Feb. 3, 1953 D. TAPPAN 2,627,082

SASH BALANCE

Filed March 21, 1950

FIG. 1

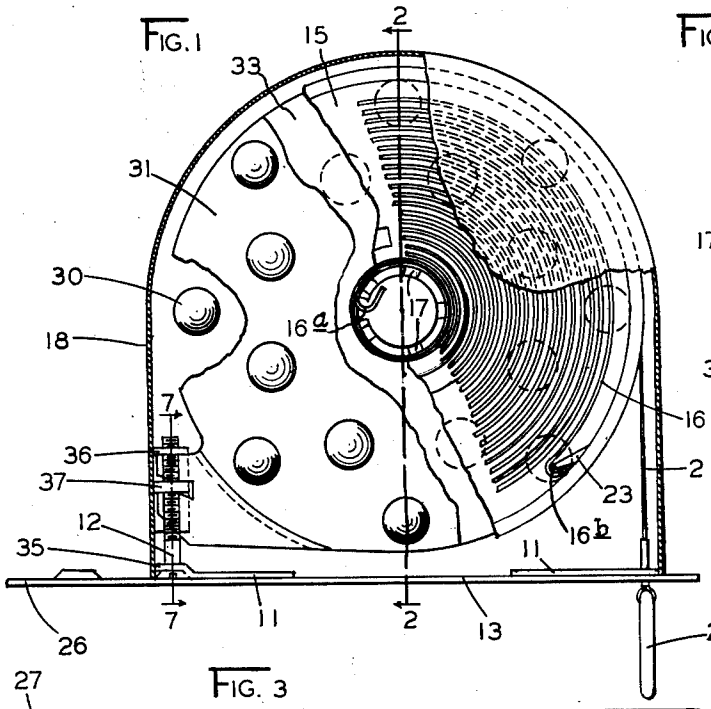


FIG. 2

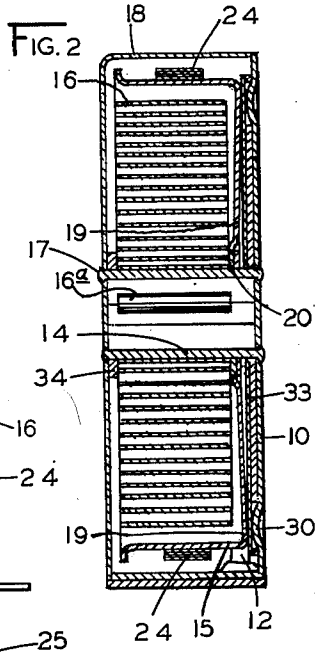


FIG. 3

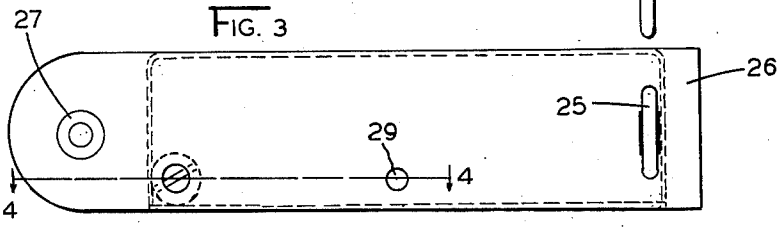


FIG. 4

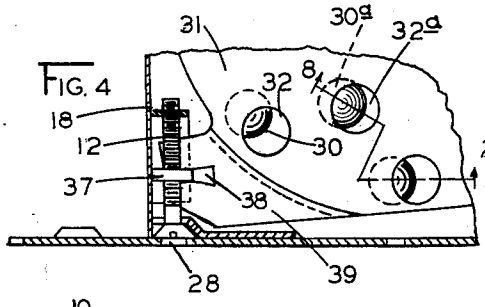


FIG. 5

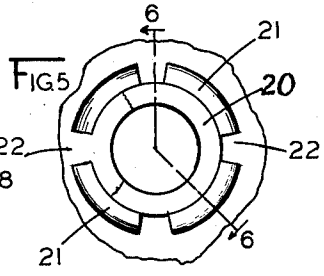


FIG. 6

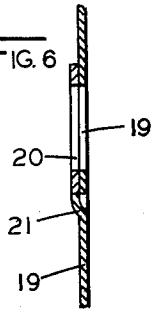


FIG. 7

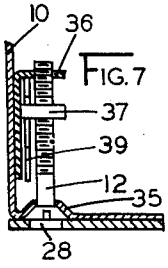
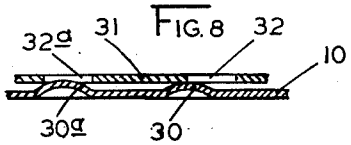


FIG. 8



INVENTOR.
DEWITT TAPPAN
BY Harold S. Hymm
HIS AGENT

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SASH BALANCE

Dewitt Tappan, Irondequoit, N. Y., assignor to
Ada I. Tappan, Irondequoit, N. Y.

Application March 21, 1950, Serial No. 150,871

11 Claims. (Cl. 16—198)

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This invention relates to window sash balances, and it more particularly pertains to sash balances of the involute or clock spring type.

In balances of this type which are adapted to be mounted in the sides and at the top of a window frame with the associated window sash supported therefrom by tapes, cables or the like, it is desirable to provide adjustable means for dampening the actuation of each balance so that a balance having a particular spring pressure can be adapted to balance its share of the weight of a window sash which is considerably lighter than the torsional force exerted by the balance as assembled. It is also desirable to dampen the operation of a balance slightly even if its torsional force can be accurately matched with the weight of a window sash it is to balance so as to compensate for the difference in torsional force exerted by the balance, dependent upon the extent to which its spring is wound when the associated window sash is actuated to its respective extreme positions.

One method of obtaining the required dampening effect is disclosed in my prior Patent No. 2,241,969, dated May 13, 1941, but the dampening effect obtainable by this method has limitations which makes it difficult to obtain sufficient dampening without excessive strain and wear on certain of the parts of a balance, particularly when the balance is employed for handling relatively heavy window sash.

An object of the present invention is to apply dampening to a drum of a sash balance to a limited extent in a manner wherein the dampening effect is applied substantially uniformly circumferentially about the axis of the drum of the balance by one means of dampening involving fixed biasing means set up upon the assembly of the balance.

