Liza M. Walsh
Eleonore Ofosu-Antwi
WALSH PIZZI O'REILLY FALANGA LLP
One Riverfront Plaza
1037 Raymond Blvd., Suite 600
Newark, NJ 07102
Telephone: (973) 757-1100

Attorneys for Plaintiff

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY

AMESBURY GROUP, INC., a Delaware corporation, Plaintiff, v. VISION INDUSTRIES GROUP, INC., a New Jersey corporation, Defendant.	Civil Action No: _____ **JURY TRIAL DEMANDED** *Electronically Filed*

COMPLAINT

Plaintiff Amesbury Group, Inc. ("Plaintiff" or "Amesbury"), by and through its undersigned counsel, hereby files the following Complaint against Defendant Vision Industries Group, Inc. ("Defendant" or "Vision Hardware"), and alleges:

INTRODUCTION

1. Amesbury is a leading provider of products and solutions in the North American window and door industry, including the provision of balance systems for double hung windows. Amesbury develops, manufactures, sells, and supports balance systems throughout the United

States. Amesbury's balance systems include its inventive balance shoes that are used with its block and tackle balances ("T-Lock Balance Systems").

2. The depth of Amesbury's engineering talent and its commitment to research and development is demonstrated by Amesbury's extensive and ever-growing patent portfolio, which includes U.S. Patent Nos. 8,424,248 (the "'248 patent") and 9,580,950 (the "'950 patent") (collectively, "Asserted Patents"). The Asserted Patents are directed to window balance systems that include Amesbury's T-Lock Balance Systems and methods of installing the same.

3. Not only are the T-Lock Balance Systems sold by Amesbury patented and proprietary, but Amesbury has over the years invested substantial amounts of time and resources developing its T-Lock Balance Systems to ensure it provides innovative, reliable, and robust products to its customers. Thanks to these efforts, the T-Lock Balance Systems have achieved significant sales and become a market leader.

4. This action arises out of competitor Vision Hardware adopting the patented technology used in Amesbury's T-Lock Balance Systems rather than putting in the time and resources necessary to independently develop its own balance system. Vision Hardware must now be held accountable for its unlawful and willful infringement.

THE PARTIES

5. Plaintiff Amesbury Group, Inc. is a Delaware corporation with its principal place of business at 3600 Minnesota Drive, Suite 800, Edina, Minnesota 55435.

6. Upon information and belief, Defendant Vision Industries Group, Inc. is a New Jersey corporation doing business as Vision Hardware with its principal place of business at 500 Metuchen Rd, South Plainfield, NJ 07080.

JURISDICTION AND VENUE

7. This is an action for patent infringement under the patent laws of the United States, 35 U.S.C. §§ 271 and 281, *et seq*. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

8. Venue is proper in this district pursuant to 28 U.S.C. §§ 1391 and 1400(b).

9. Vision Hardware is subject to this Court's specific and general personal jurisdiction pursuant to due process and/or the New Jersey Long Arm Statute. Vision Hardware engaged in and maintained systemic business contacts within the State of New Jersey and has purposefully availed itself of the benefits and protections of New Jersey corporate law. Vision Hardware maintains its principal place of business in New Jersey. In addition, on information and belief, Vision Hardware has engaged in substantial business in this forum, including: (i) at least a portion of the infringements alleged herein have occurred in New Jersey; (ii) targeting business activities towards consumers in the United States, including New Jersey, through at least fully interactive commercial Internet sites and stores; and/or (iii) regularly doing or soliciting business, engaging in other persistent courses of conduct, or deriving substantial revenue from goods and services provided to individuals in New Jersey. Upon information and belief, as a result of Defendant's marketing, selling or offering for sale of its infringing product in the State of New Jersey, Plaintiff will lose sales and will be injured in the State of New Jersey.

BACKGROUND

Asserted Patents

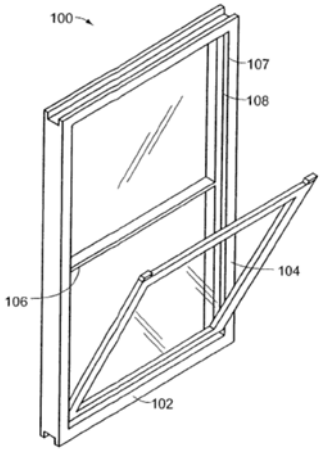
10. On February 28, 2017, the United States Patent and Trademark Office duly and legally issued the '950 patent, entitled "Locking Balance Shoe and System for a Pivotable Window." A true and correct copy of the '950 patent is attached hereto as Exhibit A.

11. On April 23, 2013, the United States Patent and Trademark Office duly and legally issued the ’248 patent, entitled “Method of Installing a Locking Balance Shoe and System for a Pivotable Window.” The ’248 patent is related to the ’950 patent. A true and correct copy of the ’248 patent is attached hereto as Exhibit B.

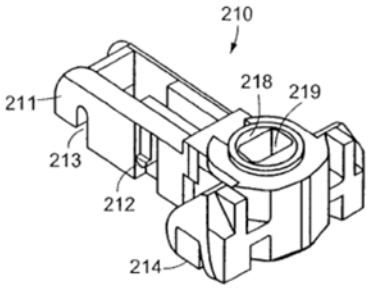
12. Amesbury is the owner of all rights, title, and interest in the Asserted Patents. These patents are presumed valid.

13. The ’950 patent discloses locking balance shoes and balance systems for incorporation into the window jamb track of pivotable double hung windows. Window balances are used with double hung windows to help control vertical window movement by offsetting the weight of a sash when in an open position. Pivotable double hung window balances for use with pivotable double hung windows include a pivot bar, or like configuration, that allows rotational movement of a sash about the pivot bar, or like configuration, to facilitate cleaning of the window.

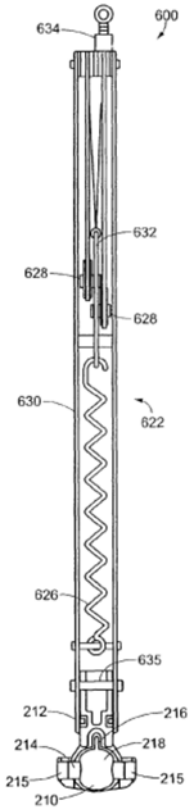
14. Figure 1 of the ’950 patent, which is reproduced below, discloses a standard double hung window assembly with the lower window sash (104) pivoted about a pivot bar (not shown):



15. Locking balance shoes and balance systems of the ’950 patent include balance shoes like the balance shoe (210) depicted in Figure 3A of the ’950 patent, which is reproduced below:



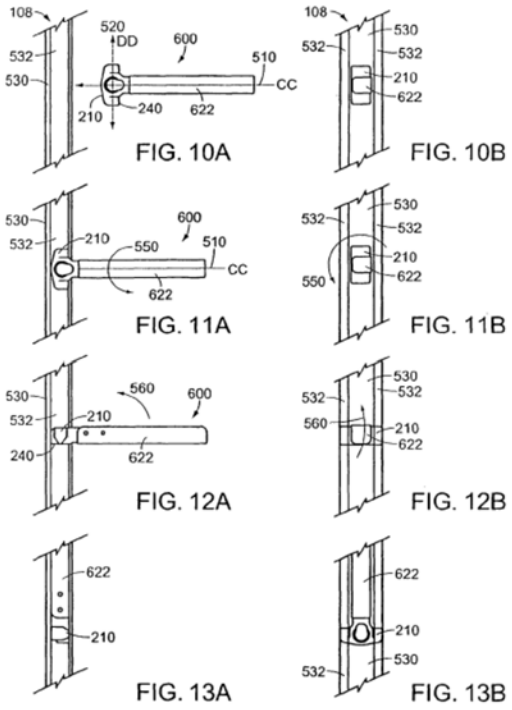
16. Locking balance shoes (210) are combined with a u-shaped channel (630), which is designed to fit within the jamb of a double hung window, and additional components to create a window balance system (622) adapted for placement in a window jamb track as disclosed by Figure 3C of the ’950 patent, which is reproduced below:



17. The ’950 patent issued with forty-five (45) claims directed to window balance systems.

18. Amesbury’s other patent at issue, the ’248 patent, discloses methods for installing locking balance shoes and balance systems in the window jamb track of double hung windows. The disclosed methods include inserting a portion of the balance shoe within a jamb track of a window jamb and rotating the balance shoe twice to position the balance shoe of the balance system in the jamb track of a window frame.

19. Figures 10-13 of the ’248 patent, which are reproduced below, disclose one example of the disclosed methods for installation, including the insertion of a balance shoe (210) of a window balance (600) into the jamb track (108) of a window in Figure 10, rotating the balance shoe (210) about a first axis in Figure 11, and rotating the balance shoe (210) about a second axis in Figure 12, resulting in the position of the balance shoe (210) substantially disposed within the jamb track (108) of a window in Figure 13:



20. The '248 patent issued with eighteen (18) claims directed to methods of installing window balance systems in a window jamb of a window frame.

Vision Hardware's Infringing Activities

21. On information and belief, Vision Hardware is making, using, selling, and/or offering to sell balance systems that infringe one or more claims of the Asserted Patents.

22. Window & Door® is a leading online (https://windowanddoor.com/) and print publication for the fenestration industry with a tagline "The Information Source for the Fenestration Industry."

23. The August 2017 print edition of Window & Door (Volume 25, Number 5) included a Vision Hardware advertisement for Vision Hardware's "Vision Balance" balance system. A copy of the advertisement is attached hereto as Exhibit C.

24. Vision Hardware's advertisement proclaims a "New Inverted Balance System" with a "[b]alance shoe [that] comes attached to the balance eliminating the need to order additional SKU's." (Exhibit C at 3.)

25. Vision Hardware's Vision Balance is "[a]vailable in inverted tilt, standard tilt and sideload options." (*Id.*)

26. Vision Hardware advertises "[m]ultiple balance shoe and mounting hook options designed for easy installation and removal," that the "balance shoe can come attached to the balance or separate to allow use of interchangeable shoes for multiple system application" and that "[a]ll balances are pretensioned specifically for each window size to match existing industry systems." (*Id.*)

27. Vision Hardware further advertises its Vision Balance includes a "[p]rotective metal channel," "[s]teel springs," and the "[u]se of industry leading cord." (*Id.*)

28. Vision Hardware's advertisement invites customers to "[v]isit visionhardware.com to order free samples or call (800) 2220-4756 to speak to a sales representative." (*Id.*) On information and belief, the advertised website and phone number are associated with and owned by Vision Hardware.

29. Vision Hardware's advertisement also invites customers to visit it at booth 1227 at GlassBuild America, which is a leading annual tradeshow for the fenestration industry and was held from September 12-14 in 2017. (*Id.*)

30. Vision Hardware's advertisement proclaims "90 days of inventory" is available "at one of our 5 regional warehouses" and the availability of customer's to "lock pricing for a minimum of two years." (*Id.*)

31. Amesbury notified Vision Hardware that it infringes the Asserted Patents by letter dated August 18, 2017, and requested Vision Hardware cease and desist its infringing activity. The letter included copies of the Asserted Patents and multiple pictures of an infringing Vision Hardware balance. Amesbury's August 18, 2017 letter to Vision Hardware is attached as Exhibit D.

32. On informant and belief, Vision Hardware has manufactured, tested, used, offered for sale and sold its "New Inverted Balance System" called "Vision Balance" in violation of one or more claims of the Asserted Patents. On informant and belief, Vision Hardware is continuing to manufacture, test, offer for sale and sell its "New Inverted Balance System" called "Vision Balance" in violation of one or more claims of the Asserted Patents.

COUNT I: INFRINGEMENT OF '950 PATENT

33. Amesbury repeats, realleges, and incorporates hereunder by reference the allegations contained in paragraph 1 through 32 above.

Direct Infringement

34. Vision Hardware has directly infringed, and continues to directly infringe, literally and/or under the doctrine of equivalents, one or more of claims of the ’950 patent by, among other things, making, using, offering for sale, or selling its Vision Balance as advertised in Exhibit C, which is covered by at least claims 1-5, 7-13, 15-16, 18-20, 23-32, 35-39, and 43-45 of the ’950 patent.

35. Vision Hardware’s Vision Balance system includes a u-shaped channel as required by the claims of the ’950 patent. The Vision Balance’s u-shaped channel is referred to as a “[p]rotective metal channel” in its advertisement.

36. The Vision Balance system includes a spring connected to a system of pulleys as required by the claims of the ’950 patent. The Vision Balance’s spring is referred to as a “[s]teel spring” and is shown connected to a system of pulleys in its advertisement.

37. The Vision Balance includes a cord as required by the claims of the ’950 patent. The Vision Balance’s cord is referred to as an “industry leading cord” in its advertisement.

38. The Vision Balance includes a t-shaped balance shoe as required by the claims of the ’950 patent. The Vision Balance’s t-shaped balance shoe is referred to as a “balance shoe” in its advertisement. The balance shoe includes a frame that includes an elongate portion consisting of a wire frame and an enlarged portion consisting of black plastic as partially shown in Vision Hardware’s advertisement.

39. The wire frame elongate portion of the Vision Balance includes two frame edge surfaces as required by the claims of the ’950 patent and a front surface and a back surface as required by the claims of the ’950.

40. The black plastic enlarged portion of the Vision Balance includes two outer

surfaces as required by the claims of the ’950 patent and a front surface and a back surface as required by the calms of the ’950 patent.

41. The wire frame elongate portion depth and width of the Vision Balance is substantially the same as the depth and width of the u-shaped channel as required by the claims of the ’950 patent and can be seen in closer detail in the images attached to the end of the August 18, 2017 letter from Amesbury to Vision Hardware.

42. The black plastic enlarged portion of the Vision Balance has a width greater than the wire frame elongate portion depth, the wire frame elongate portion width, the black plastic enlarged portion depth, the black plastic enlarged portion length, the u-shaped channel width, and the u-shaped channel depth as required by the claims of the ’950 patent and as shown in Vision Hardware’s advertisement.

43. The wire frame elongate portion of the Vision Balance fits within the u-shaped channel as required by the claims of the ’950 patent and the two outer surfaces of the black plastic enlarged portion fit within a window jamb track as required by the claims of the ’950 patent. Vision Hardware’s advertisement touts “[m]ultiple balance shoe and mounting hook options designed for easy installation and removal.”

44. The Vision Balance includes a cam within the black plastic enlarged portion as required by the claims of the ’950 patent and shown in Vision Hardware’s advertisement.

45. The Vision Balance includes a locking device in contact with the cam as required by the claims of the ’950 patent. The locking device is located on the black plastic enlarged portion.

46. The Vision Balance also includes a connecting device as required by the claims of the ’950 patent.

Willful Infringement, Damages, and Injunctive Relief

47. Since at least Amesbury's August 18, 2017 letter, Vision Hardware has had actual knowledge of the '950 patent, as well as knowledge that its offering for sale, selling and using the inventions claimed and taught in the '950 patent constituted infringement.

48. The infringement of the '950 patent by Vision Hardware has been, since at least Amesbury's August 18, 2017 letter, deliberate, willful, and knowing, or with deliberate indifference, entitling Amesbury to treble damages and recovery of its attorneys' fees.

49. Amesbury has been, and continues to be, damaged and irreparably harmed by Vision Hardware's infringement of the '950 patent, which will continue unless this Court enjoins Vision Hardware and those acting on its behalf or under its control.

50. Amesbury has at all times complied with the marking requirement of 35 U.S.C. § 287.

51. Amesbury, under 35 U.S.C. § 284, seeks damages adequate to compensate it for Vision Hardware's infringement.

52. As a consequence of Vision Hardware's willful and deliberate infringement of the '950 patent, Amesbury is entitled to enhanced damages pursuant to 35 U.S.C. § 284.

53. The Court should declare this an exceptional case under 35 U.S.C. § 285, entitling Amesbury to recover its attorneys' fees.

COUNT II: INFRINGEMENT OF '248 PATENT

54. Amesbury repeats, realleges, and incorporates hereunder by reference the allegations contained in paragraph 1 through 53 above.

