Dec. 7, 1943. G. A. KREUSCHER 2,336,406

CLOSURE BALANCE

Filed April 16, 1941 3 Sheets-Sheet 1

Fig. 1

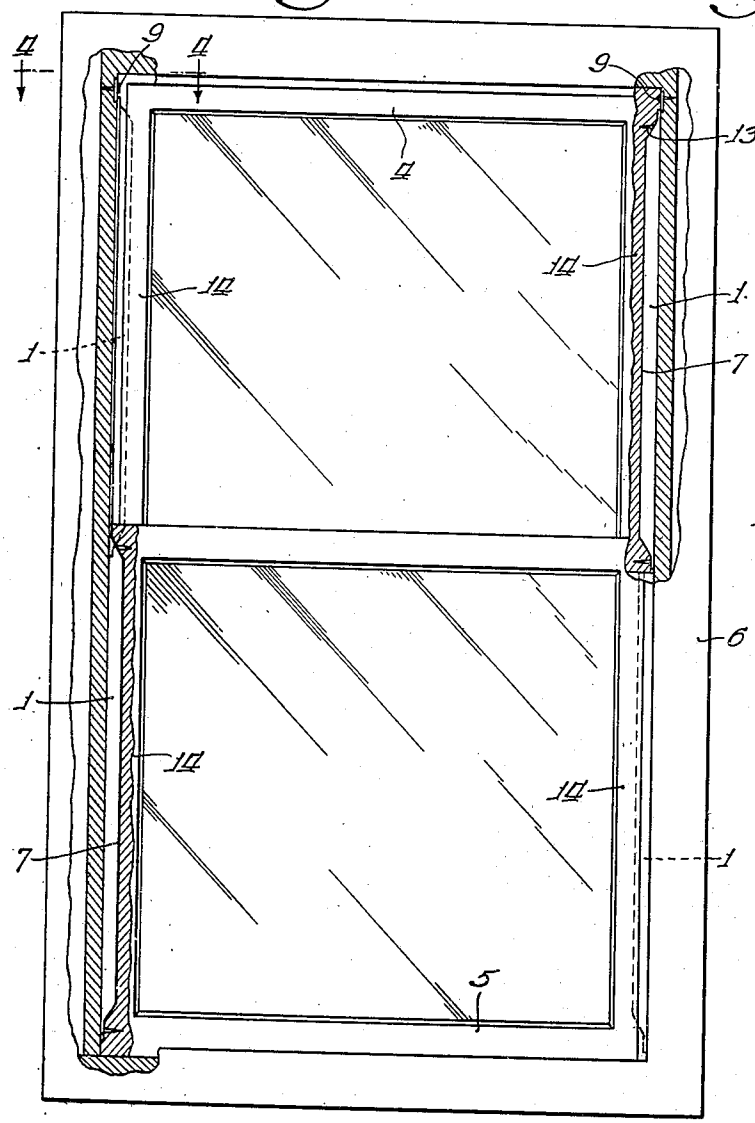
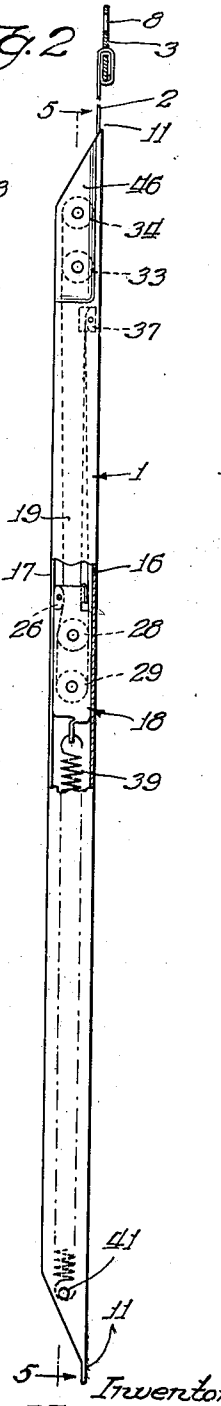