Another object of the present invention is to provide additional dampening by reason of rotation of an adjustment disc about the axis of the drum of a sash balance, such additional dampening being effective to increase the dampening substantially evenly circumferentially about the axis of the drum.

Another object of the present invention is to provide means applying increased dampening at a plurality of different radial distances from the axis of the drum and thereby increase dampening by increasing the amount of friction surface as well as increasing the pressure between the friction surfaces.

Another object of the present invention is to render the dampening effect adjustable after installation of the sash balance, the adjustment being provided in a manner to promote rotation of the adjustment disc in either direction, in accordance with whether dampening is to be increased or decreased.

Another object of the present invention is to provide an improved bearing for the drum of a

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sash balance which is particularly adapted to reduce the wear on a sash balance bearing to a minimum.

Other objects, purposes and characteristic features of the present invention will be in part obvious from the accompanying drawing and in part pointed out as the description progresses.

In describing the invention in detail, reference is made to the accompanying drawing, in which similar reference characters are used for designation of corresponding and similar parts and in which:

Fig. 1 is a plan view of the sash balance provided according to the present invention with a part of the cover broken away;

Fig. 2 is an elevational sectional view of the sash balance taken along the section line 2—2 of Fig. 1;

Fig. 3 is an end view of the sash balance shown in Fig. 1, illustrating the exposed portion of the balance when it is assembled within a window frame;

Fig. 4 is a sectional plan view of a portion of the balance illustrating the relative positions parts of the balance assume when adjustment is made to substantially a maximum dampening position;

Fig. 5 is a plan view showing the mounting of a bearing in the drum of a sash balance;

Fig. 6 is an elevational sectional view of a sash balance bearing mounting taken along the section line 6—6 of Fig. 5.