Direct Infringement

55. Vision Hardware has directly infringed, and continues to directly infringe,

literally and/or under the doctrine of equivalents, one or more of claims of the ’248 patent by, among other things, making, using, offering for sale, or selling its Vision Balance as advertised in Exhibit C, which is covered by at least claims 1-3, 9, and 12-17 of the ’248 patent.

56. The Vision Balance, which includes a balance shoe from consisting of an black plastic enlarged portion and a wire frame elongate portion, is rotated 90 degrees about a first axis relative to the orientation position and rotated 90 degrees about a second axis perpendicular to the first axis as required by the claims of the ’248 patent in order to install the Vision Balance in a jamb track of a window frame.

Induced Infringement

57. Vision Hardware has infringed and continues to infringe indirectly by active inducement, specifically intending its customers to directly infringe one or more claims of the ’248 patent.

58. Specifically Vision Hardware infringed and continues to infringe indirectly by active inducement, with such intent to induce infringement of the ’248 patent being evidenced by, at least, its advertisements instructing customers to install Vision Hardware’s Vision Balance in window frames thereby practicing the method in the ’248 patent.

59. Since at least Amesbury’s August 18, 2017 letter, Vision Hardware has had actual knowledge of the ’248 patent, as well as knowledge that its customers practice the methods claimed and taught in the ’248 patent.

60. On information and belief, with this knowledge, Vision Hardware knowingly has induced, and continues to induce, direct infringement by customers that have been and are continuing to install Vision Hardware’s Vision Balance in window frames. On information and belief, Vision Hardware also provides installation instructions with and/or for its Vision Balance

that directs its customers to practice one or more methods claimed and taught in the ’248 patent. Therefore, where Vision Hardware has sold its Vision Balance, it has, on information and belief, directed and instructed customers to use the same methods that Vision Hardware uses for installation in-house, which are the methods claimed and taught in the ‘248 patent. Consequently, Vision Hardware has intentionally caused, urged, encouraged or aided action by its customers to practice the methods claimed and taught in the ’248 patent resulting in direct infringement.

61. On information and belief, Vision Hardware has had, and continues to have, the specific intent that its customers of its Vision Balance practice the methods claimed and taught in the ’248 patent. The purpose of Vision Hardware’s Vision Balance—to provide consumers with a balance system for use with windows—would be frustrated if its customers did not install the Vision Balance in accordance with its instructions. The purpose of the Vision Balance therefore confirms Vision Hardware’s intent that its customers use the methods and claims taught in the ’248 patent.

62. Vision Hardware’s knowing and intended direction to others, including its customers, is causing indirect infringement under 35 U.S.C. § 271(b) of one or more of claims 1-3, 9, and 12-17 of the ’248 patent.

Willful Infringement, Damages and Injunctive Relief

63. Since at least Amesbury’s August 18, 2017 letter, Vision Hardware has had actual knowledge of the ’248 patent and knowledge of its infringement, as well as knowledge that its customers are infringing the ’248 patent.

64. The infringement of the ’248 patent by Vision Hardware has been, since at least Amesbury’s August 18, 2017 letter, deliberate, willful, and knowing, or with deliberate

indifference, entitling Amesbury to treble damages and its attorneys' fees.

65. Amesbury has been, and continues to be, damaged and irreparably harmed by the infringement of the '248 patent, which will continue unless this Court enjoins Vision Hardware and those acting on its behalf or under its control.

66. Amesbury has at all times complied with the marking requirement of 35 U.S.C. § 287.

67. Amesbury, under 35 U.S.C. § 284, seeks damages adequate to compensate for the infringement of Vision Hardware.

68. As a consequence of Vision Hardware's willful infringement of the '248 patent, Amesbury is entitled to enhanced damages pursuant to 35 U.S.C. § 284.

69. The Court should declare this an exceptional case under 35 U.S.C. § 285, entitling Amesbury to recover its attorneys' fees.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff respectfully requests that this Court enter:

1. An order preliminarily and permanently enjoining Defendant, its principals, officers, directors, employees, agents, successors, assigns, and all persons in active concert with it:

a. from infringing, and contributing to or inducing others to infringe, the '950 patent, including without limitation immediately ceasing and desisting any and all importing, making, using, offering for sale, or selling of the Vision Balance pursuant to 35 U.S.C. § 283; and

b. from infringing, and contributing to or inducing others to infringe, the '248 patent, including without limitation immediately ceasing and

desisting any and all use of the method of installing the Vision Balance and any other methods protected as inventions in the '248 patent, pursuant to 35 U.S.C. § 283; and

2. A judgment in favor of Plaintiff that Defendant has infringed, contributed to, and/or induced the infringement of one or more claims of the '950 patent;

3. A judgment in favor of Plaintiff that Defendant has infringed, contributed to, and/or induced the infringement of one or more claims of the '248 patent;

4. A judgment and order requiring Defendant to pay Plaintiff its damages, costs, expenses, and prejudgment and post-judgment interest for Defendant's infringement of the '950 patent as provided under 35 U.S.C. § 284;

5. A judgment and order requiring Defendant to pay Plaintiff its damages, costs, expenses, and prejudgment and post-judgment interest for Defendant's infringement of the '248 patent as provided under 35 U.S.C. § 284;

6. An award to Plaintiff of enhanced damages resulting from the knowing, deliberate, and willful nature of Defendant's prohibited conduct with notice being made at least as early as August 18, 2017, as provided under 35 U.S.C. § 284;

7. A judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285 and awarding to Plaintiff its reasonable costs, including expert fees, and attorneys' fees; and

8. Any and all other relief to which Plaintiff may show itself to be entitled or which this Court deems just and proper.

DEMAND FOR JURY TRIAL

Plaintiff, under Rule 38 of the Federal Rules of Civil Procedure, requests a trial by

jury of any issues so triable by right.

Respectfully submitted,

Dated: September 20, 2017

By: *s/Liza M. Walsh*

Liza M. Walsh
Eleonore Ofosu-Antwi
WALSH PIZZI O'REILLY FALANGA LLP
One Riverfront Plaza
1037 Raymond Blvd., Suite 600
Newark, NJ 07102
lwalsh.walsh.law
eofosuantwi@walsh.law
Phone: (973)-151-1100

Of Counsel:
Tom Leach (*Pro Hac Vice* App. Pending)
MERCHANT & GOULD PC
3200 IDS Center
80 South 8th St.
Minneapolis, MC
tleach@merchantgould.com
Phone: (612) 336-4665

Ryan Fletcher, Ph.D. (*Pro Hac Vice* App. Pending)
MERCHANT & GOULD PC
1801 California St. #3300
Denver, CO 80202-2654
rfletcher@merchantgould.com
Phone: (303) 357-1651

Attorneys for Plaintiff
Amesbury Group, Inc.

CERTIFICATION PURSUANT TO LOCAL CIVIL RULES 11.2 & 401

I hereby certify that, to the best of my knowledge, the matter in controversy is not the subject of any other pending litigation in any court or arbitration proceeding, nor are there any non-parties known to Plaintiff that should be joined to this action. In addition, I recognize a continuing obligation during the course of this litigation to file and to serve on all other parties and with the Court an amended certification if there is a change in the facts stated in this original certification.

Dated: September 20, 2017

By: *s/Liza M. Walsh*

Liza M. Walsh
Eleonore Ofosu-Antwi
WALSH PIZZI O'REILLY FALANGA LLP
One Riverfront Plaza
1037 Raymond Blvd., Suite 600
Newark, NJ 07102
lwalsh@walsh.law
eofosuantwi@walsh.law
Phone: (973)-151-1100

Of Counsel:
Tom Leach (*Pro Hac Vice* App. Pending)
MERCHANT & GOULD PC
3200 IDS Center
80 South 8th St.
Minneapolis, MC
tleach@merchantgould.com
Phone: (612) 336-4665

Ryan Fletcher, Ph.D. (*Pro Hac Vice* App. Pending)
MERCHANT & GOULD PC
1801 California St. #3300
Denver, CO 80202-2654
rfletcher@merchantgould.com
Phone: (303) 357-1651

Attorneys for Plaintiff
Amesbury Group, Inc.

RULE 201.1 CERTIFICATION

I hereby certify that the above-captioned matter is not subject to compulsory arbitration in that the Plaintiff seek, *inter alia*, injunctive relief.

Dated: September 20, 2017

By: *s/Liza M. Walsh*

Liza M. Walsh
Eleonore Ofosu-Antwi
WALSH PIZZI O'REILLY FALANGA LLP
One Riverfront Plaza
1037 Raymond Blvd., Suite 600
Newark, NJ 07102
lwalsh.walsh.law
eofosuantwi@walsh.law
Phone: (973)-151-1100

Of Counsel:
Tom Leach (*Pro Hac Vice* App. Pending)
MERCHANT & GOULD PC
3200 IDS Center
80 South 8th St.
Minneapolis, MC
tleach@merchantgould.com
Phone: (612) 336-4665

Ryan Fletcher, Ph.D. (*Pro Hac Vice* App. Pending)
MERCHANT & GOULD PC
1801 California St. #3300
Denver, CO 80202-2654
rfletcher@merchantgould.com
Phone: (303) 357-1651

Attorneys for Plaintiff
Amesbury Group, Inc.

EXHIBIT A

US009580950B2

(12) **United States Patent**
Uken et al.

(10) **Patent No.: US 9,580,950 B2**
(45) **Date of Patent: Feb. 28, 2017**

(54) **LOCKING BALANCE SHOE AND SYSTEM FOR A PIVOTABLE WINDOW**

(75) Inventors: **Stuart J. Uken**, Sioux Falls, SD (US); **Gary R. Newman**, Valley Springs, SD (US); **Lawrence J. VerSteeg**, Sioux Falls, SD (US)

(73) Assignee: **Amesbury Group, Inc.**, Amesbury, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 7 days.

(21) Appl. No.: **11/654,120**

(22) Filed: **Jan. 17, 2007**

(65) **Prior Publication Data**

US 2007/0113479 A1 May 24, 2007

Related U.S. Application Data

(63) Continuation of application No. 11/101,689, filed on Apr. 8, 2005, now Pat. No. 7,191,562, which is a continuation of application No. 10/862,950, filed on Jun. 8, 2004, now Pat. No. 6,931,788, which is a continuation of application No. 10/446,279, filed on May 23, 2003, now Pat. No. 6,820,368, which is a continuation of application No. 10/044,005, filed on Jan. 11, 2002, now Pat. No. 6,679,000.

(60) Provisional application No. 60/261,501, filed on Jan. 12, 2001.

(51) **Int. Cl.**

E05D 15/08	(2006.01)
E05C 17/64	(2006.01)
E05D 13/00	(2006.01)
E05D 15/22	(2006.01)

(52) **U.S. Cl.**

CPC ***E05D 15/08*** (2013.01); ***E05D 13/08*** (2013.01); ***E05D 13/1207*** (2013.01); ***E05D 15/22*** (2013.01); *E05Y 2201/67* (2013.01); *E05Y 2900/148* (2013.01); *Y10T 16/64* (2015.01)

(58) **Field of Classification Search**

USPC ..... 49/181, 176, 446, 183, 184, 185, 186, 49/445, 449, 455, 453, 454, 177, 161; 292/DIG. 63, DIG. 47, DIG. 37; 16/197

IPC E05D 15/08,15/22, 13/1207

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,312,665	A	8/1919	Almquist
2,178,533	A	10/1939	Viehweger
2,952,884	A	9/1960	Dinsmore

(Continued)

FOREIGN PATENT DOCUMENTS

CA	2382933	12/2002
GB	740223	11/1955

(Continued)

OTHER PUBLICATIONS

BSI's Hidden Advantage: It's as Easy as 1-2-3, Balance Systems—BSI, Amesbury Group, Inc., 2001, 3 pgs.

(Continued)

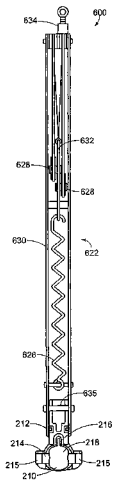
Primary Examiner — Gregory Strimbu

(74) *Attorney, Agent, or Firm* — Goodwin Procter LLP

(57) **ABSTRACT**

Locking balance shoes and balance systems to be incorporated in pivotable double hung windows include, in one embodiment, a pair of retractable tabs that partially extend through openings within an inverted window balance. In one embodiment of the method of installing such a system, an enlarged portion of the balance shoe is inserted into a window jamb and then rotated into position.

45 Claims, 13 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

3,007,194	A	11/1961	Griswold	
3,105,576	A	10/1963	Jones et al.	
3,461,608	A	8/1969	Johnson	
3,497,999	A	3/1970	Hendra	
3,529,381	A	9/1970	Grossman	
3,676,956	A	7/1972	Taylor et al.	
3,732,594	A	5/1973	Mills	
3,869,754	A	3/1975	Foster	
4,028,849	A	6/1977	Anderson	
4,068,406	A	1/1978	Wood	
4,079,549	A	3/1978	Wood	
4,089,085	A	5/1978	Fitzgibbon	
4,190,930	A	3/1980	Prosser	
4,300,316	A	11/1981	Ficurilli	
4,332,054	A	6/1982	Paist et al.	
4,506,478	A	3/1985	Anderson	
4,510,713	A	4/1985	Anderson	
4,610,108	A	9/1986	Marshik	
4,697,304	A	10/1987	Overgard	
4,704,821	A	11/1987	Berndt	
4,930,254	A	6/1990	Valentin	
4,941,285	A	7/1990	Westfall	
4,949,425	A	8/1990	Dodson et al.	
4,958,462	A	9/1990	Cross	
5,069,001	A	12/1991	Makarowski	
5,127,192	A	7/1992	Cross	
5,140,769	A	8/1992	Hickson et al.	
5,189,838	A	3/1993	Westfall	
5,210,976	A	5/1993	Cripps	
5,251,401	A	10/1993	Prete et al.	
5,301,467	A	4/1994	Schmidt et al.	
5,353,548	A	10/1994	Westfall	
5,371,971	A	12/1994	Prete	
5,377,384	A	1/1995	Riegelman	
D355,262	S	2/1995	Chaney et al.	
5,445,364	A	8/1995	Tibbals, Jr.	
5,448,858	A	9/1995	Briggs et al.	
5,452,495	A	9/1995	Briggs	
5,463,793	A	11/1995	Westfall	
5,530,991	A	7/1996	deNormand et al.	
5,553,903	A	9/1996	Prete et al.	
5,566,507	A	10/1996	Schmidt et al.	
5,572,828	A	11/1996	Westfall	
5,615,452	A	4/1997	Habbersett	
5,632,117	A	5/1997	Prete et al.	
5,632,118	A	5/1997	Stark	
5,661,927	A	9/1997	Polowinczak et al.	
5,669,180	A	9/1997	Maier	
5,697,188	A	12/1997	Fullick et al.	
5,704,165	A	1/1998	Slocomb et al.	
5,737,877	A	4/1998	Meunier et al.	
5,802,767	A	9/1998	Slocomb et al.	
5,806,243	A	9/1998	Prete et al.	
5,806,900	A	9/1998	Bratcher et al.	
5,829,196	A	11/1998	Maier	
5,855,092	A	1/1999	Raap et al.	
5,873,199	A	2/1999	Meunier et al.	
5,924,243	A	7/1999	Polowinczak et al.	
5,927,013	A	7/1999	Slocomb et al.	
5,943,822	A	8/1999	Slocomb et al.	
6,032,417	A	3/2000	Jakus et al.	
6,041,475	A	3/2000	Nidelkoff	
6,041,476	A *	3/2000	deNormand	16/197
6,041,550	A	3/2000	Tix	
6,058,653	A	5/2000	Slocomb et al.	
6,119,398	A	9/2000	Yates, Jr.	
D434,637	S	12/2000	Habeck et al.	
6,155,615	A	12/2000	Schultz	
6,161,335	A	12/2000	Beard et al.	
6,178,696	B1	1/2001	Liang	
6,226,923	B1	5/2001	Hicks et al.	
6,467,128	B1	10/2002	Damani	
6,470,530	B1	10/2002	Trunkle	
D467,490	S	12/2002	Uken et al.	
6,622,342	B1	9/2003	Annes et al.	
6,679,000	B2	1/2004	Uken et al.	
6,820,368	B2	11/2004	Uken et al.	
6,840,011	B2 *	1/2005	Thompson et al.	49/181
1,007,212	A1	10/2011	Lasersohn	
2002/0092241	A1	7/2002	Uken et al.	
2002/0129463	A1	9/2002	Newman	
2003/0074764	A1	4/2003	Pettit et al.	
2003/0213096	A1	11/2003	Annes et al.	