Fig. 2



Witness:
V. Silfander

Inventor:
George A. Kreuscher
By: Lee & Lee
Attys

Dec. 7, 1943. G. A. KREUSCHER 2,336,406

CLOSURE BALANCE

Filed April 16, 1941 3 Sheets-Sheet 2

Fig. 3

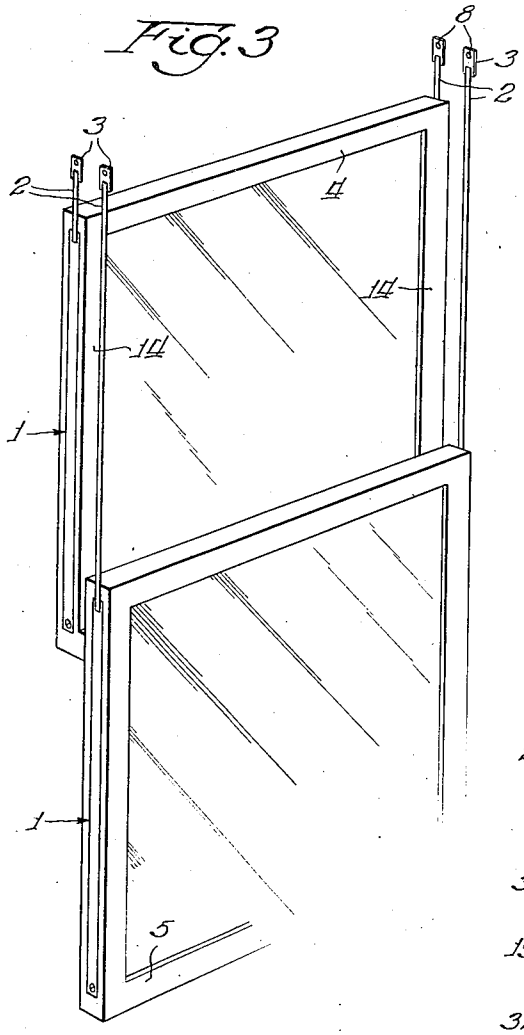


Fig. 4

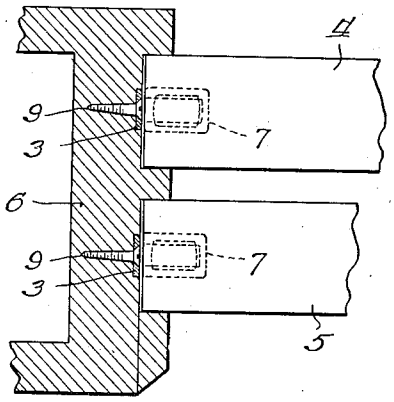
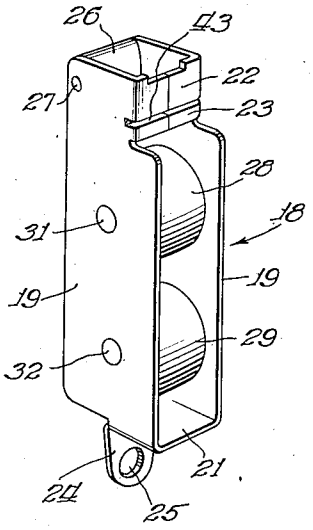