Fig. 7 is a sectional view of part of the dampening adjustment means taken along the section line 7—7 of Fig. 1; and,

Fig. 8 is a sectional view illustrating the position of parts having to do with the adjustment of the dampening at a time when maximum dampening is obtained, taken along the section line 8—8 of Fig. 4.

The balance according to the present invention comprises a base plate 10, one end of which is semi-circular and of a diameter to conform to the outline of the balance, and the other end of the base plate 10 has a flange 11 formed inwardly at right angles. The left-hand flange 11 (see Fig. 1) is adapted to receive an adjustment screw 12 as will hereinafter be considered. A face plate 13 is suitably secured, as by welding, to the flanges 11.

Concentric with the semi-circular end of the base 10, one end of a hub 14 is secured to the base plate 10 so that it projects from the base plate 10 so as to journal a drum 15. The hub 14 is tubular in shape with a longitudinal slot provided therein to serve as an anchorage for the inner end 16a of an involute spring 16. The hub 14 extends laterally entirely through the center of the balance and has ears 17 formed in its left-hand end as viewed in Fig. 2, which when riveted over after assembly of a cover 18 on the balance, completes the balance assembly and

maintains a bias spring pressure in a manner and for purposes to be hereinafter considered.

A drum 15 has an end 19 journaled on the hub 14 as shown in Figs. 2 and 6. The end of the drum 15 is dished inward slightly for dampening purposes to be hereinafter considered. Concentric with the opening in the end of the drum 15 is a series of arcuate sectors 21 formed inward between spokes 22 and providing concentric bearing surfaces at their inner edges cooperating with an additional ring shaped bearing 20, which normally remains stationary on the hub 14. Thus is provided: A radial bearing surface between the end 19 of the drum 15 and the hub 14, additional radial bearing surfaces between the inner concentric surfaces of the sectors 21 and the outer periphery of the ring 20, and a thrust bearing between the surface of the ring 20 and the drum end 19.

The clock spring 16 when assembled within the drum 15 has its inner end 16*a* anchored in a slot in the hub 14 as has been described, and its outer end 16*b* is hooked over a detent 23 which is formed inwardly from the periphery of the drum 15 as is illustrated in Fig. 1.

A window suspension tape 24 is secured to the outer periphery of the drum 15 and wound thereon by the torsional force of the spring 16 to an extent limited by the tape anchor loop 25, which is secured to the tape for facilitating the attachment to a window sash. Prior to the attachment of a window sash, this tape loop serves as a stop when it is drawn by the tape up against a narrow slot formed in the flange 11 and the face plate 26 as illustrated in Fig. 1. The face plate 26 is formed slightly larger than the flange 11 of the base plate so as to cover the edges of an opening cut in the jamb of a window frame for mounting the balance.

The hole 27 in the portion of the face plate 26 extending to the left of the balance assembly is provided for a mounting screw securing the balance within a suitable opening formed in the jamb of a window frame, upon its installation into operating position. The hole 28 (see Fig. 4) in the face plate is provided opposite the adjustment screw 12 and of a smaller diameter than the flat head of the adjustment screw so as to retain the adjustment screw 12 against longitudinal movement in either direction as the head 29 of the screw 12 is locked between an offset portion 35 of the flange 11 of the base plate 10 and the inner face of the face plate 13. The hole 29 in the face plate 13 is provided in registration with a cooperating hole (not shown) in the periphery of the drum 15 so that the insertion of a pin through the cooperating openings at the time of attachment of the tape loop 25 to a window sash can relieve the tape 24 temporarily of the torsional force applied by the spring 16 so as to facilitate the attachment of the loop 25 over a suitable hook (not shown), which in turn is secured to a window sash.