FOREIGN PATENT DOCUMENTS

GB	2 195 691	4/1988
GB	2236786	4/1991
GB	2280697	2/1995
GB	2292168	2/1996

OTHER PUBLICATIONS

BSI Tilt Balance Systems, Balance Systems—BSI, Amesbury Group, Inc., 1996-2001, 4 pgs.

Crossbow Balance! Another New Balance in BSI's Quiver, Balance Systems—BSI, Amesbury Group, Inc., Jun. 7, 1999, 3 pgs.

Heinberg, "Latest Trends in Window and Door Hardware," Shelter Magazine, Jul. 2001, cover and p. 11.

Dakota Balance—Balances and Accessories brochure, May 2001, 2 pgs.

Balance Systems—BSI Amesbury Group, Inc. Crossbow Balance Advertisment dated Jun. 7, 1999, 2 pgs.

Photographs of the Crossbow Balance Component shown in C6, 7 views; 3pgs.

* cited by examiner

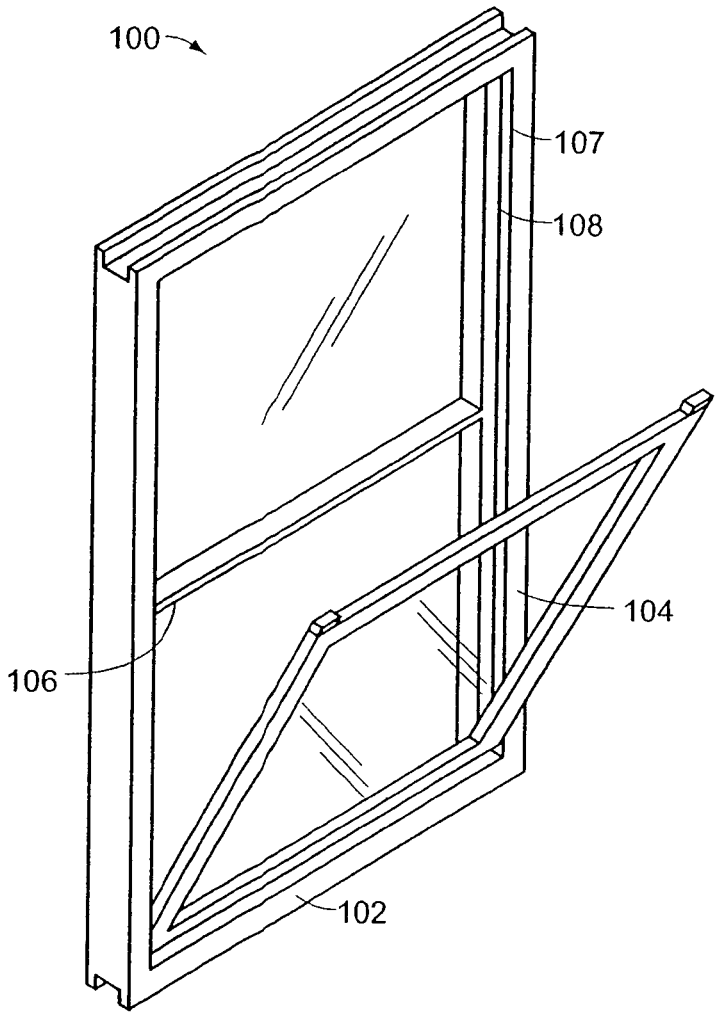


FIG. 1

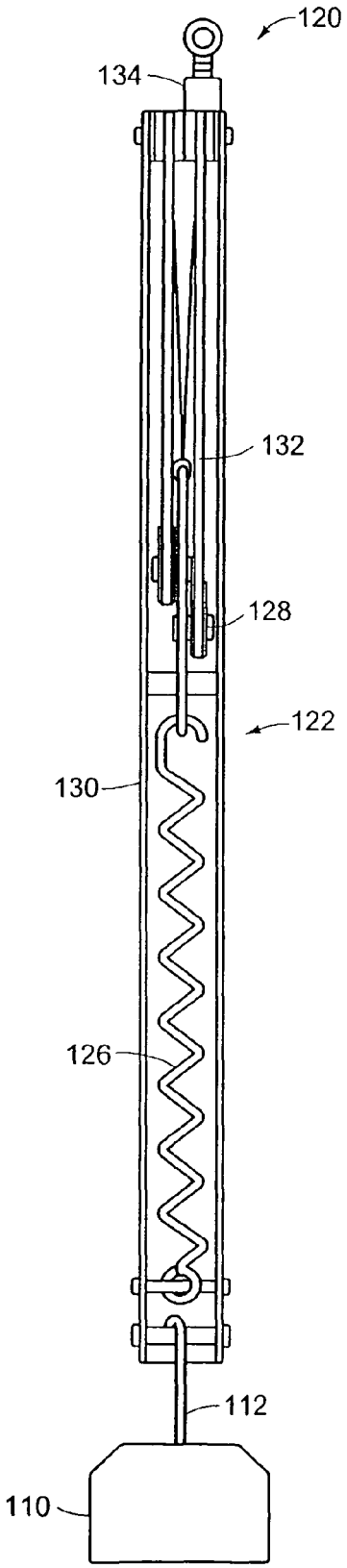


FIG. 2A
PRIOR ART

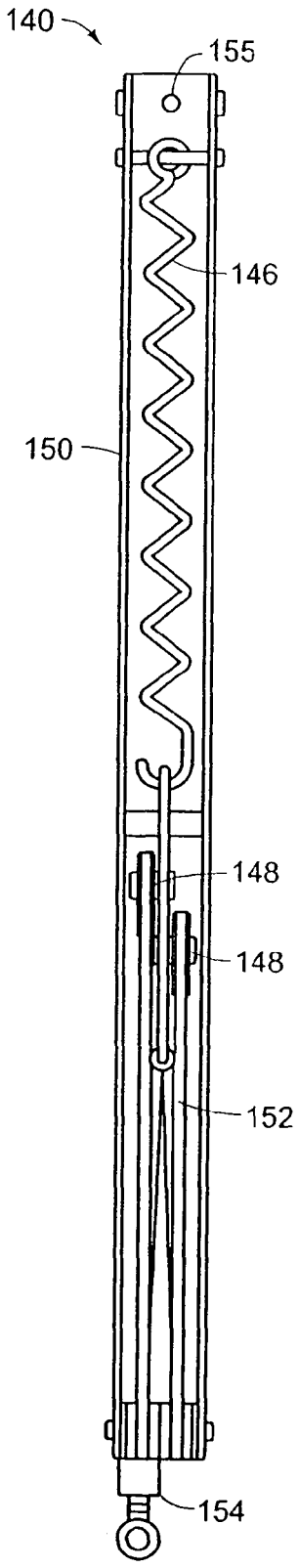


FIG. 2B

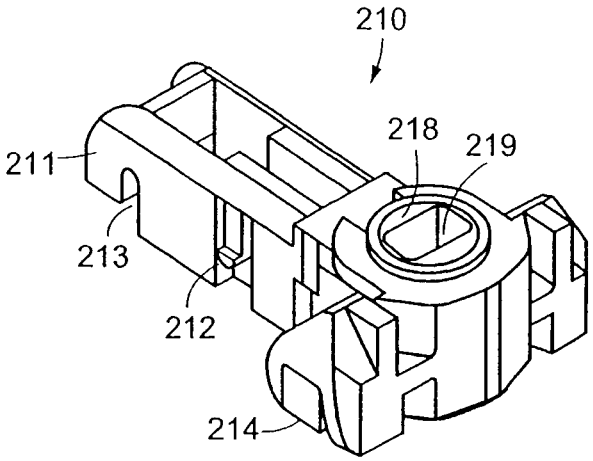


FIG. 3A

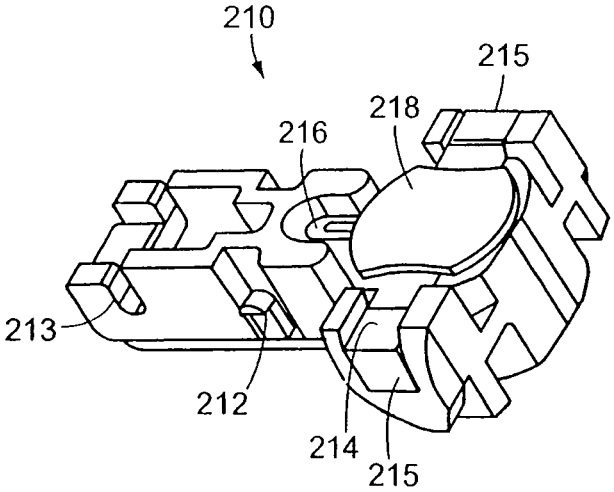


FIG. 3B

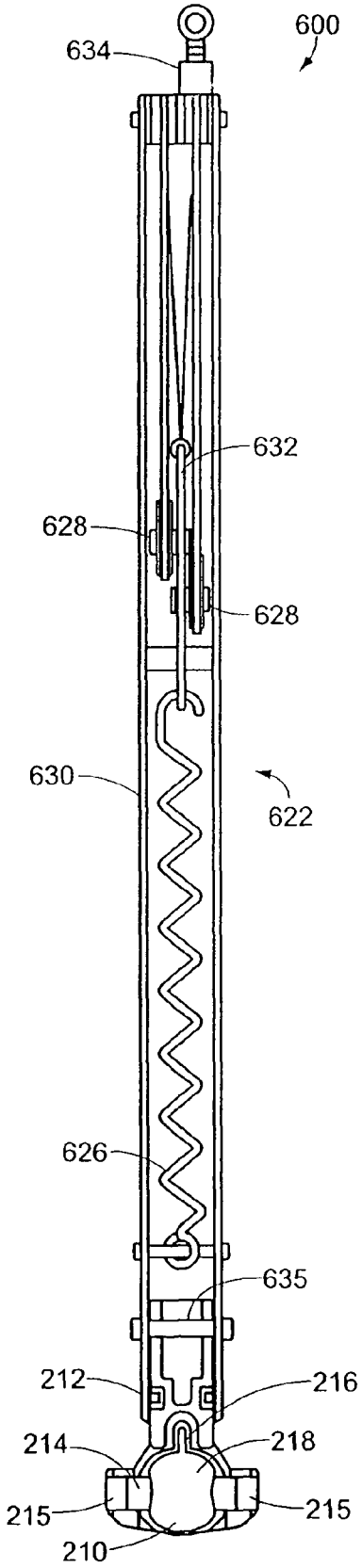


FIG. 3C

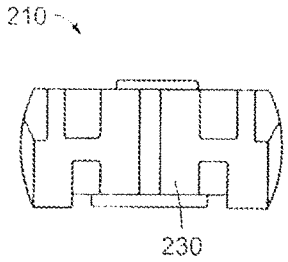


FIG. 3D

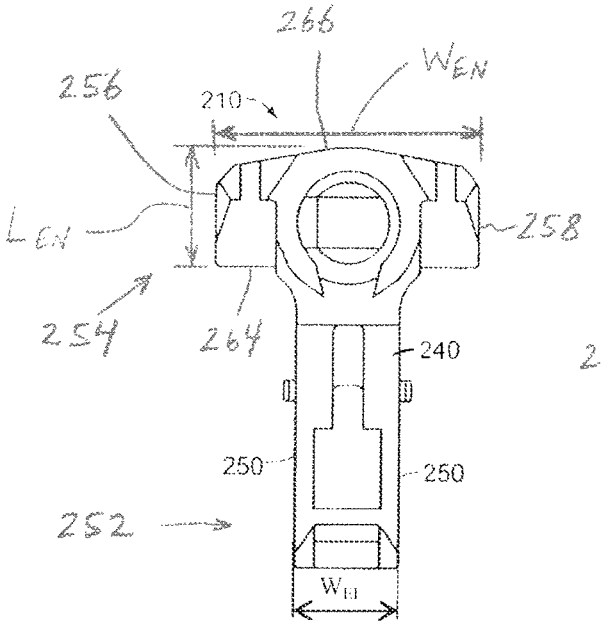


FIG. 3E

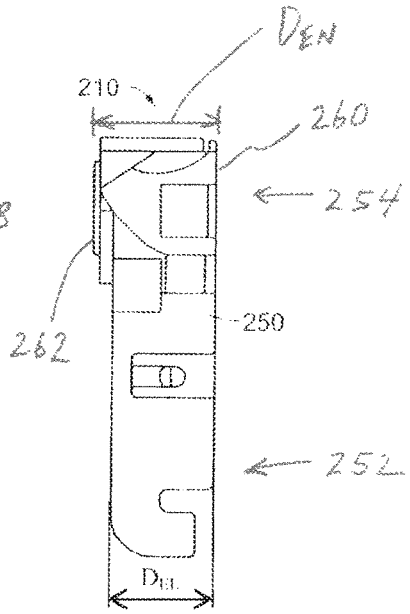


FIG. 3F

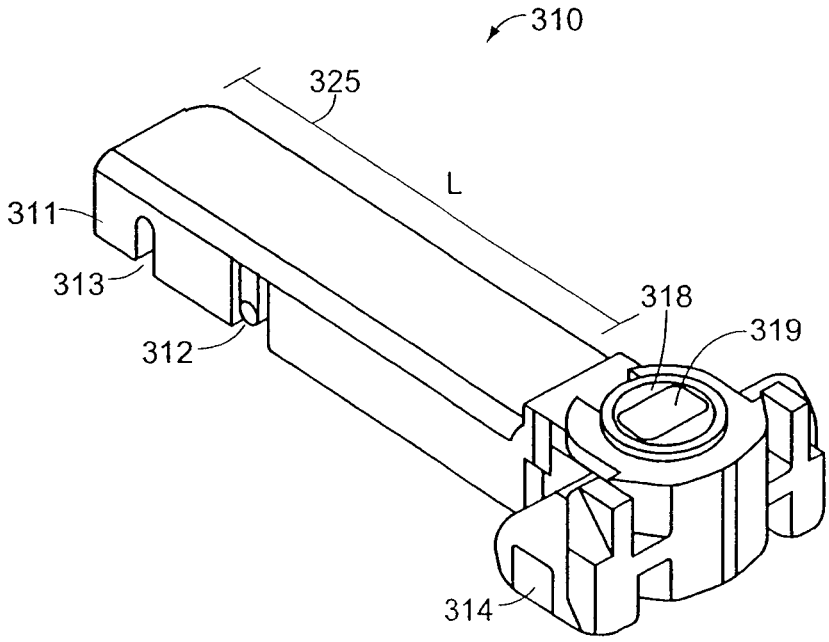


FIG. 4

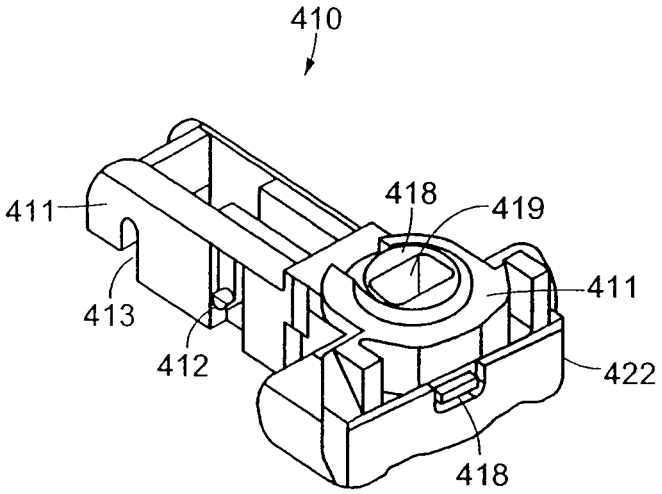


FIG. 5A

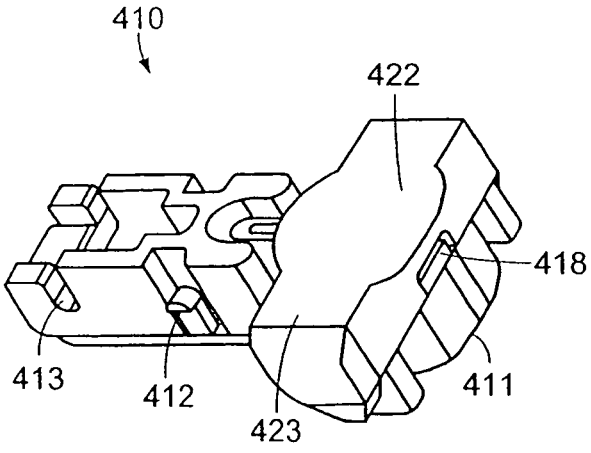


FIG. 5B

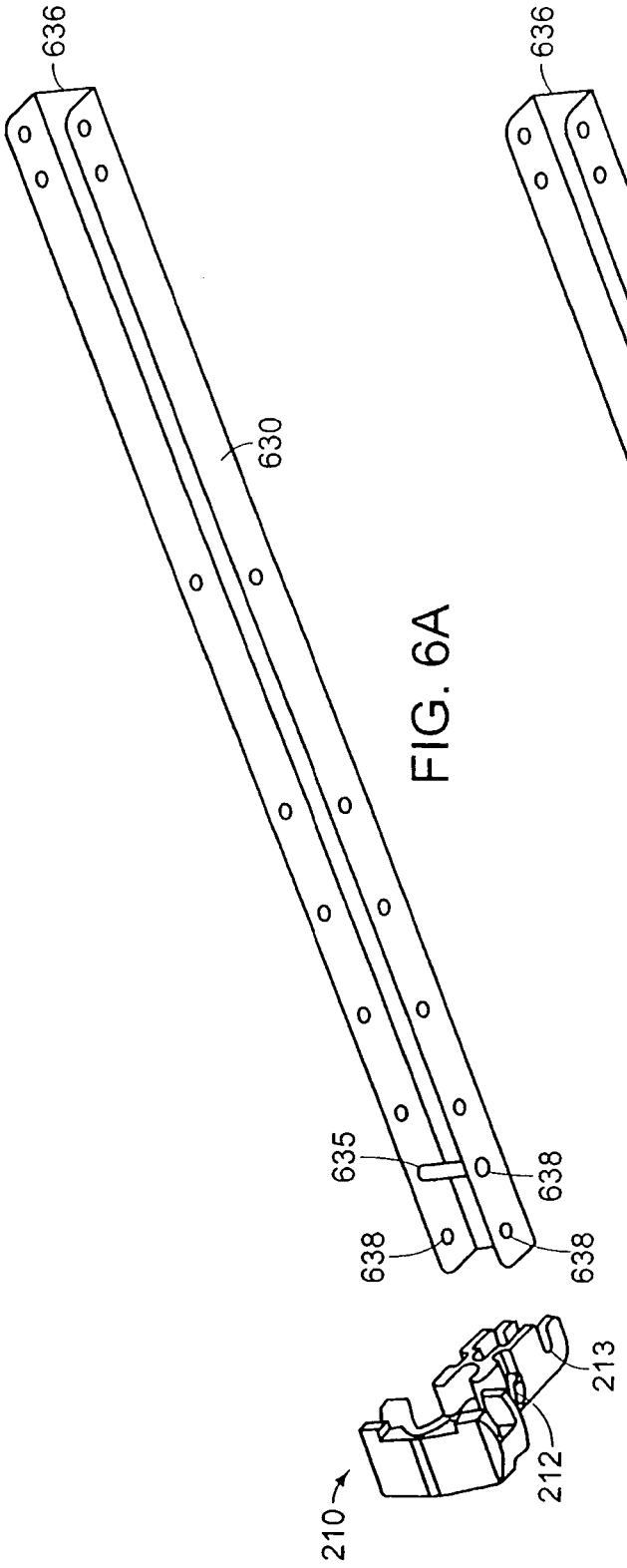


FIG. 6A

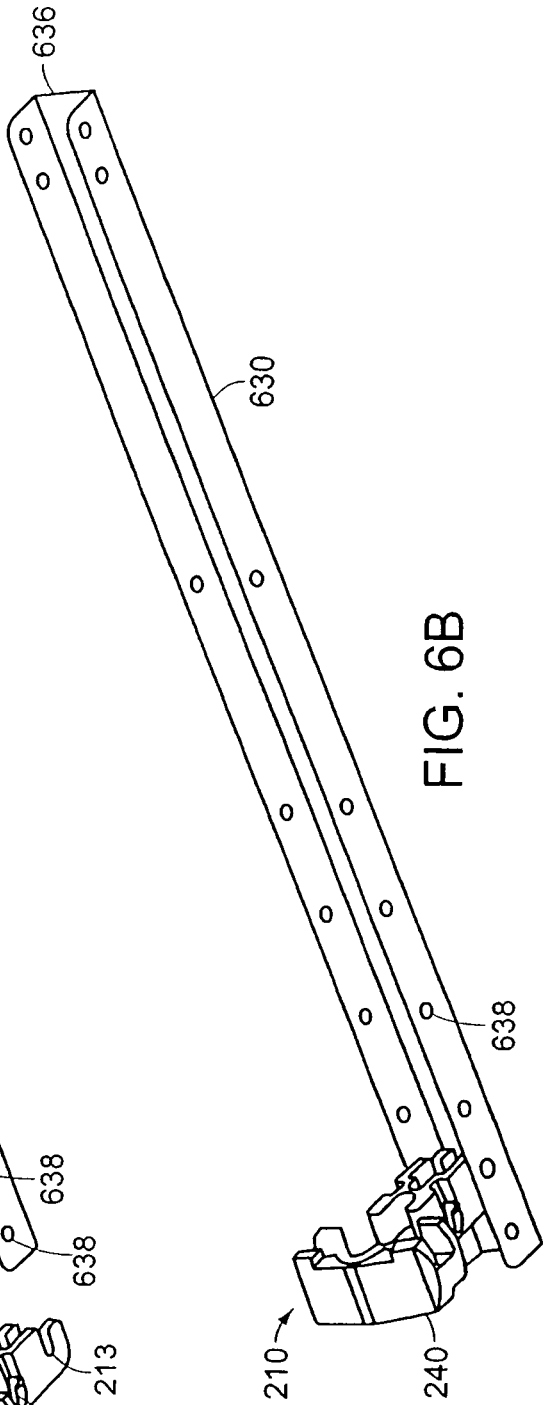


FIG. 6B

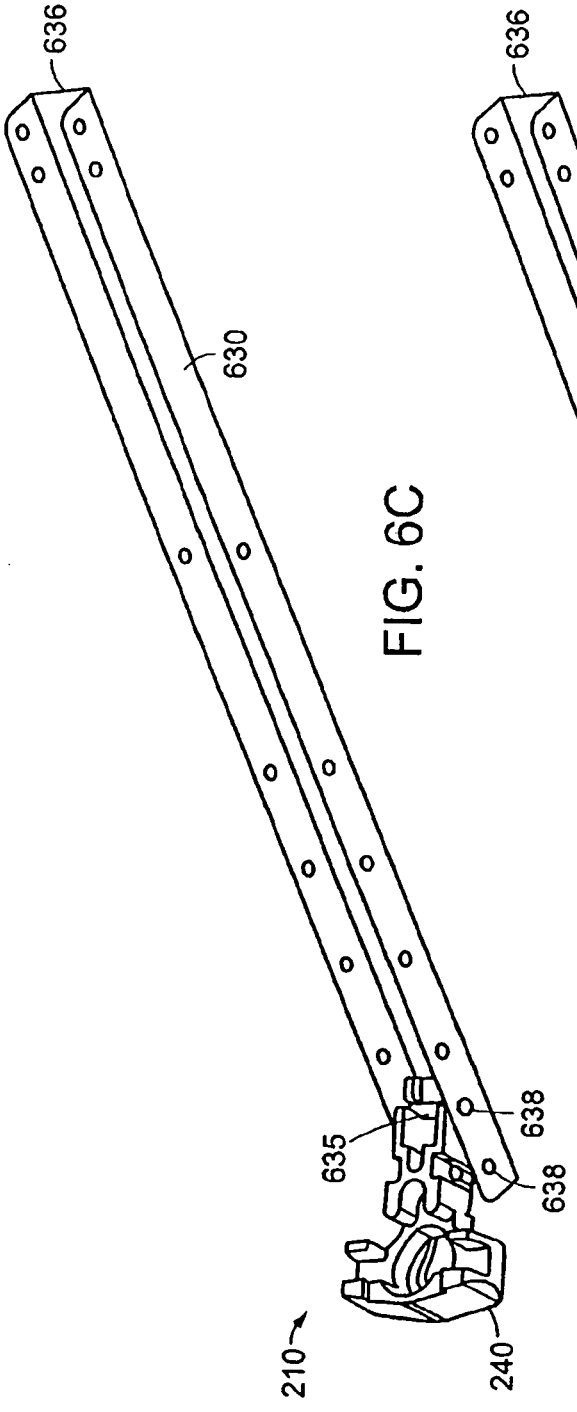


FIG. 6C

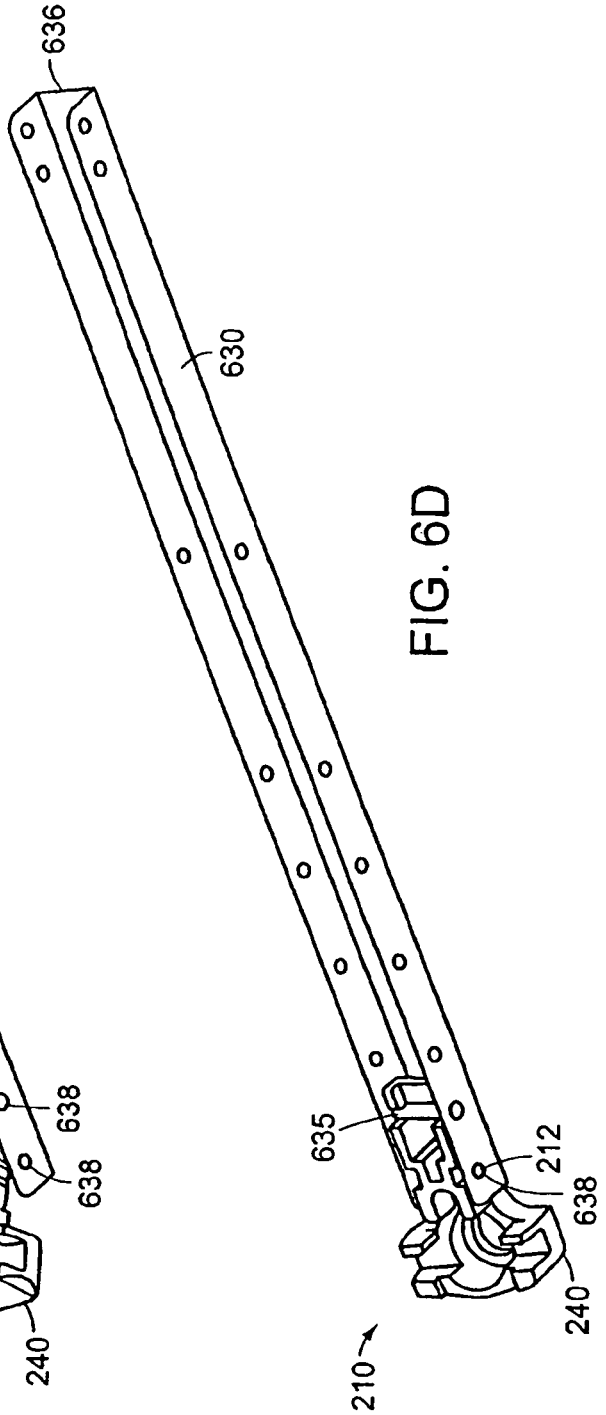


FIG. 6D

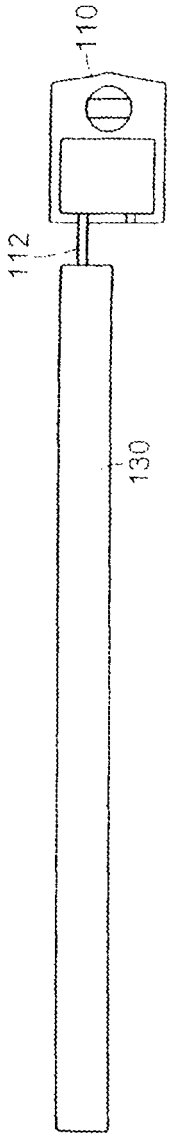


FIG. 7A
PRIOR ART

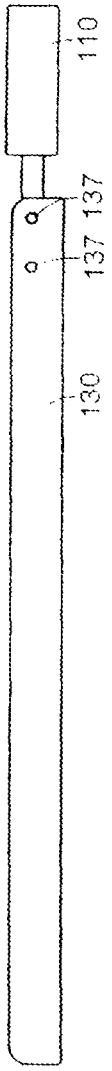


FIG. 7B
PRIOR ART

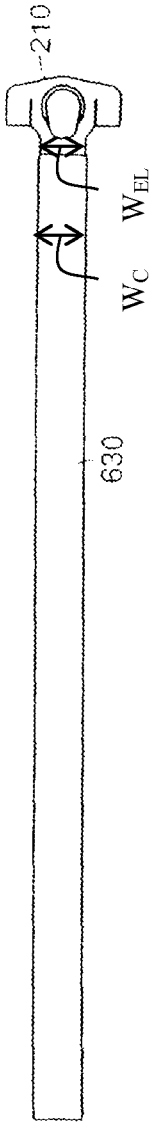


FIG. 8A

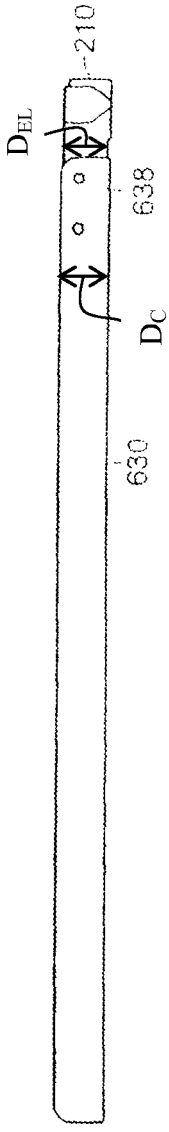


FIG. 8B

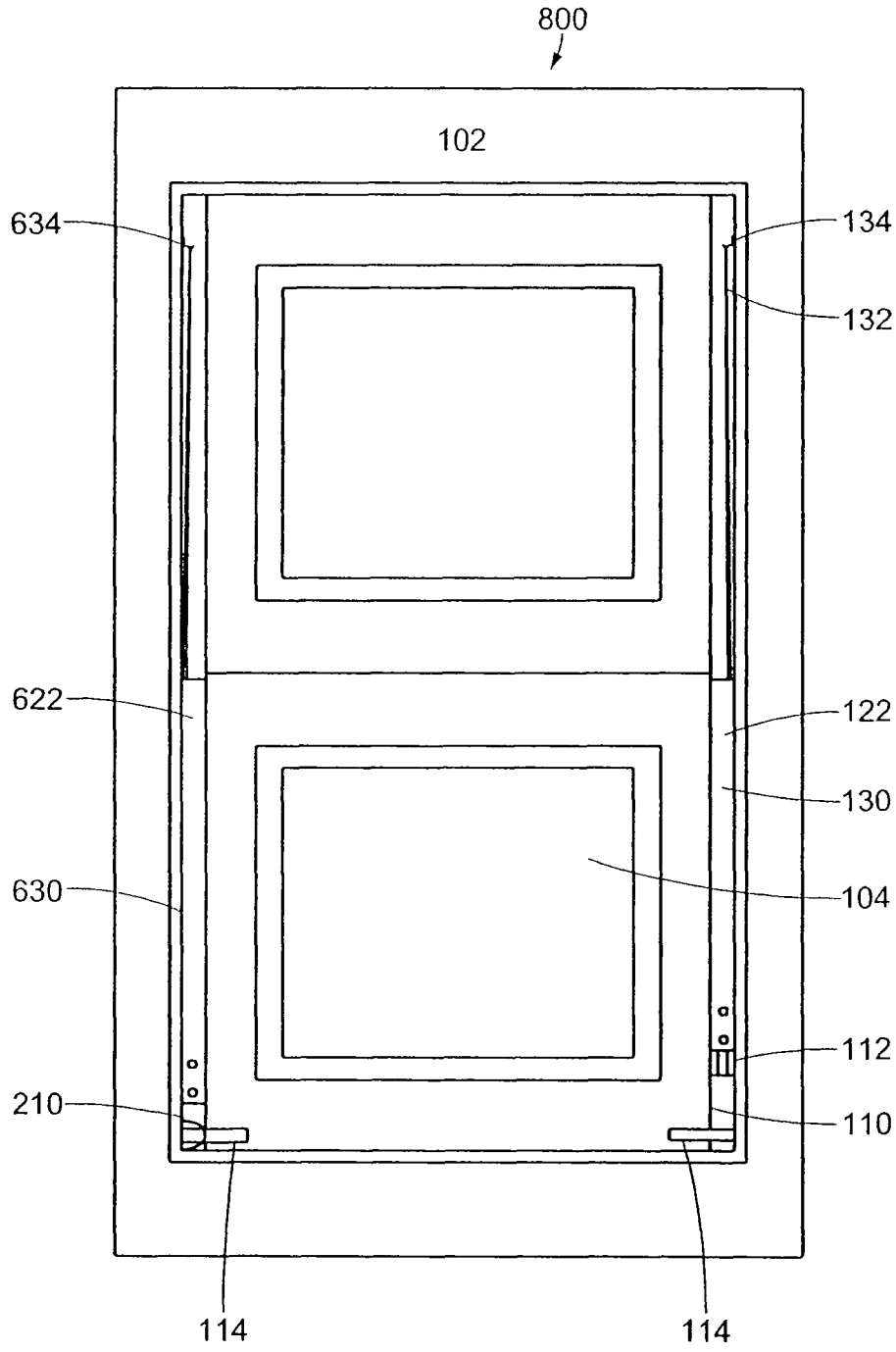


FIG. 9

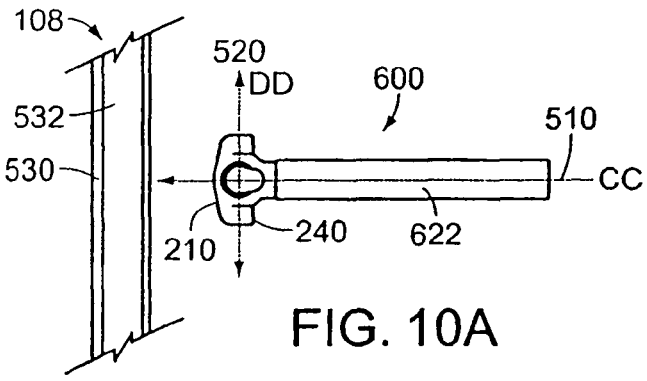


FIG. 10A

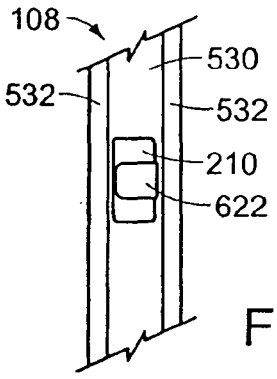


FIG. 10B

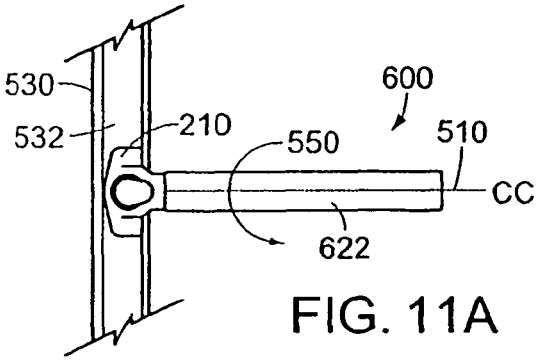


FIG. 11A

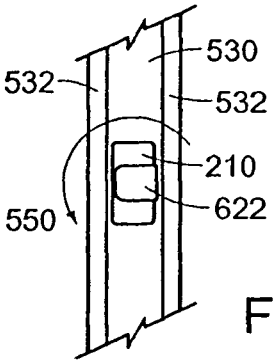


FIG. 11B

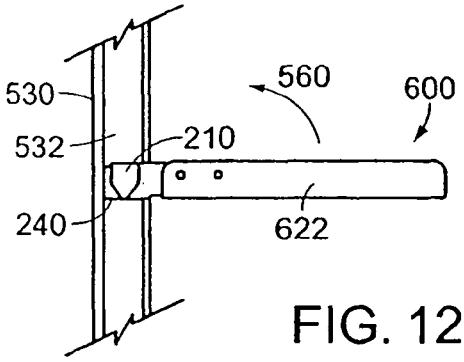


FIG. 12A

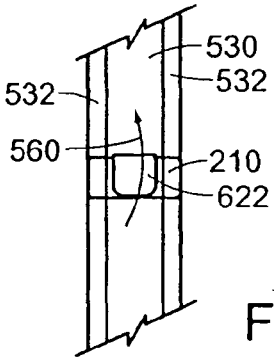


FIG. 12B

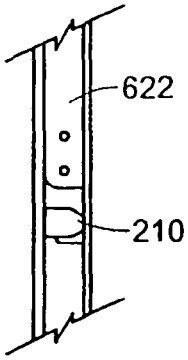


FIG. 13A

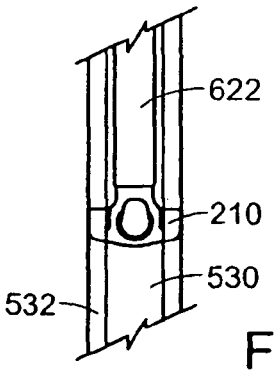


FIG. 13B

LOCKING BALANCE SHOE AND SYSTEM FOR A PIVOTABLE WINDOW

RELATED APPLICATION

This application incorporates by reference in its entirety and is a continuation of U.S. patent application Ser. No. 11/101,689, filed Apr. 8, 2005, which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/862,950, filed June 8, 2004, now U.S. Pat. No. 6,931,788, which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/446,279, filed on May 23, 2003, now U.S. Pat. No. 6,820,368, which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/044,005, filed on Jan. 11, 2002, now U.S. Pat. No. 6,679,000, which incorporates by reference in its entirety and claims priority to U.S. Provisional Patent Application Ser. No. 60/261,501 entitled Snap Lock Balance Shoe and System for a Pivotable Window filed on Jan. 12, 2001.

FIELD OF THE INVENTION

This invention relates to a window balance system for use in a pivotable window assembly.

BACKGROUND OF THE INVENTION

This invention relates to the field of tilt-in windows. More particularly this invention relates to a balance shoe of a window balance system used in conjunction with a pivot bar mounted on a window sash for rotating the window sash relative to a window frame.

Typical pivotable double hung windows include two window sashes disposed in tracks located in a window frame to allow vertical sliding movement of the sashes. Pivot bars are provided to allow rotational movement of a pivotable window sash about the pivot bars to facilitate cleaning of glazing. To control vertical movement, window balances are used so that the window sashes remain in a position in which they are placed. Balance shoes are used to guide the rotational movement of the window sashes with respect to the window frame. Typically, the balance shoes are coupled to window balances with a connecting member. See, for example, U.S. Pat. No. 6,119,398, entitled "Tilt Window Balance Shoe Assembly with Three Directional Locking" issued to H. Dale Yates, Jr., the disclosure of which is herein incorporated by reference in its entirety.

One of the problems with balance shoes and window balances for pivotable double hung windows is that they are difficult to install. In order to install a pivotable double hung window with balance shoes and window balances, the following installation steps typically must be followed. First, before the window frame is assembled, the balance shoes are inserted into jamb tracks. Next, connecting members are used to attach the balance shoes to the window balances. The balance shoes generally have an opening to accept the pivot bars that are mounted on window sashes. Finally, the sashes are made operable by inserting the pivot bars into the balance shoes and rotating the window sash up to a vertical position in the jamb tracks. The installation process is rather complex and difficult. Repair costs for replacing balance shoes are also significant. In order to change a malfunctioning or failed balance shoe, the jamb tracks either need to be deformed or replaced to gain access to the problematic balance shoe for removal and replacement.

