Nov. 18, 1969 P. SKOLNIK 3,478,384

SASH BALANCE

Filed Feb. 8, 1968 2 Sheets-Sheet 1

Fig. 1.

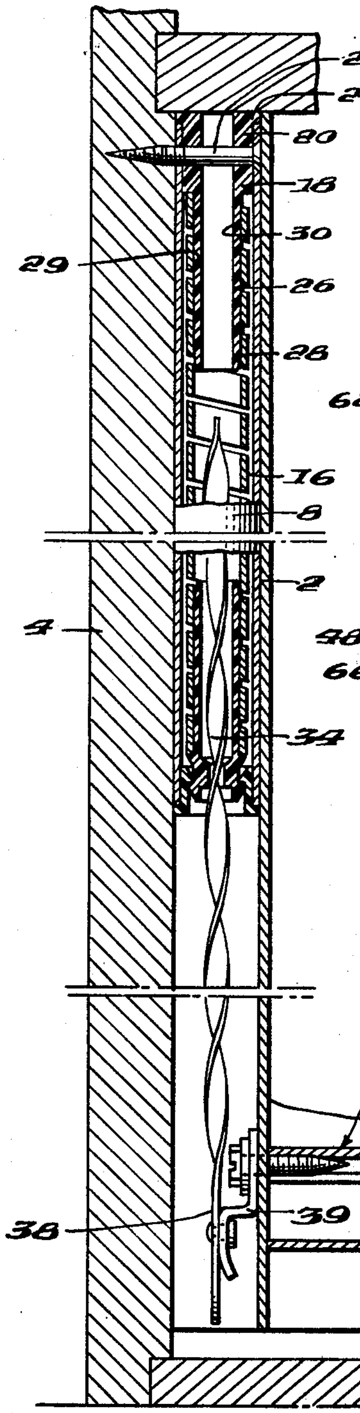


Fig. 2.

Fig. 3.

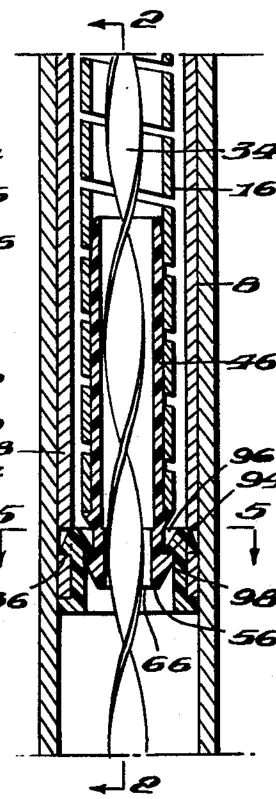


Fig. 4.

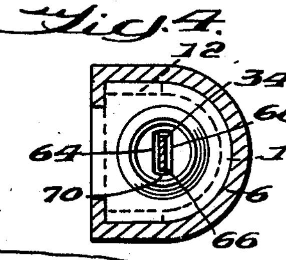
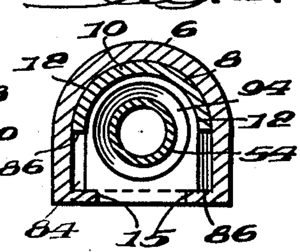


Fig. 5.



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SASH BALANCE

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Fig. 6.

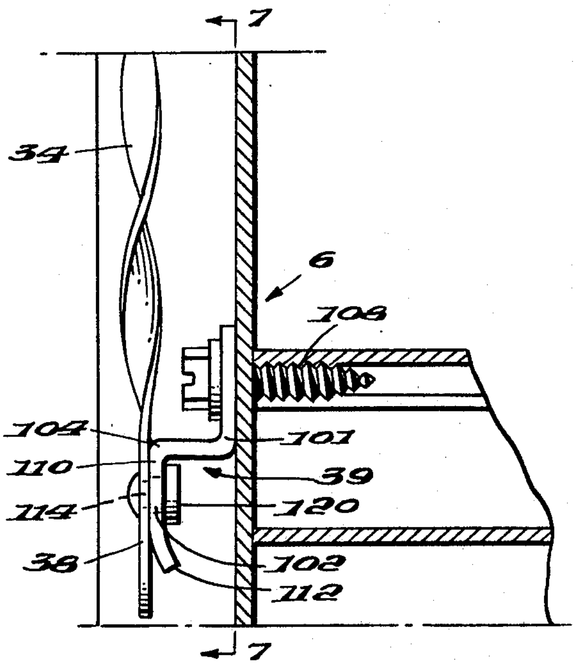


Fig. 7.