The base plate 10 has cams 30 formed inwardly therefrom at a plurality of points about the center of the hub 14, it being preferable that one series of cams be provided at a radius approaching the radius of the drum 15, while another series of cams 30*a* are formed inwardly from the base plate 10 at a smaller radius and at circumferential positions substantially midway between the series of cams provided at the larger radius. These cams are preferably circular in shape as is illustrated in the drawings with the cam surfaces sloping toward the center of the circle, although it is to be understood that the cams may take different forms in accordance with the requirements of practice.

A cam pressure adjustment plate 31 is provided in the form of a disc having holes 32 and 32*a* formed therein for the respective cams 30 and 30*a* of the base 10 so that these holes 32 and 32*a* can be brought into direct registration with the cams 30 and 30*a* as is illustrated in Figs. 1 and 2 when the adjustment disc 31 is assembled over the hub 14 and brought into position adjacent the inner surface of the base 10. Disposed in the balance between the adjustment disc 31 and the dished end 19 of the drum 15 is a friction disc 33 of a suitable friction material such as fiber. This disc 33, the adjustment disc 31 and the base plate 10 are all formed in a flat plane as compared to the end 19 of the drum 15 being dished inwardly, as has been described and as is illustrated in Fig. 2.

In the assembly of the balance, the adjustment disc 31, the fiber disc 33, the drum 15, and the bearing ring 20 are respectively journaled on the hub 14, and a spacer washer 34 bearing upon the inner turns of the spring 16 is disposed over the end of the hub 14 prior to the assembly of the cover 18 by reason of the passage of the lugs 17 of the hub 14 through registration openings in the cover 18. To assemble the cover 18 over the balance in this manner, it is necessary to apply pressure urging the cover over the lugs 17 as the lateral dimension of the spring 16, the drum 15, and the thickness of the respective fiber and adjustment discs is such as to set up a biasing pressure on the dished surface 19 of the drum 15 against the friction disc 33 when the cover 18 is retained in its assembled position by reason of the lugs 17 being riveted over after passage through holes in the cover.

It will thus be seen upon the assembly of the balance, pressure is applied by the cover 18 through the spacer 34, the inner turns of the spring 16, and the bearing ring 20 against the dished end 19 of the drum 15 so as to urge the drum 15 to bear against the fiber disc 33 at a circumferential point of contact of a radius substantially comparable to the radius of the drum 15. This is because the fiber disc 33 and its associated adjustment plate are flat as compared to the inwardly dished end 19 of the drum 15, thus providing a space as illustrated in Fig. 2 between the fiber disc 33 and the end 19 of the drum 15 when the sash balance is assembled with the holes 32 and 32*a* of the adjustment plate 31 in registration with the cams 30 and 30*a* respectively formed from the base 10.

Thus in this manner a minimum dampening is effective with the holes 32 in registration with the cams 30, such dampening being substantially sufficient to prevent the automatic operation of a window because of unbalancing within the torsional range of a spring 16 when actuated between its extreme positions upon operation of an associated window sash between its fully closed and fully opened positions.

The actuation of the adjustment disc 31 about the hub 14 after the balance is assembled is accomplished by rotation of the adjustment screw 12. This screw 12 is disposed laterally spaced from the left-hand inside edge of the cover 18 (see Fig. 1) by insertion through a hole in an inwardly formed offset screw head socket 35 of the flange 11, and a hole in a bracket 36 which is suitably attached to the base 10.

The lateral spacing of the adjustment screw

12 from the inner side of the cover 18 is governed by the width of an adjustment nut 37 which is threaded onto the screw 12 and is locked against rotation by reason of the proximity of one of its flat sides to the inside surface of the cover 18.

Thus the adjustment nut 37 can be made to travel longitudinally along the screw 12 in one direction or the other in accordance with the direction in which the screw 12 is rotated upon the insertion of a screw driver blade through the opening 28 in the face plate 13. This operation can obviously be performed after the balance is assembled within the jamb of a window frame, and after a window sash has been attached to the tape 24 by means of engagement of the loop 25 with a suitable hook (not shown) attached to the edge of a window sash.