SUMMARY OF THE INVENTION

In general, in one aspect, the invention relates to a balance shoe. The balance shoe includes a frame, a locking member at least partially disposed within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within a window balance. Embodiments of the invention can include the following features. The connecting device can include one or more retractable tabs that engage the window balance directly. The frame can further include a frame pocket sized to receive a fastener. The cam can include at least one camming surface and a keyhole opening for receiving a pivot bar attached to a window sash. The cam is at least partially housed within the frame and is disposed within a space enclosed by the locking member. Upon rotating the cam with the pivot bar, the locking member engages the window jamb. In one embodiment, the locking member includes two opposing ends integrally connected by a spring member. The cam is located within a space between the opposing ends of the locking member, and upon rotating the cam with the pivot bar, the opposing ends engage the window jamb. In another embodiment, the locking member includes a plate, which is parallel to a back surface of the frame. The cam is located within a space between the plate and the frame such that rotating the cam with the pivot bar forces the plate to engage the window jamb.

In another aspect, the invention relates to an inverted window balance system for use within a pivotable double hung window assembly. The inverted window balance system includes a rigid U-shaped channel with a plurality of openings in the channel walls for securing the contents in the channel, which include an extension spring, a system of pulleys, a cord to connect the extension spring via the system of pulleys with the window sash, and a balance shoe. The balance shoe includes a frame, a locking member at least partially disposed within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within the rigid U-shaped channel. Embodiments of this aspect of the invention can include the following features. At least a portion of the balance shoe is disposed within the rigid U-shaped channel. The connecting device can include one or more retractable tabs for engaging the rigid U-shaped channel. The retractable tabs can partially extend through at least one of the plurality of openings in the rigid U-shaped channel. The balance shoe can be further secured to the rigid U-shaped channel with a fastener that interfaces with a frame pocket in the balance shoe. The cam can include at least one camming surface and a keyhole opening for receiving a pivot bar attached to a window sash. The cam is at least partially housed within the frame and is disposed within a space enclosed by the locking member. Upon rotating the cam with the pivot bar, the locking member engages the window jamb. In one embodiment, the locking member includes two opposing ends integrally connected by a spring member. The cam is located within a space between the opposing ends of the locking member, and upon rotating the cam with the pivot bar, the opposing ends engage the window jamb. In another embodiment, the locking member includes a plate, which is parallel to a back surface of the frame. The cam is located within a space between the plate and the frame such that rotating the cam with the pivot bar forces the plate to engage the window jamb.

In still another aspect, the invention relates to a method of installing an inverted window balance system within a window jamb in a window frame. The method includes four

basic steps. The first step is to provide an inverted window balance system that includes a rigid U-shaped channel with a plurality of openings in the channel walls for securing the contents in the channel, an extension spring and a system of pulleys disposed within the rigid U-shaped channel, a cord to connect the extension spring via the system of pulleys with the window sash, and a balance shoe. The balance shoe includes a frame, a locking member located at least partially within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within the rigid U-shaped channel. The frame of the balance shoe has a frame bottom surface, a frame front surface, and two frame edge surfaces. The second step is to insert the inverted window