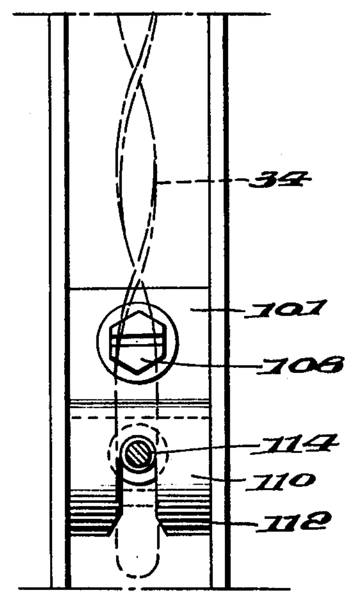
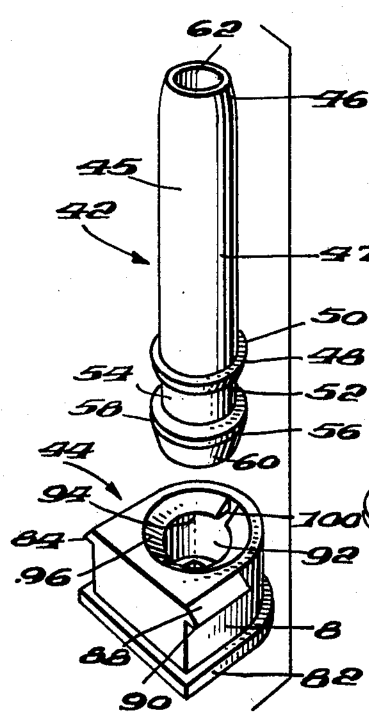


Fig. 8.



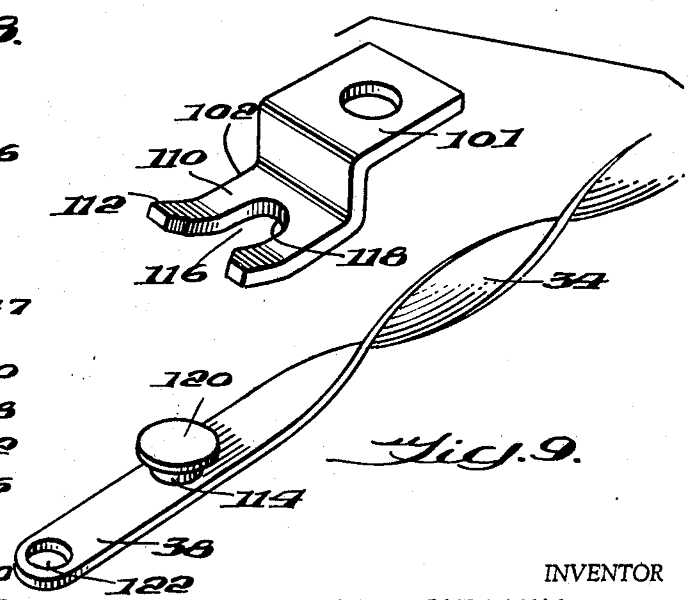


Fig. 9.

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3,478,384

SASH BALANCE

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Int. Cl. E05d 13/12
U.S. Cl. 16—197 7 Claims

ABSTRACT OF THE DISCLOSURE

A sash balance comprising a vertical hollow housing containing a spiral torsion spring fixedly connected to the housing at its upper end. A projecting shaft secured to the lower end of the spring has a slot embracing a concentric spiral rod in mating relation to cause the shaft to be rotated by axial motion of the rod. A connector is fixedly connected to the lower end of the housing. The connector and the shaft include snap-acting, interengaging means for rotatably connecting the shaft and the second connector upon predetermined relative axial closing movement between them.

The lower end of the spiral rod includes a stud received within a slot in a clip adapted to be secured to the window sash. The clip is bent away from the rod adjacent an open end of the slot to prevent separation of the stud from the clip.

BACKGROUND OF INVENTION

This invention relates to window sash balances and improvements therefor, and in particular to a window sash balance of the loaded spiral torsion spring type having improved assembly features.