As the adjustment nut 37 travels longitudinally along the adjustment screw 12, it actuates the adjustment disc 31 about the hub 14 in one direction or another because of the engagement of the nut 37 within a suitable slot 38 (see Figs. 1 and 4) of an extending arm 39 formed integral with the adjustment disc 31.

The slot 38 is preferably formed with crowned edges bearing at substantially opposite points against opposite sides of the adjustment nut 37 so that there is no free play for movement of the adjustment disc relative to the longitudinal movement of the adjustment nut 37. By the bearing surfaces being crowned substantially as illustrated in Figs. 1 and 4, the adjustment disc 31 can be freely operated between its minimum and maximum adjusted positions as shown in Figs. 1 and 4 respectively, with no free play provided at any point between these limits for the adjustment disc 31 relative to the longitudinal movement of the adjustment nut 37 along the adjustment screw 12.

To consider the dampening effect upon the rotation of the drum 15 by the spring 16 when the adjustment disc 31 is actuated, it will be assumed that increased dampening is found to be required for a balance assembled with the adjustment disc 31 in the position illustrated in Fig. 1 after the balance has been assembled within a window frame and operatively connected to a window sash.

To increase the dampening under these conditions, the screw 12 is rotated clockwise and the adjustment nut 37 is drawn axially along the adjustment screw 12 toward the face plate 13. The nut 37 thus carries with it the arm 39 of the adjustment disc 31 so as to rotate the adjustment disc 31 about the hub 14. Thus the trailing edges of the holes 32 for the direction of rotation are brought to ride upon the cams 30 of the base 10 so as to force the adjustment disc laterally to the left as viewed in Fig. 2 away from the base plate 10, thus forcing the adjustment disc 31 to the left as viewed in Fig. 2 so as to bear more tightly against the friction disc 33 and thus urge this friction disc more tightly against the dished end 19 of the drum 15. With this added pressure applied by the friction disc 33 against the end 19 of the drum 15, added dampening is obtained by added pressure being uniformly applied circumferentially to the drum 15, the increase in dampening being proportional to the extent to which the trailing edges of the holes 30 are caused to ride up on the crowned cams 30 of the base 10 in accordance with the rotation of the adjustment screw 12 clockwise. Maximum dampening is obtained substantially where the relative positions of the cams 30 and the holes 32 are as illustrated in Fig. 4, wherein the trailing edges of the holes 32 have been brought to bear upon the highest portions of the respective cams 30, which are substantially the centers of these cams.

According to the nature of the balance as assembled, a biasing pressure is applied, as viewed in Fig. 2, through the inwardly dished end portion 19 of the drum 15, urging the drum 15 against the friction disc 33. It has been pointed out that this pressure is applied through the cover 18, the spacer 34, the inner turns of the spring 16 and the bearing 20. Thus, an assembled, positive limitations against movement to the left as viewed in Fig. 2 for the end portion 19 of the drum 15 is provided at the point where the end portion 19 is journaled on the hub 14.

As the adjustment disc 31 is rotated counter-clockwise as viewed in Fig. 1, this disc 31 is spaced farther from the base plate 10 as is illustrated in Fig. 8 by reason of the holes 32 being out of register with the cams 30, and thus circumferential pressure is applied to the end portion 19 of the drum 15, through the friction disc 33, causing movement of the periphery of the drum 15 to the left as viewed in Fig. 2. The center of the back portion 19 of the drum 15 is fixed at the point where the drum is journaled on the hub 14, however, with respect to the left-hand movement, as has been described, and thus the increase of pressure through the operation of the adjustment screw 12 tends to flatten out the dished portion 19 of the drum 15, which in turn provides that the end portion 19 of the drum 15 increases its contacting surface with the flat friction disc 33, and thus increases the dampening uniformly circumferentially about the axis of the drum 15. That is, in this manner the dampening effect is produced not only by the increased pressure applied through the friction disc 33 to the end portion 19 of the drum 15, but is increased also by the increased braking surface created by reason of the dished portion of the end 19 of the drum 15 being flattened to conform more closely to the plane of the friction disc 33 and thus provide greater contact with that friction disc.