balance system into a jamb track of the window jamb, such that an axis extending along a longitudinal direction of the rigid U-shaped channel is perpendicular to a back wall of the jamb track and an axis that is perpendicular to the two frame edge surfaces is parallel to the back wall while the frame front surface faces a side wall of the jamb track. The third step is to rotate the window balance system within the jamb track 90 degrees about the axis extending along the longitudinal direction of the rigid U-shaped channel, such that the frame front surface faces in a downward direction. The final step is to rotate the window balance system 90 degrees about the axis that is perpendicular to the two frame edge surfaces, such that the frame bottom surface faces in the downward direction.

These and other features of the invention will be made apparent from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

FIG. **1** is a perspective view of a pivotable double hung window assembly;

FIG. **2**A is a rear view of inverted window balance system for use with a prior art balance shoe;

FIG. **2**B is a rear view of a window balance;

FIG. **3**A is one perspective view of an embodiment of a snap lock balance shoe of the present invention;

FIG. **3**B is another perspective view of the embodiment of the snap lock balance shoe of FIG. **3**A;

FIG. **3**C is a rear view of one embodiment of a snap lock inverted balance system;

FIG. **3**D is a bottom view of one embodiment of a snap lock balance shoe;

FIG. **3**E is a front view of one embodiment of a snap lock balance shoe;

FIG. **3**F is a side view of one embodiment of a snap lock balance shoe;

FIG. **4** is a perspective view of an embodiment of a snap lock balance shoe of the present invention;

FIG. **5**A is one perspective view of another embodiment of a snap lock balance shoe of the present invention;

FIG. **5**B is another perspective view of the embodiment of the snap lock balance shoe of FIG. **5**A;

FIG. **6**A is a perspective view of one embodiment of a balance shoe of the invention and a rigid U-shaped channel;

FIG. **6**B is a perspective view showing the first step of connecting one embodiment of the balance shoe of the invention to the rigid U-shaped channel;

FIG. **6**C is a perspective view showing the second step of connecting one embodiment of the balance shoe of the invention to the rigid U-shaped channel;

FIG. **6**D is a perspective view showing one embodiment of the balance shoe of the invention connected to the rigid U-shaped channel;

FIG. **7**A is a front view of a prior art balance shoe attached to a rigid U-shaped channel;

FIG. **7**B is a side view of the prior art balance shoe attached to the rigid U-shaped channel;

FIG. **8**A is a front view of one embodiment of a snap lock balance shoe of the present invention attached to a rigid U-shaped channel;

FIG. **8**B is a side view of one embodiment of the snap lock balance shoe of the present invention attached to the rigid U-shaped channel;

FIG. **9** is a front view of a window assembly including one snap lock inverted window balance system of the present invention and one prior art inverted window balance system installed in a window frame;

FIG. **10**A is a side view illustrating the first step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **10**B is a front view illustrating the first step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **11**A is a side view illustrating the second step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **11**B is a front view illustrating the second step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **12**A is a side view illustrating the third step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **12**B is a front view illustrating the third step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **13**A is a side view illustrating the last step of installing the snap lock inverted window balance system of the invention into the jamb track; and

FIG. **13**B is a front view illustrating the last step of installing the snap lock inverted window balance system of the invention into the jamb track.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, shown is a pivotable double hung window assembly **100** in which a snap lock balance shoe constructed in accordance with the teachings of the present invention can be used. The pivotable double hung window assembly **100** includes of a window frame **102**, a pivotable lower window sash **104**, a pivotable upper window sash **106**, and a window jamb **107**. The pivotable lower window sash **104** and the pivotable upper window sash **106** slide vertically in jamb track **108** within the window jamb **107**, while also being able to pivot about a pivot bar **114**, as shown in FIG. **9**.