In installing window sash units it is common to provide sash balances to assist in lifting the sash and for maintaining it in the last position to which it was moved. One form of sash balance is the so-called "spiral" sash balance utilizing a spiral torsion spring. In such a balance a spiral torsion spring is positioned within an axially extending housing secured to the usual window jamb, with the upper end of the spring fixedly connected to the upper end of the housing. A spiral rod matingly engages a spring anchor secured to the lower end of the spring projecting downwardly therefrom, and is secured to the window sash. Vertical lowering and raising of the window sash, moving the spiral rod axially, causes the spring anchor to load and unload the spring respectively.

Although such spiral sash balances offer significant operational advantages over several other forms of sash balance, serious manufacturing problems commonly arise in the assembly of the various component parts of spiral sash balances.

For example, there have been problems hitherto in providing an uncomplicated connected between the lower end of the spring and the spiral rod to provide for loading of the spring and for combining this connection with a connection to the housing to locate the spring against axial motion but permit rotational movement. Various relatively complicated lower end connection assemblies have been proposed but in general they require numerous assembly steps involving appreciable expense.

Other problems have arisen in the provision of a suitable connection between the free extremity of the spiral rod and the window sash in that it has sometimes been possible during lifting motion for the rod and window sash to become disengaged, thereby rendering the sash balance ineffective.

SUMMARY OF INVENTION

It is therefore a general object of the invention to provide a window sash balance of the spiral spring type intended to overcome or minimize problems of the type previously noted.

It is a particular object of the invention to provide a spiral sash balance adapted for ready assembly of its component parts.

It is a further object of the invention to provide a spiral sash balance having an axially fixed but rotational connection between one end of the spring and the adjacent end of the housing, which is of particularly simple construction.

It is yet another object of the invention to provide a spiral sash balance in which the possibility that the sash balance operating rod may inadvertently become separated from the window sash is obviated or minimized.

A sash balance in accordance with one preferred embodiment of the invention includes a hollow housing extending axially in a vertical direction. An axially extending spiral torsion spring positioned within the housing is fixedly connected at one axial end to an adjacent one axial end of the housing by a first connector. An axially extending spiral rod positioned within the spring has one free end of the rod projecting outwardly of the other end of the spring. A tubular shaft fixedly connected with the other end of the spring includes a free extremity projecting outwardly of the spring. The shaft further includes a generally rectangular slot positioned generally centrally of the shaft extending axially therethrough. The slot embraces the spiral rod in mating relation to cause the shaft to be rotated by the rod upon relative axial motion between the rod and the shaft. A second connector is fixedly connected to the other end of the housing and includes an axial bore slidably receiving portions of the shaft adjacent the free extremity thereof. The second connector and the shaft include snap-acting, interengaging means for rotatably connecting the shaft and the second connector upon predetermined relative axial closing movement between them, and for thereafter preventing subsequent axial separation of the shaft and the second connector. In this manner the spring may be axially fixed and rotatably connected with the housing at one end by simple axial pushing movements only.

Also significant is the provision of a special clip for preventing inadvertent separation of the axial rod from the window sash. For this purpose the rod adjacent its free extremity is provided with a flat portion having a headed stud projecting perpendicularly therefrom. The stud is received within an axially extending slot in a clip adapted to be secured to the window sash. The slot extends axially of the rod and has a closed extremity abutting the stud beneath the head on a side thereof remote from the free extremity of the rod. Other portions of the clip adjacent an open extremity of the slot are bent away from the flat portion of the rod to prevent axial separation of the head of the stud from the slot.

THE DRAWINGS

A preferred embodiment of the invention is illustrated in the accompanying drawings in which:

FIGURE 1 is a cross-sectional, side view of a window sash balance according to one preferred embodiment of the invention, shown installed in a portion of a sash window assembly;

FIGURE 2 is a cross-sectional side view on an expanded scale of a lower connection assembly forming a part of the window sash balance shown in FIGURE 1, taken on the line 2—2 in FIGURE 3;

FIGURE 3 is a cross-sectional side view of the lower connection assembly shown in FIGURE 2 taken at right angles thereto along the line 3—3 therein;

FIGURE 4 is a cross-sectional end view of the lower connection assembly shown in FIGURE 2 taken along the lines 4—4 therein;

FIGURE 5 is a cross-sectional end view of a part of the lower end connection assembly shown in FIGURE 3 taken along the lines 5—5 therein;

FIGURE 6 is a side view on an enlarged scale of a rod retaining clip forming a part of the window sash balance shown in FIGURE 1;

FIGURE 7 is an end view of a portion of the rod retaining clip shown in FIGURE 6 taken along the lines 7—7 therein;

FIGURE 8 is an exploded perspective view of a shaft and lower end connector forming a part of the lower connection assembly shown in FIGURE 2; and

FIGURE 9 is an exploded perspective view of the rod retaining clip shown in FIGURE 6.