It is further provided that the inner circle of holes 32*a* (see Figs. 1 and 4) in the adjustment disc 31, in cooperating with registration cams 30*a* of the base 10, positively spaces the adjustment disc 31 the same distance from the base 10 as the cams 30 so that adequate dampening may be obtained with a minimum thickness of material for the adjustment disc 31. That is, if the adjustment disc 31 were of relatively thin resilient material so as to maintain the over-all thickness of the balance at a minimum, without any inner circle of holes 32*a* and cooperating cams 30*a*, the pressure of the friction disc 33 against the end 19 of the drum 15 would be much more concentrated at the outer edge of the end portion 19, and thus in order to obtain the desirable degree of dampening, it would be necessary to concentrate so much pressure against a restricted area of the friction disc 33 that the disc 33 would wear rapidly and perhaps have to be replaced. It is therefore desirable that cooperating inner holes 32*a* and cams 30*a* be employed to positively insure that the friction surface is uniformly increased circumferentially about the axis of the drum 15 as the adjustment disc 31 is rotated counter-clockwise as viewed in Fig. 1 by the driving of the nut 37 down-

wardly axially along the adjustment screw 12 by the rotation of the adjustment screw 12 in a clockwise direction.

It is to be understood that if it is found in practice for a particular range of window sash weights for which a balance is to be employed, that adequate dampening may be obtained by an increase of the friction surface alone without materially increasing the pressure applied, the outer circle of adjustment holes 32 may be eliminated, together with their cooperating cams 30 of the base 10, thus permitting adjustment to be made entirely by the holes 32*a* cooperating with the cams 30*a* which are rotated a substantially smaller radius from the axis of the drum than the periphery of the drum 15 so that the action of the adjustment disc 33 in cooperation with the cams 30*a* under such conditions would merely tend to dish the adjustment disc 31 to conform to the contour of the dished end 19 of the drum 15 so as to increase the friction surface between this end 19 and the friction disc 33, rather than increasing the pressure materially at any particular radius from the axis of the drum 15. It will be readily apparent that by this arrangement, the adjustment disc 31 can be formed of relatively thin and resilient material, and similarly the friction disc 33 may be relatively thin and resilient so as to readily be deformed by operation of the adjustment screw 12 to conform, in varying degrees in accordance with the actuation of the adjustment screw 12, to the dished contour of the end 19 of the drum 15. In this way it is possible to obtain a considerable wide range of adjustment of the dampening effect on the drum 15 without actually deforming the dished end 19 of the drum to any material extent as there is no positive movement of the periphery of the drum to the left as is accomplished when the holes 32 and cooperating cams 30 are employed as have been set forth at a radius from the drum substantially comparable to the radius of the drum itself. It will be readily apparent, however, that where it is desirable to be able to obtain maximum dampening, this can be obtained by the combined use of both circles of adjustment holes 32 and 32*a*, and cooperating cams 30 and 30*a* as has been described and as is illustrated in the drawing, all in accordance with the requirements of practice.

Having thus described a specific embodiment of the present invention as applied to the construction of a particular sash balance, it is to be understood that this form has been illustrated more particularly for disclosing the mode of operation and the principles involved than for limiting the present invention to the specific structure that has been disclosed, and it is to be understood that various modifications, adaptations and alterations can be applied to the specific form shown to be met by the requirements of practice within the scope of the present invention, except as limited by the appended claims.