FIG. **2**A shows a rear view of an inverted window balance system **120** for use in the pivotable double hung window assembly **100**. The inverted window balance system **120** includes an inverted window balance **122** used for balancing the weight of either the pivotable lower window sash **104** or the pivotable upper window sash **106** at any vertical position within the window frame **102**, and a prior art balance shoe **110** for guiding the rotation of the pivotable lower window

sash **104** about the pivot bar **114**. A hanging connector **112** connects the prior art balance shoe **110** to the inverted window balance**122**. The inverted window balance **122** includes an extension spring **126** connected to a system of pulleys **128** housed within a rigid U-shaped channel **130** having a width (W_C) and a depth (D_C) (see FIGS. **8**A and **8**B), and a cord **132** for connecting the system of pulleys **128** to a jamb mounting attachment **134**. The jamb mounting attachment **134** is used for connecting the inverted window balance system **120** to the window jamb **107**. One difference between the inverted window balance **122** and a window balance **140**, shown in FIG. **2**B, includes the placement of the extension spring **146** above a system of pulleys **148** within the rigid U-shaped channel **150**. A cord **152**connects the system of pulleys **148** to a jamb mounting attachment **154**. Another difference is that while inverted window balances **122** travel with either the pivotable lower window sash **104** or pivotable upper window sash **106**, the window balance **140** remains in a fixed position in the window jamb **107** due to an attachment to the window jamb **107** through an attachment opening **155**.

FIGS. **3**A and **3**B are perspective views of a snap lock balance shoe **210** of one embodiment of the present invention. The snap lock balance shoe **210** has a frame **211** in which is housed a connecting device **212**, a locking device **214**, and a cam **218**. The connecting device **212** can be integral with the frame **211** and attaches the snap lock balance shoe **210** directly within an inverted window balance **622**, shown in FIG. **3**C. The inverted window balance **622** in combination with the snap lock balance shoe **210** forms a snap lock inverted window balance system **600**. The inverted window balance **622** includes an extension spring **626** connected to a system of pulleys **628** housed within a rigid U-shaped channel **630**, and a cord **632** for connecting the system of pulleys **628** to a jamb mounting attachment **634**, such as a cord terminal or hook.

In the depicted embodiment, the connecting device **212** is a pair of retractable tabs that snap into the rigid U-shaped channel **630**. In other embodiments, other connecting devices such as a screw, may be used to secure the frame **211** to the rigid U-shaped channel **630**. A fastener **635** located in the inverted window balance **622** can be used to further secure the connection between the snap lock balance shoe **210** and the inverted window balance **622**. To accommodate the fastener **635**, the snap lock balance shoe **210** can form a connection pocket **213** sized to receive or mate with the fastener **635**.

Another element of the snap lock balance shoe **210** visible in FIG. **3**A is a keyhole opening **219** located within the cam **218**. The keyhole opening **219** is sized to accept the pivot bar **114** extending from either the pivotable lower window sash **104** or the pivotable upper window sash **106**, and serves as a connection point between the pivotable lower or upper window sash **104**, **106** and the snap lock balance shoe **210**. FIG. **3**B shows a perspective view of the snap lock balance shoe **210** showing another face of the cam **218**.

In the embodiment shown in FIG. **3**B, the locking device **214** surrounds the cam **218** and includes of a pair of opposing ends **215** connected by a spring member **216**. When the pivotable lower window sash **104** is tilted open, the pivot bar **114** rotates, which in turn rotates the cam **218** forcing the opposing ends **215** outward to engage the jamb track **108** of the window frame **102**, thereby locking the balance shoe **210** in that location.

FIGS. **3**D-**3**F show different views of one of the embodiments of the snap lock balance shoe **210** of the invention. FIG. **3**D is a bottom view of the snap lock balance shoe **210** that shows a frame bottom surface **230**. FIG. **3**E is a front view of the same embodiment of the snap lock balance shoe **210** that illustrates a frame front surface **240** and with a frame back surface defining a depth (D_{EL}) therebetween (see FIG. **3**F), and FIG. **3**F is a side view that shows one of the two frame edge surfaces **250** of the snap lock balance shoe **210** which together form a width (WEL) therebetween (see FIG. **3**E). As shown in FIGS. **3**E and **3**F, the snap lock balance shoe **210** is substantially T-shaped and includes an elongate portion **252** and an enlarged portion **254**. Outer surfaces **256** and **258** define a width (W_{EN}) of the enlarged portion **254**. A front surface **260** and a back surface **262** define a depth (D_{EN}) of the enlarged portion **254**. Opposing surfaces **264** and **266** define a length (L_{EN}) of the enlarged portion **254**. Referring to FIGS. **3**E, **3**F, **8**A, and **8**B, the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C) are similarly dimensioned. Also, the enlarged portion width (W_{EN}) is substantially greater than the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C).

FIG. **4** shows another embodiment of a snap lock balance shoe **310**. The snap lock balance shoe **310** has an elongated frame **311** in which is housed a collecting device **312**, a locking device **314**, and a cam **318**. Within the cam is a keyhole opening **319** sized to receive the pivot bar **114**. The elongated frame **311** has a length L 325 that is greater than about 1.25 inches. When attached to the rigid U-shaped channel **630**, the balance shoe **310** extends further outward from the rigid U-shaped channel **630** than the balance shoe **210** attached to a similar sized rigid U-shaped channel **630**. The balance shoe **310** allows a fixed-sized rigid U-shaped channel **630** to be used in a larger window having a greater travel distance by extending the length of the entire window balance system by having a longer balance shoe **310**. One of the advantages of the present invention is that an installer can create a custom window balance system for a particular window by fitting a fixed-length rigid U-shaped channel **630** with an appropriately sized snap lock balance shoe.

Referring to FIGS. **5**A-**5**B, shown is another embodiment of the present invention of a snap lock balance shoe **410**. The snap lock balance shoe **410** has a locking member **422** which engages a back wall of the jamb track **108** locking the balance shoe **410** in that location. The locking member **422** is partially disposed in the frame **411** and includes a plate **423** that engages the back wall of the jamb track **108**. The balance shoe **410** also includes a frame **411**, a connecting device **412**, and a cam **418**. The cam **418** is partially disposed within the frame **411** in a space enclosed by the locking member **422**. The cam **418** includes a keyhole opening **419** sized to receive the pivot bar **114**. Upon rotation of the cam **418** with the pivot bar **114**, the locking member **422** is forced away from the frame **411** towards the back wall of the jamb track **108**, thereby anchoring the balance shoe **410** in that location within the window frame **102**.

FIGS. **6**A-**6**D show one embodiment of a method for securing the snap lock balance shoe **210** within a rigid U-shaped channel **630** with multiple openings **638**. It should be noted that each opening **638** on one side of the rigid U-shaped channel **630** has a corresponding opening **638** on the other side of the rigid U-shaped channel **630** to form a pair of openings. The first step, shown in FIG. **6**A, is to place a fastener **635**, such as a rivet, in one of the pairs of openings

638 in the rigid U-shaped channel 630. The next step, as depicted in FIG. 6B, is to slide the snap lock balance shoe 210 into the rigid U-shaped shaped channel 630 such that the fastener 635 is received in the connection pocket 213 of the snap lock balance shoe 210. As shown in FIG. 6C, the snap lock balance shoe 210 is then rotated down so that the front frame surface 240 is aligned with a bottom wall 636 of the rigid U-shaped channel 630. FIG. 6D shows the last step of attaching the snap lock balance shoe 210 within the rigid U-shaped channel 630. In this step, the connecting device 212 of the snap lock balance shoe 210 snaps into one of the pairs of openings 638 located on the rigid U-shaped channel 630. In alternative embodiments the connection device 212 of the snap lock balance shoe 210 can extend through off-set openings in the rigid U-shaped channel 630. In some embodiments, the snap lock balance shoe 210 is attached to the rigid U-shaped channel 630 with the fastener 635. In other embodiments, the snap lock balance shoe 210 is attached to the rigid U-shaped channel 630 without the fastener 635. It should also be noted that in some embodiments, the snap lock balance shoe 210 can be aligned and secured to the rigid U-shaped channel 630 such that the front frame surface 240 faces upwards instead of downwards as depicted in FIG. 6D.

FIG. 7A is a front view of the prior art balance shoe 110 attached to the rigid U-shaped channel 130. The rigid U-shaped channel 130 is connected to the prior art balance shoe 110 by the hanging connector 112. No part of the prior art balance shoe 110 lies within the rigid U-shaped channel 130. FIG. 7B is a side view of the prior art balance shoe 110 attached to the rigid U-shaped channel 130 illustrating channel openings 137. Fasteners (not shown) are installed through the channel openings 137 to secure the hanging connector 112 to the rigid U-shaped channel 130.

Referring to FIGS. 8A and 8B, shown is an embodiment of the snap lock balance shoe 210 of the present invention attached to the rigid U-shaped channel 630. The snap lock balance shoe 210 is directly attached within the rigid U-shaped channel 630 by a connecting device 212 located on the frame 211 of the snap lock balance shoe 210. The connecting device 212 extends through a pair of openings 638 located on the rigid U-shaped channel 630.

FIG. 9 is a front view of a pivotable double hung window assembly 800 in which an inverted window balance 122 is attached to a prior art balance shoe 110 by using the hanging connector 112, and the inverted window balance 622 is attached to the snap lock balance shoe 210 of an embodiment of the present invention. Pivot bars 114, as shown in FIG. 9, are secured to the pivotable lower window sash 104. The pivot bars 114 are slidably receivable by both the prior art balance shoe 110 and the snap lock balance shoe 210 and serve as connections between the pivotable lower window sash 104 and respective inverted window balances 122, 622.

An advantage of the type of balance shoe presently disclosed is that the snap lock balance shoe 210 is attached within the rigid U-shaped channel 630 resulting in a longer rigid U-shaped channel 630 than in the inverted balance systems 120 for a given window sash. The longer rigid U-shaped channel 630 of the inverted window balance 622 allows for the use of longer extension springs that provide greater control of the vertical positioning of the window sash than a shorter rigid U-shaped channel 130 with a shorter extension spring. Another advantage of the present invention is that the snap lock balance shoe 210 contains a smaller number of parts than prior art balance shoes 110.

One installation method used to place a snap lock inverted window balance system 600 within the jamb tracks 108 is schematically illustrated in the remaining figures. The snap lock inverted window balance system 600 includes one inverted window balance 622 and one snap lock window balance 210. FIGS. 10A, 11A, 12A, and 13A show the installation method from a side view, while FIGS. 10B, 11B, 12B, and 13B show the method from a front view. The installation method involves an orientation step, a first rotation step, and a second rotation step. FIGS. 10A and 10B show the orientation step in the installation method. In the orientation step, the snap lock inverted window balance system 600 is inserted the jamb tracks 108 such that an axis CC 510 in FIG. 10A is perpendicular to a back wall 530 of the jamb tracks 108, while an axis DD 520 in FIG. 10A is parallel to the back wall 530 and the frame front surface 240 is adjacent to a side wall 532 of the jamb tracks 108. FIGS. 11A and 11B show the snap lock inverted window balance system 600 inserted in the jamb tracks 108 as well as an arrow 550 indicating the direction of rotation of the snap lock inverted window balance system 600 required to complete the first rotation step. The first rotation step involves rotating the snap lock inverted window balance system 600 90-degrees about the axis CC 510 such that the frame front surface 240 faces downward. FIGS. 12A and 12B show the snap lock inverted window balance system 600 after the 90-degree rotation around the axis CC 510 has been completed. The second rotation step involves a 90-degree rotation about the axis DD 520. An arrow 560 showing the direction of the second rotation step is shown in FIGS. 12A and 12B. FIGS. 13A and 13B show in two different views the snap lock inverted window balance system 600 after the installation method has been completed. The cord terminal or any other jamb mounting attachment 634 (see FIG. 9) can then be screwed or hooked into place to anchor the snap lock inverted window balance system 600.

The installation method just described can be carried out in reverse to remove the snap lock inverted window balance system 600 from the jamb track 108 of the window frame 102 to allow for easy replacement of the snap lock balance shoe 210 or the snap lock inverted window balance system 600 itself. In order to replace inverted window balance systems 120 with prior art balance shoes 110, either the jamb tracks 108 need to be warped or completely removed in order to replace the prior art balance shoe 110 of the inverted window balance system 120.

While there have been described several embodiments of the invention, other variants and alternatives will be obvious to those skilled in the art. Accordingly, the scope of the invention is not limited to the specific embodiments shown.

What is claimed is:

1. A window balance system adapted to be received in a window jamb track, the window balance system comprising:

a U-shaped channel defining a plurality of openings, a channel width (W_C), and a channel depth (D_C);

a spring connected to a system of pulleys located within the U-shaped channel;

a cord with a first cord end and a second cord end, the first cord end connected to and threaded through the system of pulleys, the second cord end connected to a jamb mounting attachment; and

a T-shaped balance shoe, wherein the balance shoe comprises:

a frame comprising an elongate portion and an enlarged portion,

wherein the elongate portion comprises two frame edge surfaces defining an elongate portion width (W_{EL})

therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween,

wherein the enlarged portion comprises two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth (D_C) and the elongate portion width (W_{EL}) is substantially the same as the channel width (W_C),

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C),and

wherein the elongate portion is received at least partially within the U-shaped channel, and wherein the two outer surfaces of the enlarged portion are adapted to slide within the window jamb track;

a cam at least partially disposed within the enlarged portion, wherein the cam is adapted for rotation between a first position and a second position;

a locking device in contact with the cam and at least partially disposed within the enlarged portion, the locking device comprising opposed locking surfaces, wherein the locking surfaces are adapted to extend beyond the two outer surfaces of the enlarged portion when the cam is in the first position; and

a connecting device for attaching the balance shoe to the U-shaped channel.

2. The balance system of claim **1**, wherein the locking surfaces are adapted to retract to locations within the enlarged portion when the cam is in the second position.

3. The balance system of claim **1**, wherein the locking surfaces are joined by a spring member.

4. The balance system of claim **1**, wherein the cam defines an opening adapted to receive therein a pivot pin.

5. The window balance system of claim **1**, wherein the enlarged portion comprises a plastic.

6. The window balance system of claim **5**, wherein the elongate portion comprises the plastic.

7. The balance system of claim **1**, wherein the elongate portion includes an opening through the two frame edge surfaces of the elongate portion.

8. The balance system of claim **1**, wherein the locking surfaces are forced toward the window jamb track when the cam is in the first position.

9. The balance system of claim **8**, wherein the locking surfaces are adapted to engage the window jamb track when the cam is in the first position.

10. The balance system of claim **1**, wherein the locking device at least partially surrounds the cam.

11. The balance system of claim **1**, wherein the cam is in direct contact with the locking device.

12. The window balance system of claim **1**, wherein the frame comprises a resilient member for securing the balance shoe to the U-shaped channel.

13. The window balance system of claim **12**, wherein the elongate portion comprises the resilient member.

14. The window balance system of claim **13**, wherein the resilient member comprises a tab.

15. The balance system of claim **1**, wherein the locking device comprises a plate.

16. The balance system of claim **15**, wherein the plate is adapted to engage the window jamb track when the cam is in the first position.

17. The window balance system of claim **1**, wherein the frame comprises a unitary construction.

18. The window balance system of claim **1**, wherein the connecting device comprises a rivet.

19. The window balance system of claim **18**, wherein the elongate portion defines at least one opening adapted to mate with the rivet.

20. A window balance system adapted to be received in a window jamb track, the window balance system comprising:

a U-shaped channel defining a plurality of openings, a channel width (W_C), and a channel depth (D_C);

a spring connected to a system of pulleys located within the U-shaped channel;

a cord with a first cord end and a second cord end, the first cord end connected to and threaded through the system of pulleys, the second cord end connected to a jamb mounting attachment; and

a T-shaped balance shoe, wherein the balance shoe comprises:

a frame comprising an elongate portion and an enlarged portion,

wherein the elongate portion comprises two frame edge surfaces defining an elongate portion width (W_{EL}) therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween,

wherein the enlarged portion comprises two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth (D_C) and, the elongate portion width (W_{EL}) is substantially the same as the channel width (W_C),

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C), and

wherein the elongate portion is received at least partially within the U-shaped channel, and wherein the two outer surfaces of the enlarged portion are adapted to slide within the window jamb track;

a cam at least partially disposed within the enlarged portion, wherein the cam is adapted for rotation between a first position and a second position; and

a locking device in contact with the cam, the locking device adapted to be forced toward the window jamb track when the cam is in the first position.