Fig. 10



Witness:
V. Silgander

Inventor:
George A. Kreuscher
By: Lee & Lee
Atty's

Dec. 7, 1943. G. A. KREUSCHER 2,336,406

CLOSURE BALANCE

Filed April 16, 1941 3 Sheets-Sheet 3

Fig. 5

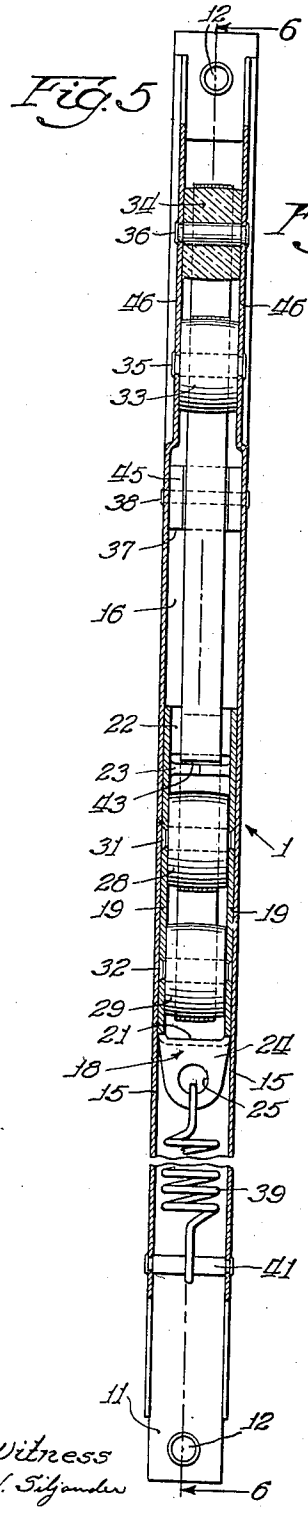


Fig. 6

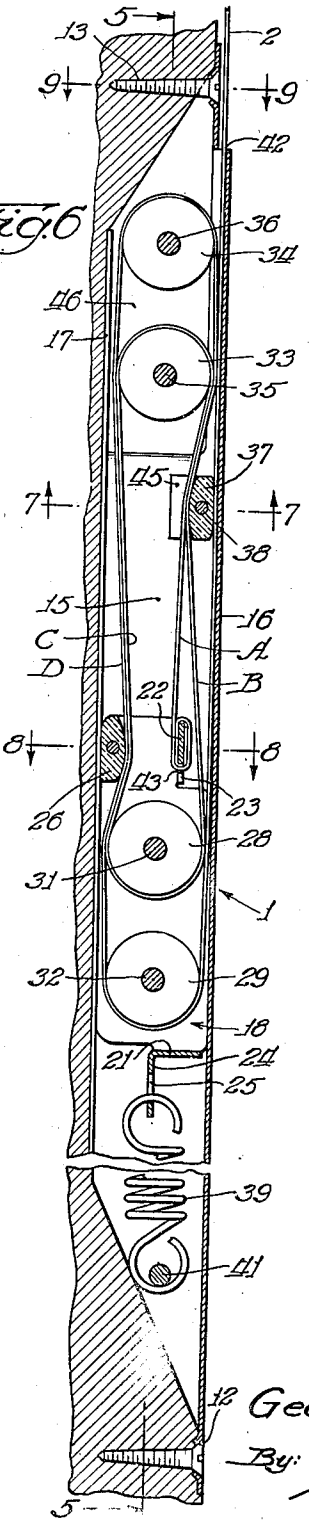


Fig. 7

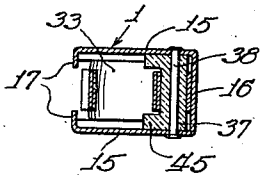


Fig. 8

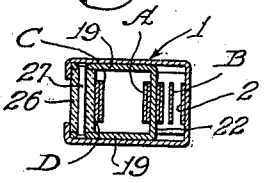
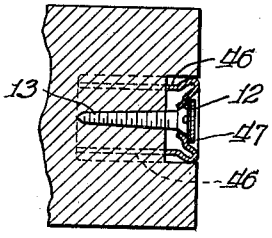


Fig. 9



Witness
V. Silfander

Inventor:
George A. Kreuscher

By: Lee & Lee Attys.

