The invention relates to a mechanism for anchoring vertically sliding window sash. The present application is a substitute of my former application which was filed March 30, 1944, under Serial No. 528,781, and which was permitted to die through error.

During the last few years, window frame and sash manufacturers have been doing considerable experimentation in an attempt to find a practical method of anchoring vertically sliding window sash in various positions of vertical adjustment, so that the usual sash cords, sash pulleys and counterbalancing sash weights could be eliminated. The elimination of these long used elements would not only save metal, but would also constitute a considerable saving in window frame materials, since the usual box or channel at each side of the frame, and in which the sash weight travels, could thereby be dispensed with. Elimination of the sash weight channel, would not only save in the window frame materials, but would permit a plurality or battery of such frames to be mounted side by side in close relation to each other, so that more usable wall space could be provided in a building.

It has been found that, where comparatively light weight window sash are used, the counter-balancing action of the usual sash weights is not absolutely necessary, since it does not require a prohibitive amount of effort to bodily lift such sash. The prime difficulty has been in finding a means for anchoring the sash, in any and all desired positions of vertical adjustments; if the sash weights are eliminated.

The principle object of the present invention is to provide a mechanism which will positively hold a vertically slideable window sash in any and all positions of vertical adjustment, when the usual sash weight is absent.

A further object is to provide a mechanism for this purpose which is adjustable, after insulation, in order to compensate for different sash of various weights, and also for sash having different amounts of frictional engagement with the window frame sash races in which they operate.

Another object is to provide a device of this class which is automatic in operation.

A still further object is to provide a sash anchoring mechanism which functions through the application of friction, in contradistinction to those sash balances which use a helical spring.

Yet another object is to provide a device of this class in which there is less friction applied when the sash is being raised, than when it is being lowered.

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

Figure 1 is an elevational view of the inside face of a typical window frame having vertically slideable sash mounted therein, the device of the present invention being shown operatively installed thereon;

Figure 2 is an enlarged elevational view of a sheave housing, which constitutes a part of the mechanism, the dotted lines showing the relative vertical positions of the sheaves therein;

Figure 3 is a vertical sectional view taken substantially along the line 2—3 of Figure 2;

Figure 4 is a view similar to Figure 2, with the front face plate of the housing removed, the dotted lines illustrating the lateral adjustability of the middle sheave;

Figure 5 is an enlarged perspective view of the upper cable anchoring element;

Figure 6 is an enlarged perspective view of the clamp for anchoring the lower end of the cable; and,

Figure 7 is a vertical sectional view detailing a device, used in connection with the mechanism, for relieving friction upon the cable as the sash is being raised.

Like characters of reference indicate like parts in all of the figures.

In the drawings:

The reference numeral 1 indicates, as a whole, a typical window frame having vertical side members 2 and 4 respectively. Slidably mounted for vertical movement between the side members 2 are an upper sash 5 and a lower sash 6, both of which are usual. The reference numeral 7 indicates the inside faces of the two side members 2, and the numeral 8 indicates the two side rails of the lower sash 6.

The mechanism of the present invention consists primarily of a sheave box or housing 10, a flexible cable 11, an anchoring element 12 for the upper end of the cable, and a clamping mechanism 13 for the lower end of the cable.

Referring now more particularly to Figures 2, 3 and 4, the box 10 and its associated parts will first be described.

The box 10 is preferably made of sheet metal, is substantially rectangular in form, and consists of a back wall 14 having one perpendicular side wall 15 and top and bottom walls 16 and 17 respectively. The front of the box 10 is adapted to be entirely closed by a removable face plate
18. One side of the housing remains entirely open, and this side is the one which lies adjacent the left hand edge 19 (Figure 4) of the back wall 14.

Rotatabley mounted within the housing 10 upon pivot pins or axles 20 are two sheaves 21 and 22 which are peripherally grooved to receive the flexible cable 11, the office of which is more fully described hereinbelow. The pins 21 and 22 are permanently fixed in the back wall 14, and the front plate 18 is superficially bored in its inner face to nest the forward ends of these pivot pins.

This arrangement maintains the sheaves 21 and 22 in fixed relation to each other and to the housing, except for their rotation.

At a point substantially midway between the two sheaves 21 and 22, the face plate 18 is provided with an elongated through slot 23 which extends for a desired distance toward the right hand therein from a left hand point in alignment with the two pivot pins 20.

A set-screw 24 extends through the slot 23 and its threads adjustably engage with internal threads carried by a tubular axle 25. The front end of the axle 25 has an annular flange or head 26 adapted to be drawn firmly against the side, or rear face, of the plate 18, when the set-screw 24 is tightened. The rear end of the axle 25 rests against the forward face of the back wall 14 of the housing. The axle 25 can therefore be moved to any desired point along the slot 23 when the set-screw is loosened, and may be anchored firmly against movement by tightening the set-screw.

Rotatably mounted upon the axle 25 is a third sheave 27.