21. The balance system of claim **20**, the frame further comprising a resilient tab.

22. The balance system of claim **21**, wherein the resilient tab is located on the elongate portion.

23. The balance system of claim **20**, wherein the elongate portion includes an opening through the two frame edge surfaces of the elongate portion define an opening therebetween.

24. The balance system of claim **23**, wherein the opening is adapted to receive a connecting device.

25. The balance system of claim **20**, wherein the locking device at least partially surrounds the cam.

26. The balance system of claim 20, wherein the cam defines an opening adapted to receive therein a pivot pin.

27. The balance system of claim 20, wherein the cam is in direct contact with the locking device.

28. A window balance system adapted to be received in a window jamb track, the window balance system comprising:

a U-shaped channel defining a plurality of openings, an axis, a channel width (W_C), and a channel depth (D_C);

a spring connected to a system of pulleys located within the U-shaped channel;

a cord with a first cord end and a second cord end, the first cord end connected to and threaded through the system of pulleys, the second cord end connected to a jamb mounting attachment;

a fastener; and

a frame comprising:

means defined by the frame for receiving the fastener for pivotally connecting the frame to the U-shaped channel;

means for securing the frame against rotation relative to the U-shaped channel;

an elongate portion comprising two frame edge surfaces defining an elongate portion width (W_{EL}) therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween; and

an enlarged portion comprising two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth, the elongate portion width (W_{EL}) is substantially the same as the channel width (W_C), and

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C).

29. The window balance system of claim 28, wherein the two outer surfaces of the enlarged portion of the frame are adapted to slide within the window jamb track.

30. The window balance system of claim 29, further comprising:

a cam located within the frame, wherein the cam is adapted for rotation between a first position and a second position; and

a locking device in contact with the cam and comprising opposed locking surfaces, wherein the locking surfaces are adapted to extend toward the window jamb track when the window balance system is received in the window jamb track and the cam is in the first position.

31. The window balance system of claim 30, wherein the elongate portion is integral with the frame.

32. The window balance system of claim 31, wherein the frame comprises a balance shoe.

33. The window balance system of claim 28, wherein the securing means comprises at least one tab.

34. The window balance system of claim 33, wherein the at least one tab engages an opening defined by the U-shaped channel when the frame is connected to the U-shaped channel.

35. The window balance system of claim 28, wherein the fastener comprises a rivet.

36. A window balance system adapted to be received in a window jamb track and counterbalance a window sash, the window balance system comprising:

a U-shaped channel defining a channel width (W_C) and a channel depth (D_C);

a fastener; and

a frame pivotally connected to the U-shaped channel, the frame comprising:

means defined by the frame for receiving the fastener for pivotally connecting the frame to the U-shaped channel;

means for securing the frame against rotation relative to the U-shaped channel;

an elongate portion comprising two frame edge surfaces defining an elongate portion width (W_{EL}) therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween; and

an enlarged portion comprising two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth, the elongate portion width (W_{EL}) is substantially the same as the channel width (W_C), and

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C).

37. The window balance system of claim 36, further comprising:

a cam substantially located within the frame, wherein the cam is adapted for rotation between a first position and a second position; and

a locking device in contact with the cam and comprising opposed locking surfaces, wherein the locking surfaces are adapted to extend toward the window jamb track when the window balance system is received in the window jamb track and the cam is in the first position.

38. The window balance system of claim 36, wherein the elongate portion is received within the U-shaped channel.

39. The window balance system of claim 38, wherein the frame comprises a plastic.

40. The window balance system of claim 38, wherein the elongate portion comprises a plastic.

41. The window balance system of claim 38, wherein the means for securing the frame against rotation comprises a resilient member.

42. The window balance system of claim 41, wherein the resilient member comprises a tab.

43. The window balance system of claim 38, wherein the elongate portion defines the receiving means.

44. A window balance system adapted to be received in a window jamb track, the window balance system comprising:

a U-shaped channel defining an axis, a channel width (W_C), and a channel depth (D_C);

a spring connected to a system of pulleys located within the U-shaped channel;

a cord comprising a first cord end and a second cord end, the first cord end connected to and threaded through the system of pulleys, the second cord end connected to a jamb mounting attachment;

a fastener; and

a frame comprising:

means defined by the frame for receiving the fastener for pivotally connecting the frame to the U-shaped channel;

means for securing the frame against rotation relative to the U-shaped channel, an elongate portion comprising two frame edge surfaces defining an elongate portion width (W_{EL}) therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween; and

an enlarged portion comprising two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth, the elongate portion width (W_{EL}) is subtantially the same as the channel width (W_C),

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C), and

wherein the U-shaped channel and the frame are T-shaped when connected.

45. The window balance system of claim **44**, wherein the frame further comprises:

a cam located within the frame, wherein the cam is adapted for rotation between a first position and a second position; and

a locking device in contact with the cam and comprising opposed locking surfaces, wherein the locking surfaces are adapted to extend substantially orthogonal to the axis toward the window jamb track when the window balance system is received in the window jamb track and the cam is in the first position.

* * * * *

EXHIBIT B

US008424248B2

(12) **United States Patent**
Uken et al.

(10) **Patent No.: US 8,424,248 B2**
(45) **Date of Patent: *Apr. 23, 2013**

(54) **METHOD OF INSTALLING A LOCKING BALANCE SHOE AND SYSTEM FOR A PIVOTABLE WINDOW**

(75) Inventors: **Stuart J. Uken**, Sioux Falls, SD (US); **Gary R. Newman**, Valley Spring, SD (US); **Lawrence J. Versteeg**, Sioux Falls, SD (US)

(73) Assignee: **Amesbury Group, Inc.**, Amesbury, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 363 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/690,266**

(22) Filed: **Jan. 20, 2010**

(65) **Prior Publication Data**

US 2010/0115854 A1 May 13, 2010

Related U.S. Application Data

(60) Division of application No. 11/654,120, filed on Jan. 17, 2007, which is a continuation of application No. 11/101,689, filed on Apr. 8, 2005, now Pat. No. 7,191,562, which is a continuation of application No. 10/862,950, filed on Jun. 8, 2004, now Pat. No. 6,931,788, which is a continuation of application No. 10/446,279, filed on May 23, 2003, now Pat. No. 6,820,368, which is a continuation of application No. 10/044,005, filed on Jan. 11, 2002, now Pat. No. 6,679, 000.

(60) Provisional application No. 60/261,501, filed on Jan. 12, 2001.

(51) **Int. Cl.**
E06B 3/00 (2006.01)

(52) **U.S. Cl.**
USPC **49/506**; 49/181; 49/176; 49/445

(58) **Field of Classification Search** ..... 49/181, 49/176, 446, 183, 184, 185, 186, 445, 449, 49/455, 453, 454, 177, 161, 506; 292/DIG. 63, 292/DIG. 47, DIG. 37; 16/197
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,007,212 A 10/1911 Lasersohn
1,312,665 A 8/1919 Almquist
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2382933 A1 12/2002
GB 740223 A 11/1955
(Continued)

OTHER PUBLICATIONS

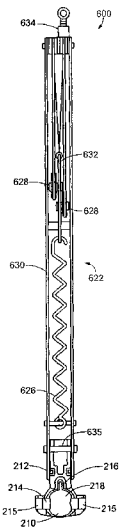
Crossbow Balance! Another New Balance in BSI's Quiver, Balance Systems—BSI, Amesbury Group, Inc., Jun. 7, 1999, 3 pgs.
(Continued)

Primary Examiner — Gregory J. Strimbu
(74) *Attorney, Agent, or Firm* — Goodwin Procter LLP

(57) **ABSTRACT**

A snap lock balance shoe and system to be incorporated in pivotable double hung windows. In one embodiment, the snap lock balance shoe includes a pair of retractable tabs that partially extend through openings within an inverted window balance. Embodiments of methods for installing the system include inserting a frame of the balance shoe within a jamb track of the window jamb, rotating the frame 90 degrees about a first axis, and rotating the frame 90 degrees about a second axis such that the frame is substantially fully disposed within the jamb track.

18 Claims, 13 Drawing Sheets



U.S. PATENT DOCUMENTS

2,178,533	A	10/1939	Viehweger	
2,952,884	A	9/1960	Dinsmore	
3,007,194	A	11/1961	Griswold	
3,105,576	A	10/1963	Jones et al.	
3,461,608	A	8/1969	Johnson	
3,497,999	A	3/1970	Hendra	
3,529,381	A	9/1970	Grossman	
3,676,956	A	7/1972	Taylor et al.	
3,732,594	A	5/1973	Mills	
3,869,754	A	3/1975	Foster	
4,028,849	A	6/1977	Anderson	
4,068,406	A	1/1978	Wood	
4,079,549	A	3/1978	Wood	
4,089,085	A	5/1978	Fitzgibbon	
4,190,930	A	3/1980	Prosser	
4,300,316	A	11/1981	Ficurilli	
4,332,054	A	6/1982	Paist et al.	
4,506,478	A	3/1985	Anderson	
4,510,713	A	4/1985	Anderson	
4,610,108	A	9/1986	Marshik	
4,697,304	A	10/1987	Overgard	
4,704,821	A	11/1987	Berndt	
4,930,254	A	6/1990	Valentin	
4,941,285	A	7/1990	Westfall	
4,949,425	A	8/1990	Dodson et al.	
4,958,462	A	9/1990	Cross	
5,069,001	A	12/1991	Makarowski	
5,127,192	A	7/1992	Cross	
5,140,769	A	8/1992	Hickson et al.	
5,189,838	A	3/1993	Westfall	
5,210,976	A	5/1993	Cripps	
5,251,401	A	10/1993	Prete et al.	
5,301,467	A	4/1994	Schmidt et al.	
5,353,548	A	10/1994	Westfall	
5,371,971	A	12/1994	Prete	
5,377,384	A	1/1995	Riegelman	
D355,262	S	2/1995	Chaney et al.	
5,445,364	A	8/1995	Tibbals, Jr.	
5,448,858	A	9/1995	Briggs et al.	
5,452,495	A	9/1995	Briggs	
5,463,793	A	11/1995	Westfall	
5,530,991	A	7/1996	deNormand et al.	
5,553,903	A	9/1996	Prete et al.	
5,566,507	A	10/1996	Schmidt et al.	
5,572,828	A	11/1996	Westfall	
5,615,452	A	4/1997	Habbersett	
5,632,117	A	5/1997	Prete et al.	
5,632,118	A	5/1997	Stark	
5,661,927	A	9/1997	Polowinczak et al.	
5,669,180	A	9/1997	Maier	
5,697,188	A	12/1997	Fullick et al.	
5,704,165	A	1/1998	Slocomb et al.	
5,737,877	A	4/1998	Meunier et al.	
5,802,767	A	9/1998	Slocomb et al.	
5,806,243	A	9/1998	Prete et al.	
5,806,900	A	9/1998	Bratcher et al.	
5,829,196	A	11/1998	Maier	
5,855,092	A	1/1999	Raap et al.	
5,873,199	A	2/1999	Meunier et al.	
5,924,243	A	7/1999	Polowinczak et al.	
5,927,013	A	7/1999	Slocomb et al.	
5,943,822	A	8/1999	Slocomb et al.	
6,032,417	A	3/2000	Jakus et al.	
6,041,475	A	3/2000	Nidelkoff	
6,041,476	A	3/2000	deNormand	
6,041,550	A	3/2000	Tix	
6,058,653	A	5/2000	Slocomb et al.	
6,119,398	A	9/2000	Yates, Jr.	
D434,637	S	12/2000	Habeck et al.	
6,155,615	A	12/2000	Schultz	
6,161,335	A	12/2000	Beard et al.	
6,178,696	B1	1/2001	Liang	
6,226,923	B1	5/2001	Hicks et al.	
6,467,128	B1	10/2002	Damani	
6,470,530	B1	10/2002	Trunkle	
D467,490	S	12/2002	Uken et al.	
6,622,342	B1	9/2003	Annes et al.	
6,679,000	B2	1/2004	Uken et al.	
6,820,368	B2	11/2004	Uken et al.	
6,840,011	B2	1/2005	Thompson et al.	
7,945,994	B2 *	5/2011	Dallas et al.	16/193
2002/0092241	A1	7/2002	Uken et al.	
2002/0129463	A1	9/2002	Newman	
2003/0074764	A1	4/2003	Pettit et al.	
2003/0213096	A1	11/2003	Annes et al.	

FOREIGN PATENT DOCUMENTS

GB	2195691	A	4/1988
GB	2236786	A	4/1991
GB	2280697	A	2/1995
GB	2292168	A	2/1996
JP	63-3785		1/1988

OTHER PUBLICATIONS

Heinberg, "Latest Trends in Window and Door Hardware," Shelter Magazine, Jul. 2001, cover and p. 11.

Dakota Balance—Balances and Accessories brochure, May 2001, 2 pgs.

Balance Systems—BSI Amesbury Group, Inc. Crossbow Balance Advertisment dated Jun. 7, 1999, 2 pgs.

Photographs of the Crossbow Balance Component shown in C6, 7 views; 3pgs.