Patented Dec. 7, 1943 2,336,406

UNITED STATES PATENT OFFICE

2,336,406

CLOSURE BALANCE

George A. Kreuscher, Kenosha, Wis., assignor to W. J. Dennis & Company, Chicago, Ill., a corporation of Illinois

Application April 16, 1941, Serial No. 388,830

7 Claims. (Cl. 16—197)

The invention relates generally to closure supporting members and more particularly to an improved sash balance of the spring type.

There have been numerous types of sash balances utilizing springs as the counterbalancing means. However, these have generally had certain disadvantages one of which is the difficulty of obtaining a spring which will satisfactorily counterbalance the window sash or other closure member throughout the various positions of the latter. This is due in part to the relatively long travel of the closure member whereby the tension spring, if strong enough to counterbalance the closure member, would tend to move the member out of a given position, for example, in a window construction where the lower window sash when in its closed position and the spring under maximum tension, the sash may tend to rise, due to such increased tension. Similarly, if a weaker spring is employed the counterbalancing force may be reduced to an insufficient amount to maintain the sash in a raised position.

The present invention has therefore among its objects the production of a counterbalance utilizing a spring for its counterbalancing power which is so constructed that there will be adequate counterbalancing power at all times regardless of the position of the sash or other closure member and yet which will maintain the latter in any desired position.

Another object of the invention is the production of a counterbalance of the type described in which the spring movement is relatively small as compared with the closure movement.

A further object of the invention is the production of such a counterbalance in which the counterbalancing action provides its own resistance for preventing undesired movement of the closure member, and at the same time providing the necessary counterbalancing action.

Other objects of the invention are the production of such a device which is simple and durable in construction, inexpensive to manufacture, and very efficient for the purposes intended.

A further object of the invention is the production of such a device which may be readily and easily installed on the closure member.

Many other objects and advantages of the invention herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described and more particularly pointed out in the claims.

In the drawings wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a front elevational view of a window closure with portions thereof shown in section to illustrate the application of the device;

Fig. 2 is a side elevational view of a counterbalance construction embodying the present invention with a portion of the housing broken away to disclose the interior thereof;

Fig. 3 is a perspective view of a pair of window sashes with the counterbalances mounted thereon;

Fig. 4 is a sectional view taken approximately on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view taken approximately on the line 5—5 of Fig. 2;

Fig. 6 is a sectional view taken approximately on the line 6—6 of Fig. 5;

Fig. 7 is a sectional view taken approximately on the line 7—7 of Fig. 6;

Fig. 8 is a sectional view taken approximately on the line 8—8 of Fig. 6;

Fig. 9 is a sectional view taken approximately on the line 9—9 of Fig. 6; and

Fig. 10 is a perspective view of the movable carriage employed.

As illustrated in Figs. 1 to 4 the device comprises a housing designated generally by the numeral 1 from which extends a flexible tape 2, the free end of which is provided with a mounting member 3. Four of these counterbalancing devices are generally employed in the usual window construction having upper and lower sashes 4 and 5 respectively, slidably carried in the window frame 6. The side edges of the respective sashes are provided with rabbets or channels 7 in which are positioned the housings 1. The respective mounting members 3 are provided with apertures 8 for receiving screws 9 which are screwed into the sides of the window frame at the top thereof. As illustrated the housing is provided with flanges or tongues 11 at their respective ends having apertures 12 therein for receiving mounting screws 13 which are screwed directly into the respective side members 14 of the sashes.

As illustrated in Figs. 5 through 8, the housing 1 is substantially U-shaped in cross-section, having substantially parallel side walls 15 and connecting front wall 16, the housing illustrated being formed of suitable sheet material and bent or stamped to the desired shape with the free longitudinal edges of the side walls 15 being turned inwardly to provide stiffening or reenforcing flanges 17, the latter also providing guiding and retaining means for a carriage, designated gener-

ally by the numeral 18, which is slidably carried in the housing. The carriage 18, as illustrated in Fig. 10, comprises side walls 19, an end wall 21, and the transverse portions 22 and 23. In the embodiment illustrated, the carriage 18 is constructed from a sheet of material folded to provide the end wall 21 and side walls 19, portions of the side walls being cut and folded inwardly, to form the transverse portions 22 and 23. Extending from the end wall 21 is a lug 24 having an aperture 25 therein. Positioned at the opposite end of the carriage between the side walls 19 is a block 26 which is secured in place by a pin or rivet 27. Rotatably mounted in the carriage 18 between the side walls 19 are a pair of rollers 28 and 29 respectively, supported by pins 31 and 32.