DETAILED DESCRIPTION

Structure

Referring to FIGURE 1 of the drawings, a sash balance **2** according to a preferred embodiment of the invention is there shown, installed between conventional window jamb structure **4** and conventional window sash structure **6**. A more detailed description of the mounting of the sash unit in the surrounding window structure may be obtained by reference to my U.S. Patent 3,271,812.

The sash unit **2** includes a vertically extending housing **8** of suitable light, rigid material such as aluminum, or suitable plastics. The housing **8** comprises an open ended rigid tube of generally U-shaped configuration (FIGURE 5) having a semicircular central section **10** blending into two flat wall portions **12** spaced apart with their free extremities defining an opening **14** facing toward the adjacent window jamb structure **4**. Each wall portion **12** has an inwardly directed, vertically extending beading **15** provided along its free edge.

Positioned within the interior of the housing **8** is an axially extending, coiled torsion spring **16** of the flat wire type. The spring **16** is fixedly connected with the housing **8** adjacent the upper end thereof by a top or first connector **18** made of nylon. The first connector **18** includes an axially extending central body **20** having an exterior peripheral surface shaped to fit slidingly and snugly within and against the interior of the housing **8**. Across the opening **14** of the housing **8**, the central body **20** has a flat peripheral face facing towards the adjacent portions of the window jamb **4**. Aligned, horizontally disposed apertures are provided in the central body **20** and in adjacent portions of the housing **8** to receive an elongate connector **22**, such as a screw for securing the upper end of the housing to the window jamb **4**.

To limit motion of the central body **20** into the open upper end of the housing **8** upon assembly, a rim **24** shaped to conform to the exterior profile of the housing **8** is provided integrally on the central body **20** at the upper end thereof. On assembly the rim **24** moves into abutting contact with the upper end of the housing **8** to limit relative axial closing motion between them.

The spring **16** is fixedly and anti-rotationally secured to the first connector **18** by a locating tube **26** concentric and integral with the main body **20**, depending therefrom. At its lower end the locating tube **26** has an exterior peripheral frusto-conical end portion **28** having a minimum diameter less than the interior diameter of the spring **16**. The portion **28** blends into a main peripheral portion **29** of the locating tube **26**, which is of greater diameter than the spring **16**. The locating tube **26** is forced into the spring **16** so that the latter becomes radially expanded about the main portion **29** into firm, gripping contact therewith. An axially extending circular bore **30** extends entirely through the first connector **18**.

A spiral rod **34** is positioned concentrically within the spring **16** extending downwardly and outwardly thereof below the housing **8**. The spiral rod **34** is formed from longitudinally extending, flat sheet material of uniform width and thickness, twisted into a regular, spiral configuration. At its upper end, the rod **34** may extend partially into the bore **30** of the first connector in a retracted condition of the rod. At its lower end projecting below the housing **8**, the spiral rod is provided with a flattened end portion **38** connected by a clip **39** to the window sash structure **6**. As the window is raised and lowered it causes corresponding axial motion of the rod **34**.

To operatively connect the spiral rod **34** with the spring **16** and with the housing **8**, a lower end connection assembly generally designated **40** (FIGURES 2 and 3) is provided. The connection assembly includes a shaft member **42** and a lower end or second connector **44** (FIGURE 8) both fabricated of nylon.

The shaft member **42** includes locating tube **45** having end and main portions **46** and **47** of similar construction to the previously described locating tube **26** of the first connector. The locating tube **45** enters and is fixedly secured to the lower end of the spring **16** in the same manner as the locating tube **26**. Integral with and extending downwardly from the locating tube **45** is a concentric annular collar **48** having one annular, radially extending, flat surface **50** abutting the adjacent end parts of the spring **16**. The collar **48** also includes an annular, downwardly and radially inwardly inclined, slant face **52**. Extending downwardly from the slant face **52** is a bearing portion **54** of generally the same external diameter as the main portion **47** of the locating tube **45** concentric therewith. A boss **56** concentric and integral with the bearing portion **54** is integrally provided at the lower end thereof. The boss **56** includes a maximum diameter, axially extending, peripherally facing rim **58** of generally the same diameter as the maximum diameter of the previously menttioned collar **48**, and a frusto-conical, downwardly directed portion **60** integral with and extending downwardly and inwardly from the rim **58**.