Before the device is mounted upon the window sash, the cable 11 is threaded between and partially around the three sheaves 21, 22, and 27 as shown, and the central sheave 27 is positioned in substantial alignment with the other two sheaves as illustrated in solid lines in Figure 4. The box is then mounted by screws 28 to the upper corner of the sash 6 with its open side flush with the outer vertical edge of the side rail 8 of the sash. The upper end of the cable 11 is attached by the anchoring element 12 and a wood screw 29 to the upper portion of the face 1 of the side member 2 of the window frame 1. The lower end of the cable is then hanging along the lower portion of the face 1.

The clamping mechanism 13 is then installed upon the face 1 of the window frame adjacent the dangling end of the cable.

This clamping mechanism 13 consists substantially of a metal block 30 having a corrugated surface 31. The block 30 is anchored by screws 32 to the face 1 of the window frame. The mechanism 13 further includes another block 33 having a corrugated surface 34 adapted to register with the surface 31 of the block 30. Stub bolts 35 act to draw the block 33 into intimate engagement with the block 30 in an obvious manner.

The dangling end of the cable 11 is passed between the corrugated surfaces of the blocks 30 and 33 and is manually drawn taut. The uses bolts 35 are then tightened to hold the cable in such taut condition. It is, of course, intended that one of the devices will be installed at each side of the window frame, as illustrated in Figure 4.

Due to the fact that the sheave 27 acts to place a "kink" in the cable 11, frictional resistance to the movement of the sheaves along the cable is set up between the sheaves and the cable, and this resistance may be increased by lateral adjustment of the sheave 27 along the slot 23 in the front plate 18 of the housing.

As a means for decreasing the friction between the sheaves and the cable only during upward movement of the sash 6, the mechanism of Figure 7 is interposed in the cable 11 between the lower end of the housing 10 and the upper end of the clamping mechanism 13.

This friction relaxing mechanism is indicated, as a whole, by the reference numeral 60, and consists substantially of a cylindrical body 61 forming a chamber 62 with a closed bottom 63 and an open upper end. A plunger 64 having an outwardly extending annular flange 65 at its lower end is slidably positioned within the chamber 62, and a helical spring 66 is provided around the plunger and seated upon the flange 65. The upper end of the chamber 62 is closed by an annular plate 67 which surrounds the upper portion of the plunger 64, and the upper end of the spring 66 bears against the inner surface of this plate 67.

When the mechanism 40 is used, the cable 11 is severed and one portion is attached to the upper end of the plunger 64, while the other portion is attached to the lower end of the body 41 as shown.

With the mechanism 40 thus installed in the cable, upward movement of the window sash 6 will act to compress the spring 66 and thus slacken the cable. This, of course, decreases friction between the cable and the sheaves and permits the sash to be more easily raised. As soon as this upward movement of the sash ceases, the spring returns to its expanded condition, and the cable is again held taut.

It is thought to be obvious that the above described mechanism will accomplish all of the objects and purposes set forth hereinabove.

I claim:

1. In a device for the purpose set forth, the combination with a window frame having a vertical sash race, and with a window sash mounted for vertical movement in said race, of: a plurality of at least three vertically disposed sheaves carried by the sash adjacent said race; a flexible cable mounted upon the frame adjacent and parallel to said sash race, said cable being threaded between and partially around said sheaves, whereby a substantially abrupt bend is placed therein, for obtaining sufficient frictional engagement with the sheaves to hold the sash against gravitational movement; and means carried by the cable below the sheaves for relieving said friction during upward movement of the sash.

2. Organization as described in claim 1, and means for adjusting the position of one of said sheaves at different horizontal positions upon the sash, for increasing or decreasing said friction.

3. A device for the purpose set forth, including: a flexible cable; means for attaching the cable in a taut condition to a window frame adjacent and parallel to a vertical sash race carried by the frame; a plurality of vertically disposed sheaves rotatably mounted upon a window sash adjacent said cable, said cable being threaded partially around all of said sheaves whereby a substantially abrupt bend is placed in the cable for obtaining sufficient friction between the cable and the sheaves to support the weight of the sash; and means, carried by the cable below the sheaves for relieving said friction during upward movement of the sash.
4. Organization as described in claim 3, and
mean for adjustably positioning one of said sheaves on the sash to increase or decrease said friction.

5. The combination with a window frame hav-
ing a vertical sash race, and with a window sash
mounted for vertical movement in said race, of:
a plurality of vertically spaced sheaves carried by
the sash adjacent said race, a flexible cable
threaded between and partially around said
sheaves; means for attaching one end of said
cable to the upper portion of the window frame
adjacent said race; clamping means carried by
the frame adjacent said race, and below said
sheaves, for holding the cable in various degrees
of tautness, for obtaining various degrees of fric-
tion between the cable and sheaves; and means,
carried by the cable below the sheaves and above
said clamping means, for relieving said friction
during upward movement of the sash.

6. Organization as described in claim 5, in
which the last mentioned means includes: a
spring attached in the cable to form a continu-
ation thereof, said spring having sufficient re-
sistance to normally hold the cable so tight that
the friction between the cable and sheaves will
hold the sash against gravitational movement in
the race.

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