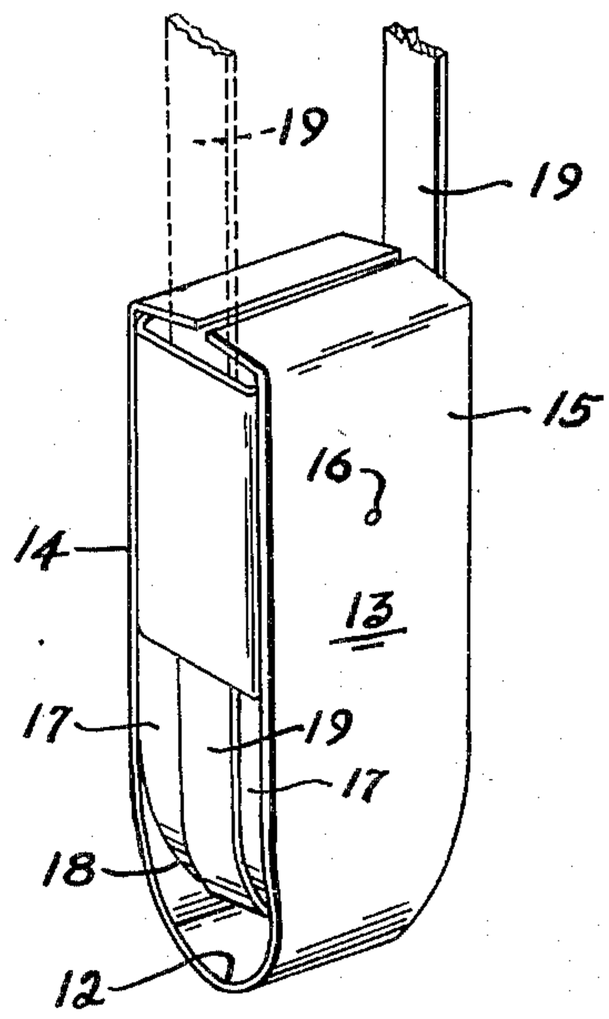

FIG. 4

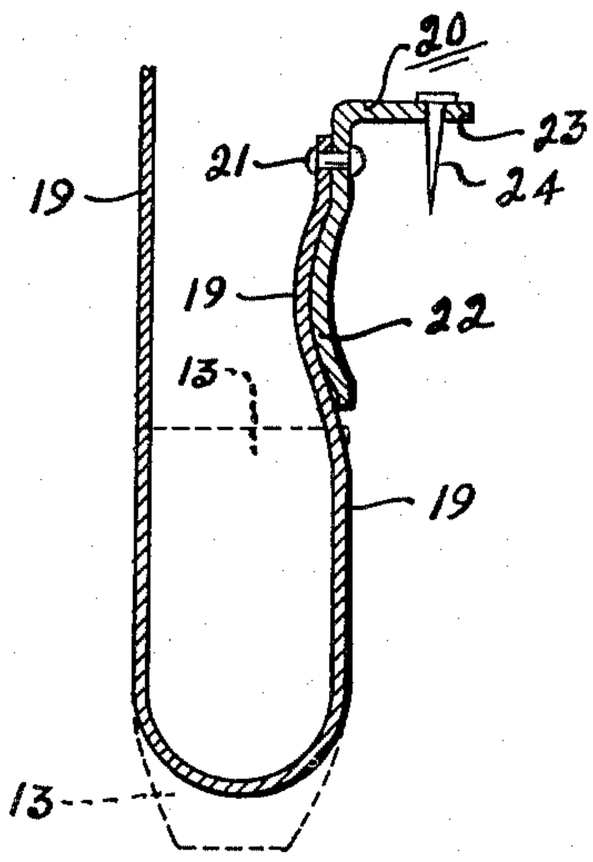

FIG. 6

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SASH BALANCE MECHANISM

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2 Claims. (Cl. 16—197)

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My invention relates to apparatus for balancing, or in other words for automatically holding adjustably stationary, vertically slidable window sashes.

The mechanism of the present invention is intended to supplant the conventional sash-cord, sash-pulleys and sash weights, and to consequently eliminate the necessity of the usual sash weight channels in the window frame.

A principal object of the invention is to provide a mechanically operated sash balancing mechanism, which is operatively housed within a longitudinal furrow or groove ploughed in the vertical edge of the sash.

Another object is to provide a mechanism of this class which is simple to install, has few moving parts to become worn or to get out of order, and which is comparatively cheap to manufacture.