The shaft member **42** also includes an internal bore **62** extending axially through the shaft member surrounding the spiral rod **34** which passes through the shaft member with ample clearance. Internally of the bore **62**, axially adjacent the bearing portion **54**, is provided an internally constricted region **64** (FIGURE 4). The constricted region **64** includes a generally rectangular, axially extending slot **66** loosely embracing the spiral rod **34**. The slot **66** has a major side **68** a small amount greater than the width of the sheet material from which the spiral rod is formed and a minor side **70** a small amount greater than the thickness of the sheet material of which the spiral rod **34** is formed. As the rod **34** is advanced axially of the shaft member **42** by raising and lowering of the sash window, the spiral rod **34** contacts the edges of the slot to cause rotational motion of the shaft thereby causing corresponding twisting and untwisting of the spring **16**.

To locate the shaft member **42** in fixed axial relation to the housing **8** for rotation relative thereto, the previously mentioned second connector **44** is provided. The second connector **44** includes an axially extending main body **80** having an external peripheral face shaped to be slid axially into the open lower end of the housing **8** in snug abutting contact with the interior thereof. Integral with the lower end of the central body **80** is a peripherally extending rim **82** having the same peripheral profile as the housing **8**. The rim **82** abuts the adjacent lower end edges of the housing **8** once the second connector **44** is inserted into the housing **8** to limit further internal motion of the second connector into the housing.

To facilitate mounting the second connector **44** in the lower end of the housing **8**, the connector is provided with snap-engaging, projecting ears **84** positioned on opposite sides of the central body **80** on the peripheral surface adjacent the upper end thereof. Each of the ears **84** is aligned with one of two generally closed rectangular cut-out openings **86** (FIGURE 3) extending through each of the flat side wall portions **12** of the housing **8**. The openings **86** are positioned adjacent and spaced a short distance from the lower end of the housing **8** and spaced a short distance

away from the adjacent free vertical edges of the wall portions **12**. Each ear **84** further includes a wedging surface **88** inclined downwardly and away from the adjacent peripheral surface of the body **80** and a locking surface **90** disposed perpendicularly to adjacent portions of the peripheral surface of the main body **80**. On assembly, as the second connector unit **44** is pressed into the open lower end of the housing **8**, the wedging surfaces **88** of the ears **84** resiliently distend apart the adjacent side wall portions **12** of the housing **8**. As the rim **82** moves into abutting contact with the end of the housing **8**, the ears **84** concurrently enter the openings **86** so that the adjacent portions of the housing snap closely about them. The locking surfaces **90** then prevent subsequent separation of the second connector **44** from the housing.

Inside the central body **80** of the second connector **44** is an axially extending interior bore **92** (FIGURES 2, 3 and 8) of sufficient diameter to snugly but rotatably receive the maximum diameter rim **58** of the boss **56** of the shaft member **42**. A resiliently deformable annular flange **94** integral with the upper end of the body **80** projecting inwardly of the bore **92** is provided. The flange **94** is resiliently deformable and includes a downwardly and radially inwardly inclined slant face **96** facing upwardly and a lower, flat, radially extending face **98**. The flange **94** extends peripherally around the interior of the bore **92** except for a small radial cut-out portion **100** provided to facilitate resilient deformation of the flange.

During assembly of the sash balance which will be described in more detail hereinafter, the shaft member **42** and the second connector **44** are pressed relatively together so that the boss **56** enters the bore **92** and resiliently deforms the flange **94** downwardly until the rim **58** has passed below the flange. The flange then snaps back into position above the boss **56** adjacent the bearing portion **54** to prevent subsequent axial separation of the shaft **42**, thus locating it axially relative to the second connector **44** but permitting relative rotational movement. It will be appreciated that the boss **56** and flange **94** thus constitute snap action interengaging portions facilitating assembly of the sash balance unit by simple, axially directed pressure.