Similar rollers 33 and 34 are rotatably mounted in the housing 1 on pins 35 and 36 respectively, positioned adjacent one end of the housing, in Figs. 5 and 6, this being the upper end thereof. Also mounted in the housing 1 is a small block 37 similar to the block 26 of the carriage 18, the block 37 being positioned below the roller 33 and spaced slightly from the wall 16 of the housing. A pin or rivet 38 secures the block to the housing. Secured at one end to the carriage 18 is a spring 39, the opposite end of the latter being secured to the rivet 41 extending between the side walls 15 of the housing adjacent the lower end thereof, the respective ends of the spring passing through the opening 25 in the lug 24 on the housing and around the pin 41.

One end of the tape 2 is secured to the carriage 18 at the transverse portion 22 thereof and extends from the upper portion of the carriage 18 upwardly over the block 37 to and around the roller 33, thence downwardly over the block 26 to and around the roller 28 on the carriage. The tape then extends upwardly between the end portion of the tape and the block 37, past the roller 33, to and around the roller 34, thence downwardly again between the block 26 and the adjacent portion of the tape, past the roller 28, to and around the roller 29. It then continues upwardly between the wall 16 and block 37 past the rollers 33 and 34 through a slot 42 and out of the housing. The free end of the tape, as previously mentioned, is secured to a mounting member 3. The respective ends of the tape may be secured to the carriage 18 and mounting member 3 respectively by any suitable means. In the present instance the end of the tape is secured to the end of the carriage by wrapping the end of the tape around the transverse portion 22 of the carriage with the tape passing through the slot 43 separating the portions 22 and 23 of the carriage, with the stiffness of the tape and the friction between the turns thereof securely connecting the tape with the carriage. In a like manner the free end of the tape is passed through a slot 44 of the mounting member 3 and wrapped around the adjacent portion thereof.

From the above construction it will be apparent that as the housing 1 is secured to the window sash and the free end of the tape 2 is secured to the window frame, as the sash is moved with respect to the frame and therefore the housing with respect to the end of the tape, the tape will draw the carriage towards the upper end of the housing or will permit the carriage to move downwardly in response to the force exerted on the spring, depending upon the direction of movement of the housing with respect to the fixed end of the tape. It will be noted that by use of the 4 pulleys and the manner in which the tape is engaged therewith that only ¼ as much force is required on the tape 2 to overcome the force exerted by the spring 39, this being due to the mechanical advantage resulting from the particular construction, consequently, a relatively stiff spring may be employed. As illustrated in Figs. 6, 7 and 8, the portions A and B of the tape pass over the block 37, the latter being constructed of a suitable material adapted to frictionally resist the movement of the tape B, and it will be apparent that as the block 37 bends the tape inwardly the action of the spring will tend to urge the tape into contact with the block 37. Similarly, the portion A of the tape will frictionally engage the portion B where they are overlying and in contact with one another, the contact extending approximately from the block B to the roller 33. In a like manner the portions C and D of the tape pass over the block 26, and are in contact substantially throughout the distance between the rollers 28 and 33. Thus, the blocks 26 and 37 may be considered brakes tending to frictionally maintain the mechanism in any desired position. As illustrated in Figs. 6 and 7, the block 37 may be provided with flanges 45 which maintain the tapes in proper alignment. In a like manner, if desired, the block 26 and rollers 28, 29, 33, and 34, could be provided with flanges thereon for guiding the tape. However, as the rollers are provided with a slight crown, the tape is maintained in proper alignment on the rollers. As illustrated in Figs. 5 and 9 the upper portions of the side walls 15 are inset as shown at 46, the distance between the portions 46 being substantially equal to the distance between the side walls 19 of the carriage 18 to permit the use of the same sized rollers in both the housing and the carriage. In a similar manner the portion 47 of the wall 16 intermediate the slot 42 and the upper end of the housing is inset from the plane of the wall 16 to permit the tape 2 to extend vertically upward through the slot 42. It will be noted that, when installed, the operating mechanism is enclosed protecting the same from dirt and dust.