In the past, there have been automatically operated sash balancing mechanisms which rely upon springs to supplant the usual sash weights. Some such mechanisms rely upon "long-stretch" coiled springs to overcome or support the weight of the sash. Others have used laterally movable spring loaded plates or plungers to retard movement of the sash through friction. The present invention falls more or less under the first classification, since it balances the weight of the sash through the use of a helical spring. However, the present invention overcomes some of the impractical features found in most spring balances of non-frictional type.

In most sash balances of this class, the coil spring must be capable of stretching a distance substantially equal to the permitted travel of the sash. The result is that there is either a lack of sufficient spring tension at one end of the travel, or excessive tension at the other end, or both.

It is an object of the present invention to so mount a coil spring with relation to a sash, that the spring only stretches a distance substantially equal to one-half of the sash travel, and in which the point at which the spring is anchored to the window frame, is automatically shifted during movement of the sash, so as to partially compensate for the additional spring tension entailed by the elongation of the spring.

A further object is to provide a sash balance of the type described, wherein a means is provided for breaking movement of the sash in the direction in which the spring exerts its force, when such force is at its peak, and for automatically relieving such braking action when such force is lessened.

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Another object is to provide a spring sash balance of the type above disclosed, which may be installed without removing the sash from the window frame.

Other objects will be apparent from the following description when taken in conjunction with the accompanying two sheets of drawings, wherein:

Figure 1 is a fragmentary elevational view of the balance mechanism operatively installed between a window frame and a vertically slidable sash, the sash being shown in dotted lines at the lower end of its permitted travel;

Figure 2 is a similar view showing the sash at the upper end of its permitted travel;

Figure 3 is a fragmentary perspective view showing a sash provided with a vertical groove in one edge for operatively receiving the balance mechanism;

Figure 4 is an enlarged detail of a traveling friction block used in one embodiment of the invention;

Figure 5 is a similar view showing a different embodiment of traveling friction member; and

Figure 6 is an enlarged vertical sectional view detailing a portion of the mechanism.

Like characters of reference designate like parts in all of the figures wherein they occur.

In the drawings:

The reference numeral 1 indicates the vertical side member, and 2 indicates the horizontal top member of a usual window frame, which is indicated as a whole by the numeral 3. The reference numeral 4 indicates, as a whole, a typical window sash which is mounted in a conventional manner for vertical movement between two of the side members 1 of the window frame 3. In order to adapt the window frame and sash to accommodate the balancing mechanism of the present invention, the only requirement is that the outer edge of the vertical side rail 5 of the sash 4 be provided with an elongated groove 6 which extends throughout the entire length of the rail, and has open upper and lower ends as shown (Fig. 3).

The sash balance mechanism, per se, of the present invention, includes:

An angle fitting 10, which is anchored to the lower end of the sash rail 5, has an up-turned end extending outwardly into the open lower end of the groove 6. A helical retrieving spring 11 lies within the groove 6 and has its lower end attached to the fitting 10. The upper end of the spring 11 is attached to the lower looped end 12 of a sheet metal stirrup or cage 13, having flat sides 14 and 15. Between the sides 14 and

15 is anchored, by a pin 16, a solid block 17 having a cylindrically rounded lower end portion 18 (Fig. 4). The block 17 may be of any suitable material such as wood, plastic or metal, and the stirrup 13 and block 17 are sufficiently small in cross-sectional dimension to freely move upwardly and downwardly in the groove 6. The stirrup 13 and block 17 might well be termed a "traveling block."

With one of its ends attached firmly to the window frame member 1 adjacent the top member 2, is a ribbon-like flexible member 19 which extends downwardly along the frame member 1, passes through the stirrup 13 beneath the rounded lower end 18 of the block 17, passes upwardly in the groove 6 in the sash 4, and is attached by a fitting 20 (Fig. 6) to the upper end of the sash. The flexible member 19 may be of any suitable material such as annealed metal, woven fabric or leather, and its end is preferably attached to the fitting 20 by a rivet or rivets 21.

The fitting 20 is preferably made of resilient or spring metal, and has a depending arcuate or bowed portion 22 which lies in the sash groove 6. The fitting 20 also has a flat horizontal portion 23, which lies upon the upper end of the sash rail 5 and is attached thereto by a nail 24. The flexible member 19, therefore, is resiliently held in spaced relation to the valley surface of the groove 6 by the bowed portion 22 of the fitting.