As the window sash **6** is lowered relative to the window jamb **4**, axial motion of the rod **34** through the shaft member **42** causes the latter to be rotated in such a direction as to increase the torsional loading of the spring **16**. When the sash is raised, expansion of the spring **16** releasing torsional energy stored in the spring assists in raising the window sash against gravity. In any position, the window sash is held against dropping under the effect of gravity by the resistance to further torsional deflection of the spring **16**.

As previously mentioned, the lower end of the spiral rod **34** is secured to the window sash by the clip **39** (FIGURES 6 and 7). The clip **39** is formed of sheet metal and includes vertically extending upper and lower flanges **101** and **102** respectively connected by a horizontal, intermediate web **104**. The vertical flange **101** is adapted to abut an adjacent vertical portion of the window sash structure **6** and is fixedly connected thereto by a suitable elongate connector **108** such as, for example, a screw.

The lower flange **102** includes an intermediate portion **110** disposed in parallel abutting relation to the previously mentioned flattened portion **38** at the free extremity of the spiral rod. A lower portion **112** integral with the intermediate portion **110** extends downwardly therefrom and is deflected away from the adjacent portion **38** of the rod. To secure the rod and clip together, a stud **114** secured to the end portion **38** passes through an axially extending slot **116** in the lower flange, of sufficient width to matingly, slidingly receive the stud **114**. The slot **116** has a closed upper extremity **118** in abutting contact with the stud. A head **120** of greater diameter than the stud is disposed in overlapping relation to the adjacent areas of the intermediate portion **110** of the lower flange. The slot **116** further includes an open lower extremity to provide for entry of the stud into the slot on assembly before the upper flange **101** is secured to the sash **6**.

On assembly, the clip is engaged either by lengthwise bending of the rod portion **38** to interengage the stud **114** with the clip on the sash; or, if preferred, the clip can be slid over the stud prior to securing the upper flange **101** to the adjacent sash portion **6**. Axial separation of the lower flange **102** from the stud **114** is prevented by deflecting the lower portions **112** away from the rod portion **38** so that travel of the head **120** along the slot is prevented once the unit has been assembled on the sash, thus inclining the portions **112** in blocking relation against the head.

Assembly

In the assembly of the sash balance, the locating tube **26** is forced axially into the upper end of the spring **16** to secure the first connector **18** to the spring. Similarly the locating tube **45** is forced axially into the lower end of the spring **16** to secure the shaft member **42** to the spring. The spring **16** is then fed axially into the housing **8** through the open upper end thereof until the rim **24** of the first connector **18** comes into abutting contact with the upper edge of the housing **8**. At this time the boss **56** of the shaft member **42** will be located adjacent the lower end of the housing **8**. The second connector **44** is then forced axially into the lower end of the housing **8** while holding the boss **56** in fixed position. This causes the flange **94** to pass over the boss **56** to secure the shaft member **42** and second connector **44** together for relative rotation. At the same time the ears **84** of the second connector **44** are snapped into fixed connection with the housing **8** to secure the second connector to the housing. The spiral rod is slid through the opening **66** in the shaft member **42** into the spring. The lower flange of the clip **39** is slid along the stud **114** to secure the clip to the spiral rod. An opening **122** in the end of the spiral rod may be engaged by a tool to aid in engagement with the clip.

The upper end of the housing may be secured by the connector **20** to the window jamb **4**, and the upper flange of the clip **39** should be secured to the window sash unless it has been attached as described above.

SUMMARY OF ADVANTAGES

In following the construction of the present invention a sash balance having certain significant advantages is provided.

Particularly significant is the provision of connections between all the elements of the sash balance which may be assembled by simple axial pushing movement, thereby producing an uncomplicated sash balance suitable for low-cost production.

In this regard the snap-engaging connection provided between the shaft member and the second connector affords a simple but effective connection between the spring, the spiral rod and the lower end of the housing to facilitate twisting of the spring under the action of the spiral rod.

Also significant is the provision of the clip specially configured to entrap the head of the stud once the clip has been secured to the adjacent window sash so that subsequent separation of the window sash from the spiral operating rod is prevented.

Although the invention has been described with reference to a preferred embodiment, it will be appreciated by those skilled in the art that numerous additions, deletions, substitutions, modifications and other changes not specifically described, may be made which will fall within the spirit of the invention.