The operation of the device is as follows:

Assuming the device to be applied to the upper sash illustrated in Fig. 1 in which the end of the tape is fastened to the side of the window frame adjacent the top thereof, the tape 2 will be practically entirely within the housing and the spring 39 will be in its contracted position. As the upper sash is moved downwardly the tape 2 is drawn from the housing, thereby drawing the carriage 18 towards the rollers 33 and 34. Obviously, due to the mechanical advantage obtained, the carriage 18 will move one-fourth of the distance traveled by the sash so that the expansion of the spring is but a fraction of the travel of the sash. Thus, the force exerted by the spring on the sash will vary by a relatively small amount between its contracted position and its extended position. As previously mentioned, the blocks 26 and 37 will impart a braking action to the adjacent portions of the tape. Due to the force of inertia it will require a greater amount of force to initially move the end of the tape relative to the housing than it would to continue the movement thereof. This action is very desirable as it prevents the window sash from moving out of a set position. Similarly, as a stiff spring can be employed, due to the mechanical advantage obtained the increased tension on the tape will urge the portions A and B, and C and D, respectively, into greater frictional

contact with one another and with the respective blocks 37 and 26, thus, increasing the frictional resistance of these portions and resulting in a counterbalance having very desirable characteristics. Due to the novel construction employed, oil and grease on the mechanism is unnecessary thereby reducing the collection of dust and dirt on the tape and other parts, and assuring a smooth and dependable action at all times.

While I have illustrated the invention as installed with the housing secured to the sash or movable closure member, and the tape secured to the frame, obviously, in certain cases it may be desirable to reverse the mounting and secure the housing to the frame adjacent the top thereof, and the tape to the sash adjacent the bottom thereof, thereby permitting full movement of the sash, the mechanical operation being the same as that just described.

It will be apparent from the above description that I have provided a counterbalance of the spring type having relatively uniform counterbalancing action throughout the travel of the closure member and which is constructed to impart a braking action between the movable portions thereof, whereby the closure member will be maintained in any given position of adjustment without any tendency to move out of such adjustment.

It will also be noted that I have provided a counterbalance having these desirable features which is relatively simple in construction, durable, and readily mounted on the closure member.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement, and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. In a counterbalance device, the combination of a supporting member, a movable member operatively related thereto, resilient means connecting said members, one or more rollers carried by said supporting member, one or more rollers carried by said movable member, a flat flexible tape operatively connecting said rollers with the free end extending from said supporting member, and brake means carried by said supporting member and having a braking face engageable with portions of the tape intermediate the rollers on the respective members and arranged to deflect said portions of the tape out of their normal paths to oppose the tensioning action of said resilient means and thereby frictionally resist movement of said tape.

2. In a counterbalance for closure members, the combination of a housing, a carriage slidably carried by the housing, a tension spring operatively connected at its respective ends to said housing and carriage, a pair of rollers carried by said housing adjacent one end thereof, a second pair of rollers carried by said carriage, a flexible tape operatively connecting said rollers, the free end of the tape extending from the housing, and brake means mounted on said carriage to move directly therewith and having a braking face engageable with portions of the tape intermediate the rollers of the respective members and arranged to deflect said portions of the tape out of their normal paths for frictionally resisting movement of the tape.