What I claim is:

1. A sash balance comprising in combination, a base plate having several cams formed therein spaced circumferentially about a center point, a hub having one end secured to said base plate at said center point, an adjustment disc journaled on said hub having registration openings formed therein in cooperation with said cams so as to vary the spacing between said base plate and said adjustment disc in accordance with the relative degree of rotation of said disc, a drum journaled on said hub, said drum having a closed end facing in the direction of said adjustment disc, said closed end being dished inwardly, a torsional spring within said drum having one end secured to said hub and the other end secured to the inner periphery of said drum, a friction disc disposed on said hub between said drum and said adjustment disc, means bearing against the inner turns of said spring for biasing said drum against said friction disc and in the direction of said adjustment disc and said base plate.

2. A sash balance comprising in combination, a base plate and an adjustment disc, said base plate and adjustment disc having cooperating registration holes and cams circumferentially located about a common center point so that the rotation of the adjustment disc with respect to the base plate governs the lateral spacing of the adjustment disc from the base plate, a drum, a hub secured at one end to said base plate at said center point journaling said drum and said adjustment disc, means for biasing said drum in the direction of said base plate and said adjustment disc upon assembly of the balance so as to dampen the rotation of said drum by reason of friction applied to the side of the drum, and manually adjustable means governing the rotation of said adjustment disc relative to said base plate whereby the extent of dampening of the rotation of said drum can be increased subsequent to assembly of the balance.

3. A sash balance comprising in combination, a drum, a base plate and an adjustment disc, said base plate and adjustment disc having cooperating registration holes and cams circumferentially located about a common center point at a radial distance substantially less than the radius of said drum, whereby the rotation of the adjustment disc with respect to the base plate governs the lateral spacing between the adjustment disc and the base plate, a hub secured at one end to said base plate at said center point journaling said drum and said adjustment disc, means effective upon the assembly of the sash balance for biasing said drum in the direction of said adjustment disc and thereby dampening the drum with respect to rotation by friction against the side thereof, and manually adjustable means governing the rotation of said disc relative to said base plate whereby the extent of dampening of the rotation of said drum can be increased subsequent to the assembly of the balance.

4. A sash balance comprising, a drum having an end portion dished inwardly and providing a bearing along the axis of the drum, a base plate and an adjustment disc, said base plate and adjustment disc having cooperating registration holes and cams circumferentially located about a common center point at a radial distance substantially less than the radius of said drum, a friction disc, a hub secured at one end to said base plate at said center point journaling said drum, said friction disc and said adjustment disc, means effective upon assembly of the balance for applying pressure at said bearing of said drum urging said end portion of said drum against said friction disc so as to dampen the rotation of the drum, and manually adjustable means governing the rotation of said adjustment disc relative to said base plate so as to adjustably increase the dampening of the rotation of said drum subsequent to the assembly of the sash balance.

5. A sash balance comprising in combination, a base plate having a plurality of inwardly formed cams circumferentially disposed about a center

point, a hub having one of its ends secured to said base plate at said center point, a drum journaled on said hub, an involute spring within said drum and about said hub, said spring having its inner end secured to said hub and its outer end secured at the inner periphery of said drum, a rotatable variable pressure disc journaled on said hub between said drum and said base plate, said disc having openings disposed to register with said cams when said pressure disc is in a particular rotated position with respect to said base plate, a friction disc disposed between said pressure disc and said drum, and means bearing against the inner turns of said spring biasing said spring, said drum, said friction disc and said variable pressure disc in the direction of said base plate.

6. A sash balance comprising in combination, a drum, a base plate, an adjustment disc, said base plate and adjustment disc having several cooperating registration cams formed therein at two different radial distances from a common axis, said cams being substantially evenly spaced about said axis, whereby the rotation of said adjustment disc relative to said base plate governs the lateral spacing between the adjustment disc and the base plate, a hub secured at one end to said base plate along said common axis, said hub journaling said adjustment disc and said drum, biasing means effective upon the assembly of the sash balance for biasing said drum in the direction of said adjustment disc and thereby dampening the rotation of said drum, and manually operable means governing the rotation of said adjustment disc relative to said base plate whereby the dampening of the rotation of said drum can be adjusted subsequent to the assembly of the sash balance.