When the sash is at, or is adjacent the upper end of its travel (Fig. 2), the spring 11 is in substantially collapsed condition, although the flexible member 19 remains taut due to the action of the spring. The sash is there held stationary. As the sash is lowered, the block 17 which is suspended in the lower looped portion of the member 19, moves downwardly a distance approximately one-half of the distance moved by the sash. During this movement of the sash, the spring elongates approximately one-half of the distance the sash travels. The spring of the present invention therefore is never required to stretch a distance greater than one-half the maximum distance the sash is permitted to travel. This arrangement eliminates excessive spring tension when the spring is at its fullest elongation. The arrangement also eliminates the necessity of manually overcoming excessive spring tension during downward movement of the sash. The maximum required stretch of the spring is illustrated in Fig. 1.

Since the spring tension is the greatest when the sash is at the lower end of its travel, there might be a tendency for light weight sash to be unseated by this tension. This tendency is defeated by the bowed portion 22 of the fitting 20. The portion 22 acts to urge the stirrup 13 toward wedging engagement with the window frame member 1, as the fitting 20 approaches the stirrup. Friction is therefore supplied where the spring is at its tightest.

While the drawings and the above description have dealt with the installation and operation of the device upon only one side of the sash, it is to be understood that in most cases a similar installation will be made on the opposite side thereof. The two devices operating in unison make it possible to utilize lighter springs than would be necessary should only one spring be used.

In Figure 5 is illustrated a slightly different embodiment or form of "traveling block" than that shown in Fig. 4.

In the embodiment of Fig. 4, the flexible member 19 slides around the lower end of the solid

block 17, and the friction of the member around the block 17 tends to stabilize the sash against being moved upwardly by the spring from a stationary position.

In the embodiment of Fig. 5, a cylindrical roller or sheave 25 is journalled for rotation in the side members 14 and 15 of the stirrup, and the flexible member 17 is passed beneath this roller. This arrangement eliminates the frictional wear of the block 17 and the flexible member 19 which is encountered in the embodiment of Fig. 4. However, the desirable sash stabilizing friction is also eliminated.

As a means for providing this desired sash stabilizing friction, a cylindrical body 26 of elastic or resilient material, such as rubber, is placed above the stirrup 13 between the two vertical extents of the flexible member 19. The body 26 is of slightly greater diameter than that of the roller 25, and therefore it assumes a slightly ovate form when placed in position as shown. The body 26 is not anchored in any manner, but is confined to its position only by the presence of the sides of the groove 6 in the sash.

When the sash is moved vertically, the flexible member 19 simultaneously bears against the opposite sides of the body 26, with one extent of the member 19 travelling upwardly and the other moving downwardly. Since the body 26 was forced to assume an ovate form when placed between the two extents of the flexible member 19, it maintains a constant frictional engagement with the member 19. Simultaneous movement of the two extents of the member 19 therefore have a kneading action upon the body 26 with the inherent resilience of the material of the body constantly resisting the deformation thereof. The inherent resistance of the body 26 to its own deformation exerts a braking action against the free movement of the flexible member 19, and consequently against free vertical movement of the sash.

Obviously the embodiments of the invention above disclosed could be modified to some extent without defeating the utility of the invention, and I therefore do not wish to be confined to only such structure as that described hereinabove and shown in the drawings, further than I am limited by the scope of the appended claims.

I claim:

1. In a sash balancing mechanism adapted for use in a window frame having a vertically slidable window sash therein, said sash balancing mechanism comprising: a flexible ribbon-like member having one end attached to the upper portion of the frame, and having its other end connected to the upper portion of the sash with slack in the member provided intermediate said ends; a helical retrieving spring having its lower end anchored to the lower portion of the sash; a substantially U-shaped stirrup having its legs pointing upwardly and having its central portion connected to the upper end of the spring; and a friction block carried between the legs of the stirrup and slidably engaged within the slack portion of the flexible member.

2. In a sash balancing mechanism adapted for use in a window frame having a vertically slidable window sash therein, said sash balancing mechanism comprising: a helical spring attached to the lower portion of the sash and extending upwardly along a vertical edge thereof; a loop-like fitting carried by the upper end of the spring; a flexible ribbon-like member having one end attached to the upper portion of the frame,

said member extending downwardly through said fitting and upwardly to the upper portion of the sash; means for anchoring the member to said upper sash portion; and a block of frictional material associated with said fitting for offering frictional resistance to the sliding movement of said flexible member with relation to the fitting.

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