I claim:

1. A sash balance for use with a window sash, said sash balance comprising,

an axially extending hollow housing,

an axially extending spiral torsion spring positioned within said housing,

an axially extending spiral rod positioned within said spring projecting outwardly of one end thereof,

an annular shaft fixedly connected with said one end of said spring projecting outwardly thereof, said shaft including,

axially extending slot means positioned generally centrally of said shaft and embracing said spiral rod in mating relation thereto to cause said shaft to be rotated by said rod upon relative axial motion between said rod and said shaft;

a connector fixedly connected to said one end of housing, said connector having

an axial bore slideably receiving portions of said shaft; said connector and said shaft including,

snap acting, inter-engaging means for rotatably connecting said shaft and said connector upon predetermined relative axial closing movement therebetween and for thereafter preventing subsequent axial separation of said shaft and said connector.

2. A sash balance as defined in claim **1** wherein,

said bore and said shaft are of circular cross-section and are of relatively larger and smaller diameters,

said inter-engaging portions including,

a boss secured to said free extremely of said shaft concentric therewith, said boss being generally frusto-conical and facing toward said second connector with said boss having a maximum diameter slightly less than said bore to be rotatably received therein; and

a flange fixedly secured to and extending about the interior of said bore, said flange having an interior diameter smaller than said maximum diameter of said boss, said flange being resiliently deformable in one direction away from said shaft to permit said boss to be pushed entirely past said flange in said one direction into an engaged relation but to prevent axial separation of said boss from said flange thereafter in a reverse axial direction.

3. A sash balance as defined in claim **2** further including a raised annular collar fixedly secured to said shaft spaced axially from said boss on an opposite side of said flange from said boss when said boss is in engaged relation with said second flange.

4. A sash balance as defined in claim **2** wherein,

one end of said housing is open,

said connector further including,

an axially extending peripheral face shaped to be slid axially into said open one end of said housing in snug abutting relation thereto,

a peripherally extending raised rim at an outer axial end of said peripheral face abuttingly contacting a radial end surface of said housing at said one end thereof to limit axial motion of said connector into said housing;

said peripheral face of said connector and adjacent portions of said housing including,

snap acting, second inter-engaging means for fixedly connecting said connector and said housing upon predetermined relative axial closing movement therebetween and for thereafter preventing subsequent axial separation of said housing and said connector.

5. A sash balance as defined in claim **4** wherein,

said second inter-engaging means includes,

at least one opening in said housing adjacent and spaced axially from said one end thereof,

at least one ear projecting from said peripheral surface of said connector, said ear including,

a forward surface inclined axially toward said one end of said housing to resiliently deflect adjacent portions of said housing away from said peripheral surface upon movement of said connector into said housing;

a rear surface extending perpendicularly from said peripheral surface,

said ear snapping into said opening upon arrival thereat with said rear surface preventing withdrawal of said connector from said housing.

6. A sash balance as defined in claim **1** wherein,

said spiral rod adjacent an extremity thereof outward of said spring further includes,

an axially extending flat portion;

a stud projecting perpendicularly from said flat portion;

a head on the free extremity of said stud said head being of greater diameter than said stud;

a clip adapted to be secured to adjacent portions of the window sash, said clip including,

a flat member having,

one surface abuttingly contacting said flat portion of said spiral rod,

another surface of said flat member abuttingly contacting the adjacent surface of said head;

an axially extending slot in said flat member havan open end facing toward said free extremity of said spiral rod, said slot embracing said stud but being of smaller diameter than said head, said slot further including a closed extremity abutting said stud on a side thereof remote from said free extremity of said rod; and

foot portions on said flat member on a side of said stud adjacent said free extremity of said rod, said foot portions inclined away from said rod preventing separation of said stud from said clip.

7. A retaining clip for securing a spiral rod forming part of a spiral spring type sash balance to a window sash, the spiral rod further including a free extremity having a flat portion generally parallel to adjacent side portions of the window sash with a headed pin projecting perpendicularly from the flat portion, said retaining clip comprising;

a first member adapted to be secured to the adjacent side portions of the window sash,

a second member connected to said first member, said second member including,

a slot having one open end to permit the second member to be slid between said flat portion of said spiral rod and the headed portion of said pin,

a first portion positioned around said headed pin when said clip is in engaged relation in said slot; and

a second portion adjacent said open end of said slot diverging away from said spiral rod to block release of said headed pin from said slot.

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DONALD A. GRIFFIN, Primary Examiner