7. A sash balance comprising in combination, a drum, a base plate, a friction disc, and an adjustment disc, said base plate and adjustment disc having several cooperating registration cams formed therein at a radial distance about a common axis substantially less than the radius of said drum, said cams being substantially evenly spaced circumferentially, a hub extending along said common axis secured at one end to said base plate, said hub journaling respectively said adjustment disc, said friction disc, and said drum; means effective upon the assembly of the balance to bias said drum, said friction disc, said adjustment disc and said base plate in lateral relationship respectively; and manually operable means effective subsequent to the assembly of the sash balance for rotating said adjustment disc relative to said base plate and thereby increase the dampening of the rotation of said drum by increasing the lateral spacing between said base plate and said adjustment disc.

8. A sash balance comprising, a drum, a base plate, a friction disc, an adjustment disc, said base plate and said adjustment disc having substantially evenly spaced cooperating registration cams disposed circumferentially about a common axis at a radial distance less than the radius of said drum, a hub extending along said common axis and secured at one end to said base plate, said hub journaling respectively said adjustment disc, said friction disc and said drum laterally with respect to each other; biasing means urging said drum, said friction disc, said adjustment disc and said base plate in respective lateral engagement; a face plate secured to said base plate at one end thereof, said face plate having an opening formed therein; an adjustment screw and nut, said screw being fixed with respect to axial movement and having its head accessible to a hand tool inserted through said opening in said face plate; and means for operably connecting said adjustment disc to said nut so that the axial movement of said nut along said screw effects rotation of said adjustment disc about said hub.

9. A sash balance comprising, a drum, a base plate, an involute spring, said drum having an end plate dished inwardly with a bushing loosely fitted therein and extending along the axis of said drum, a hub secured at one end to said base plate, said hub being effective to journal said bushing of said drum, an involute spring within said drum having its inner end secured to said hub and its outer end secured to the inner periphery of said drum, and biasing means acting through the inner turns of said spring urging said spring laterally against said bushing, whereby said bushing may be prevented from rotating with said drum by reason of said biasing means, while said drum is free to rotate on said bushing.

10. A sash balance comprising in combination, a base plate having several cams formed therein and spaced circumferentially about a center point, a hub secured at one end to said base plate at said center point, an adjustment disc journaled on said hub having registration openings formed therein in cooperation with said cams so as to permit said adjustment disc to be in direct lateral contact with said base plate when in a particular rotated position with respect to said base plate, but to be laterally spaced from said base plate to a variable extent as said adjustment disc is rotated, a drum journaled on said hub, a friction disc between said drum and said hub, and biasing means effective upon the assembly of the balance for biasing said drum against said friction disc.

11. A sash balance comprising, a base plate, a hub secured to said base plate, a drum rotatable on said hub, an involute spring within said drum having its inner end secured to said hub and its outer end secured to said drum to rotate therewith, a ring shaped bearing element on said hub within said drum, said drum having an end wall with an opening therein adapted to journal on said hub, and arcuate sectors formed inwardly from said wall leaving radial spokes therebetwen, such sectors having the arcuate surfaces concentric with said opening and of suitable diameter to form a radial bearing when associated with the outer periphery of said ring shaped bearing element, means for biasing the inner coils of said involute spring against the ring shaped bearing element and the wall of said drum, and flexible suspension means coilable on the outer periphery of said drum and having one end secured to the drum and the opposite end attachable to a window sash, whereby said drum is rotated on movement of said window sash and force to balance said window sash is stored in the involute spring on downward movement of said window sash.

DEWITT TAPPAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
488,699	Rosentreter et al.	Dec. 27, 1892
522,624	Smith	July 10, 1894
2,241,969	Tappan	May 13, 1941
2,534,968	Haas	Dec. 19, 1950