3. In a counterbalance for closure members, the combination of a housing, a carriage slidably carried by the housing, a tension spring operatively connected at its respective ends to said housing and carriage, rollers carried respectively by said housing and carriage, said rollers lying in a common plane a flat flexible tape operatively connecting the rollers on the carriage and housing for moving the carriage relative to the housing in opposition to said spring, the free end of said tape extending from the housing, and brake blocks carried by the housing and carriage respectively, said blocks being disposed in line with certain direct runs of said tape and adapted for engaging and biasing said runs of tape to frictionally resist movement of the latter.

4. In a counterbalance for closure members, the combination of a housing comprising a pair of spaced side walls connected adjacent corresponding longitudinal edges by an end wall, inwardly extending flanges carried by the opposite longitudinal edges of said side walls, a carriage slidably carried in said housing and guided for longitudinal movement between said end wall and flanges, a tension spring connected at one end to said carriage and at the opposite end to said housing, one or more rollers positioned in said housing, one or more rollers carried by said carriage, said rollers being of substantially the same size and lying in a common plane, and a flat flexible tape secured at one end to said carriage and passing around the respective rollers and out of the housing with portions of the tape overlying and engaging one another to frictionally resist movement of the tape.

5. In a counterbalance for closure members, the combination of a housing comprising a pair of spaced side walls connected adjacent corresponding longitudinal edges by an end wall, inwardly extending flanges carried by the opposite longitudinal edges of said side walls, a carriage slidably carried in said housing and guided for longitudinal movement between said end wall and flanges, a tension spring connected at one end to said carriage and at the opposite end to said housing adjacent one end thereof, a pair of rollers positioned in said housing adjacent the opposite end thereof, a second pair of rollers carried by said carriage, all of said rollers lying in a common plane, and a flat flexible tape secured at one end to said carriage and passing around the adjacent roller on the housing, said tape then extending back to and around the nearest roller on the carriage, thence to and around the other roller on the housing, thence extending to and around the second roller on the carriage, and back, past the rollers on the housing, and out of the same, said tape having a plurality of extended portions thereof overlying and engaging one another to frictionally resist movement of the tape at spaced intervals along the length thereof.

6. In a counterbalance for closure members, the combination of a housing, a carriage slidably carried by the housing, a tension spring operatively connected at its respective ends to said housing and carriage, a pair of rollers carried by said housing adjacent one end thereof, a second pair of rollers carried by said carriage, a flexible tape secured at one end to said carriage and extended around one of the rollers carried by the housing, then back to the carriage and around one of the rollers thereon, then back to

the other roller on the housing and around the same, and back to the carriage and around the other roller thereon, and out of the housing, a brake block carried by the housing intermediate the two pairs of rollers engageable with a portion of the tape passing over said rollers, and a second brake block carried by the carriage and positioned intermediate said pairs of rollers, said second block engageable with a portion of the tape adjacent the rollers on said carriage, said blocks operative to frictionally resist movement of the tape.

7. In a counterbalance for closure members, the combination of a housing comprising a pair of spaced side walls connected adjacent corresponding longitudinal edges by an end wall, inwardly extending flanges carried by the opposite longitudinal edges of said side walls, a carriage slidably carried in said housing, a tension spring connected at one end to said carriage and at the opposite end to said housing adjacent one end thereof, a pair of rollers positioned in said housing adjacent the opposite end thereof, a second pair of rollers carried by said carriage, a flexible tape secured at one end to said carriage and passing around the adjacent roller carried by the housing, said tape then extending back to and around the roller on the carriage, thence to and around the other roller carried by the housing, thence extending to and around the second roller on the carriage, and back and past the rollers on the housing and out of the latter, a brake block carried by the housing intermediate the two pairs of rollers and engageable with the adjacent portion of the tape passing over said rollers, and a second brake block carried by the carriage positioned intermediate said pairs of rollers and engageable with the adjacent portion of the tape, said blocks operative to frictionally resist movement of the tape and urge overlying portions thereof into frictional engagement with each other.

GEORGE A. KREUSCHER.