* cited by examiner

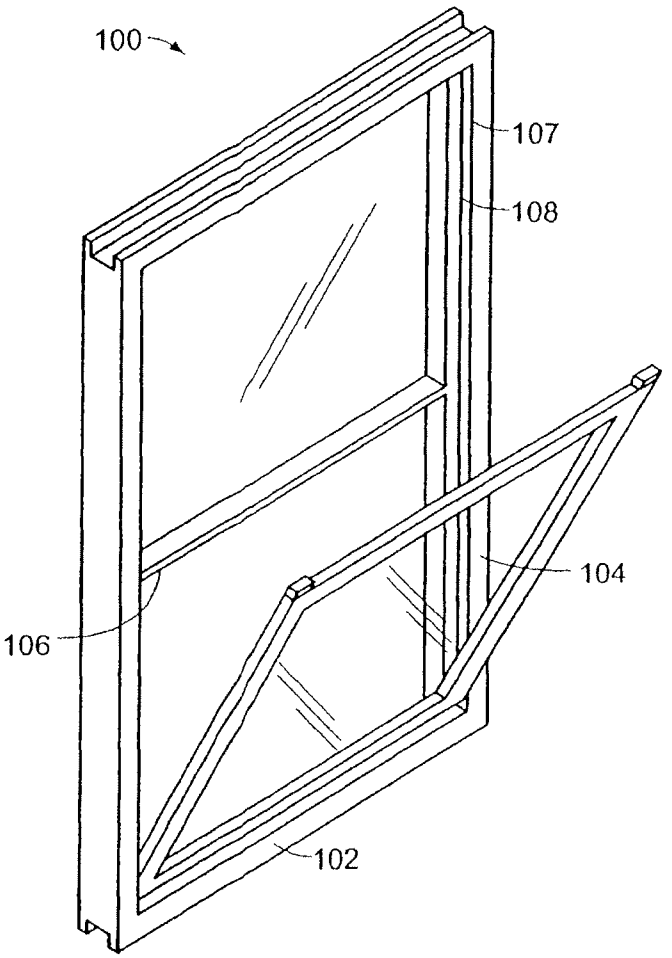


FIG. 1

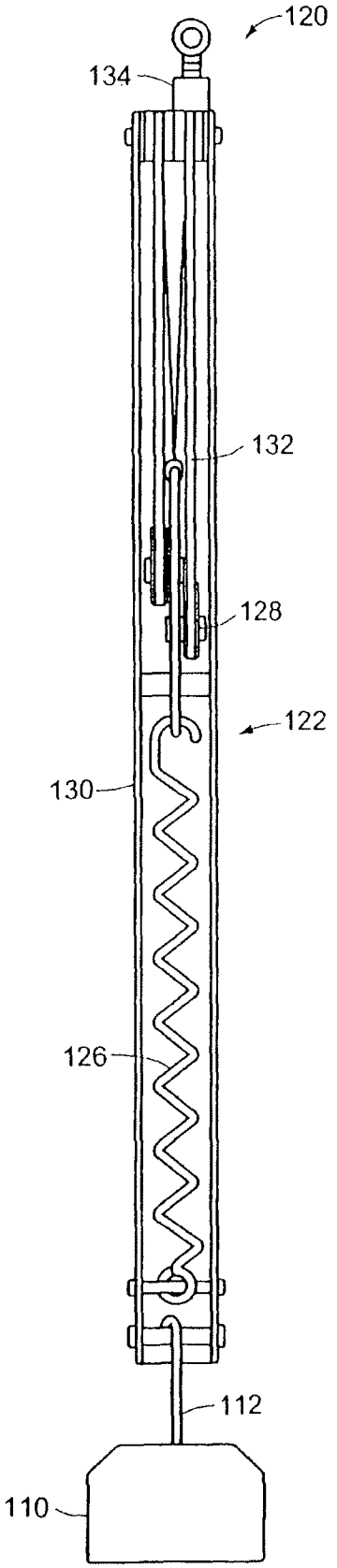


FIG. 2A
PRIOR ART

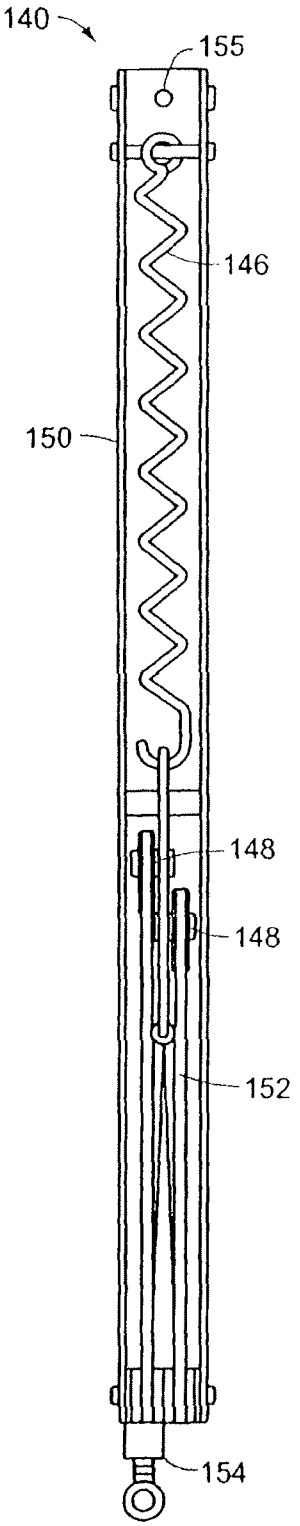


FIG. 2B

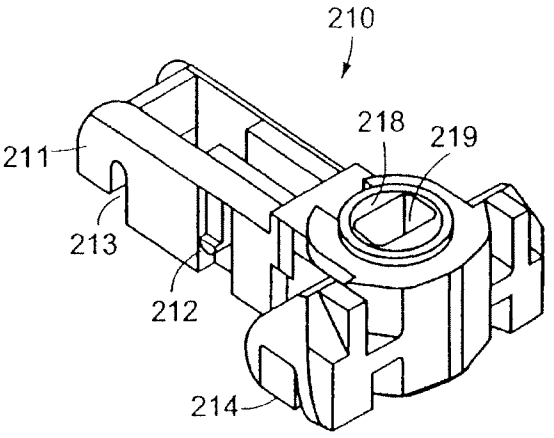


FIG. 3A

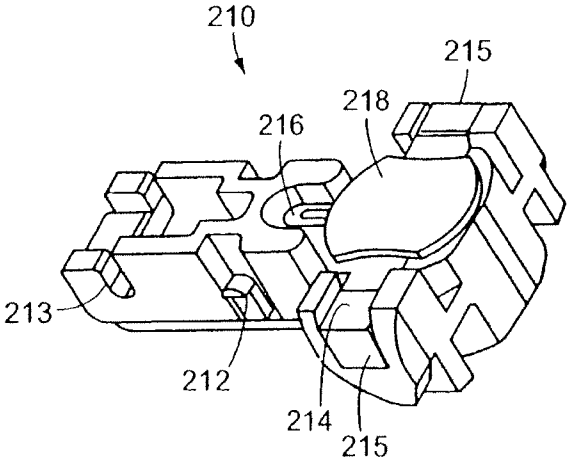


FIG. 3B

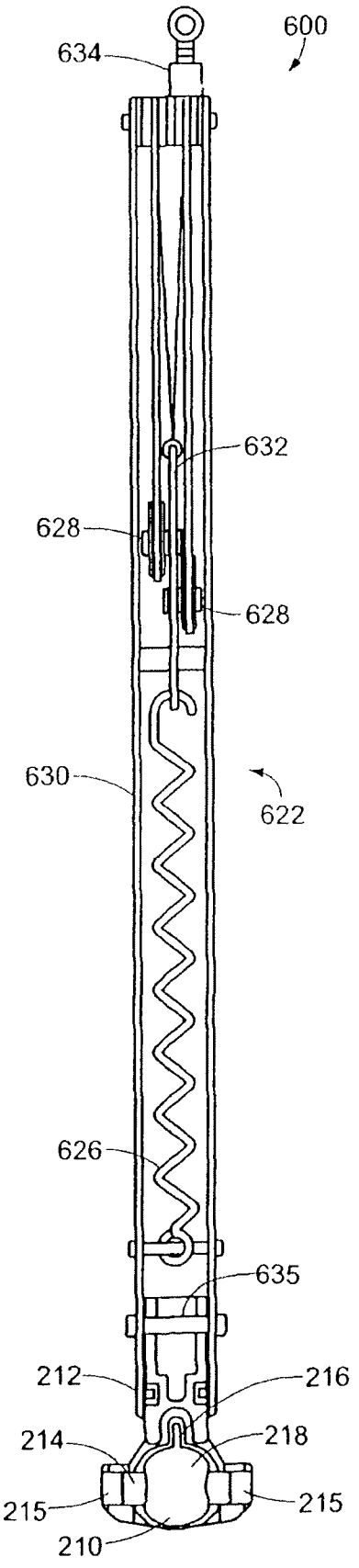


FIG. 3C

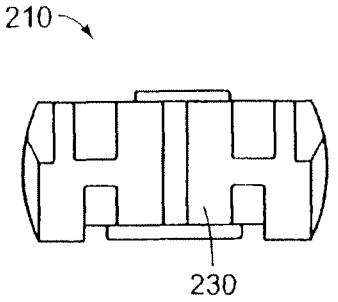


FIG. 3D

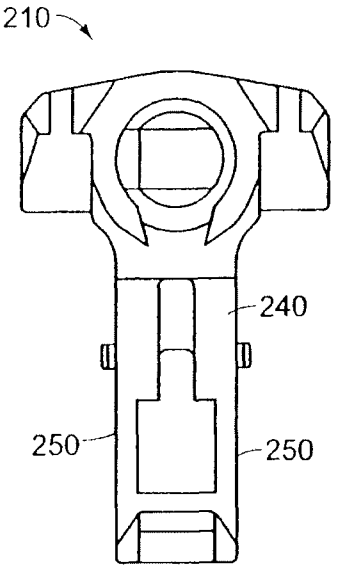


FIG. 3E

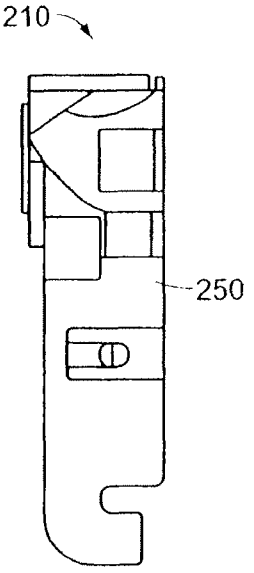


FIG. 3F

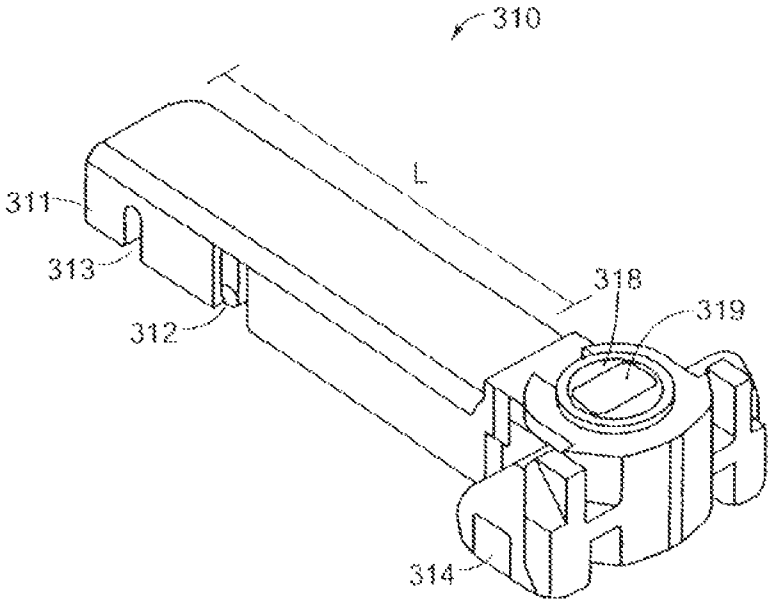


FIG. 4

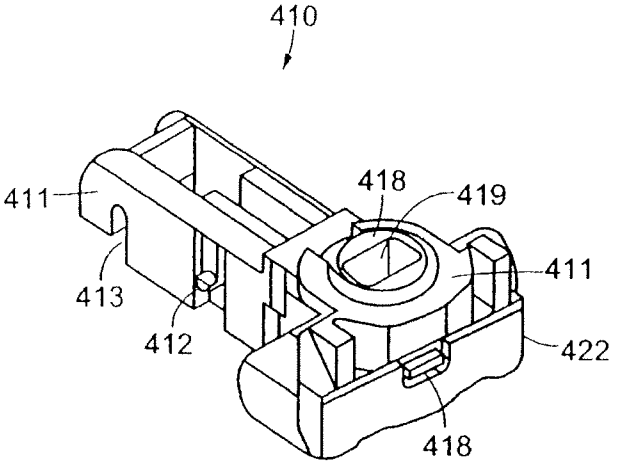


FIG. 5A

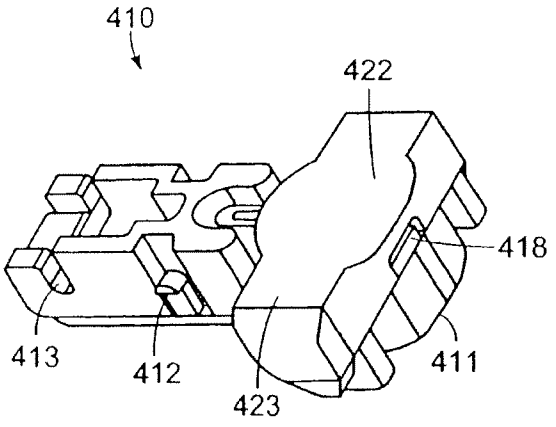


FIG. 5B

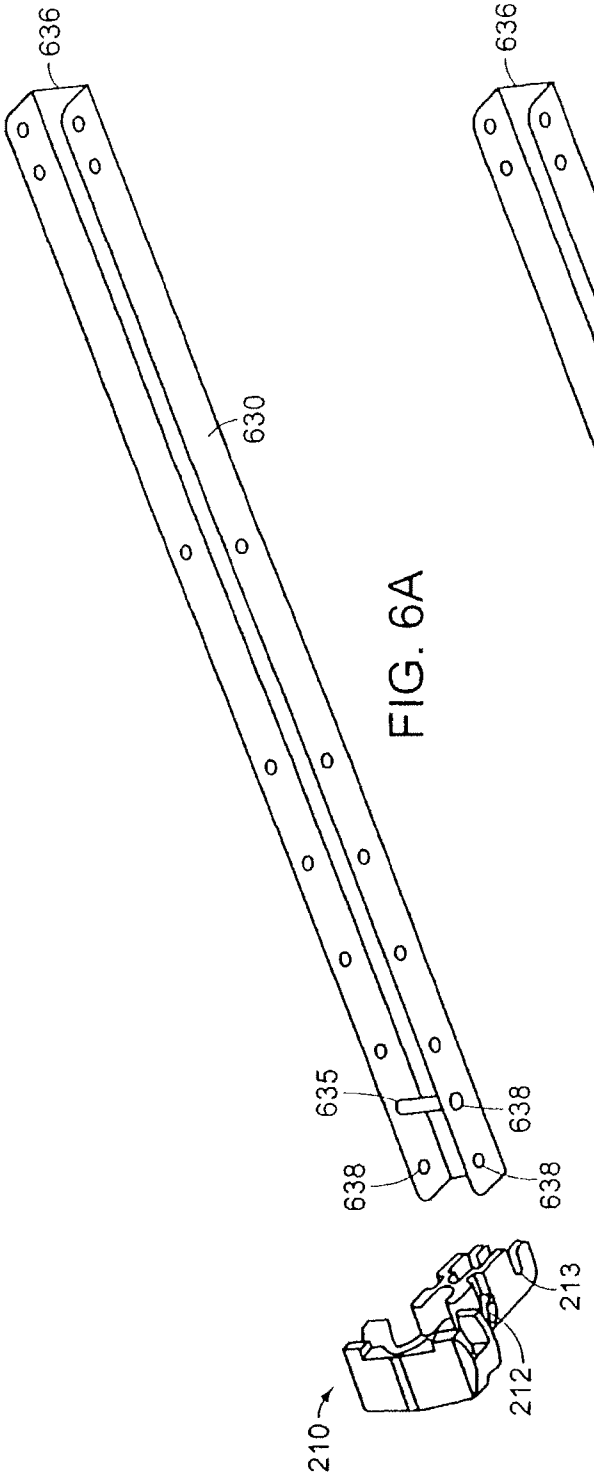


FIG. 6A

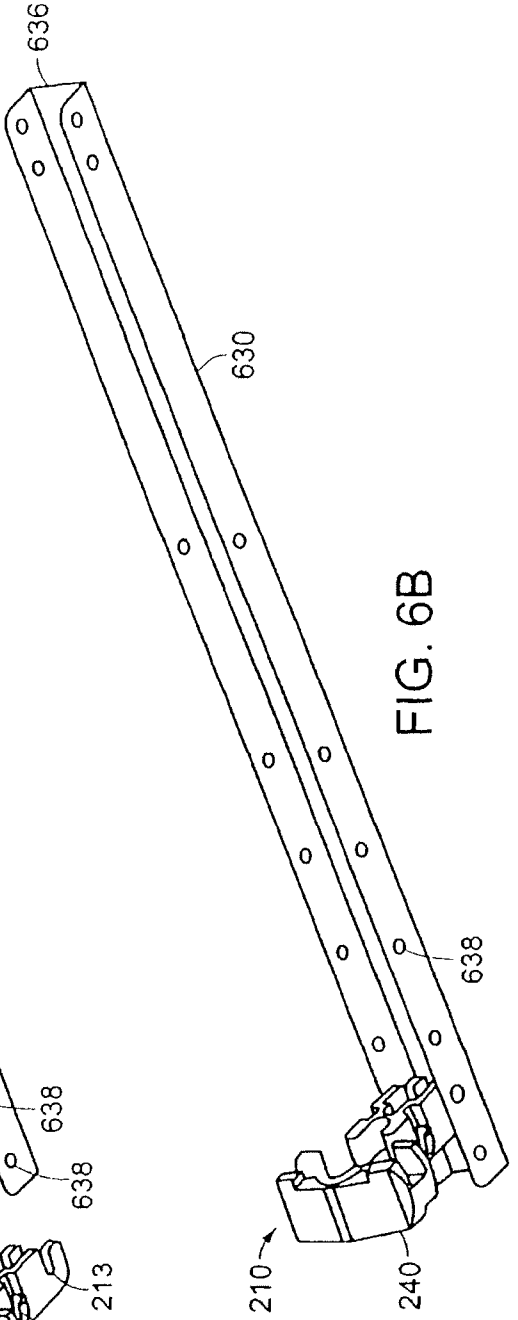


FIG. 6B

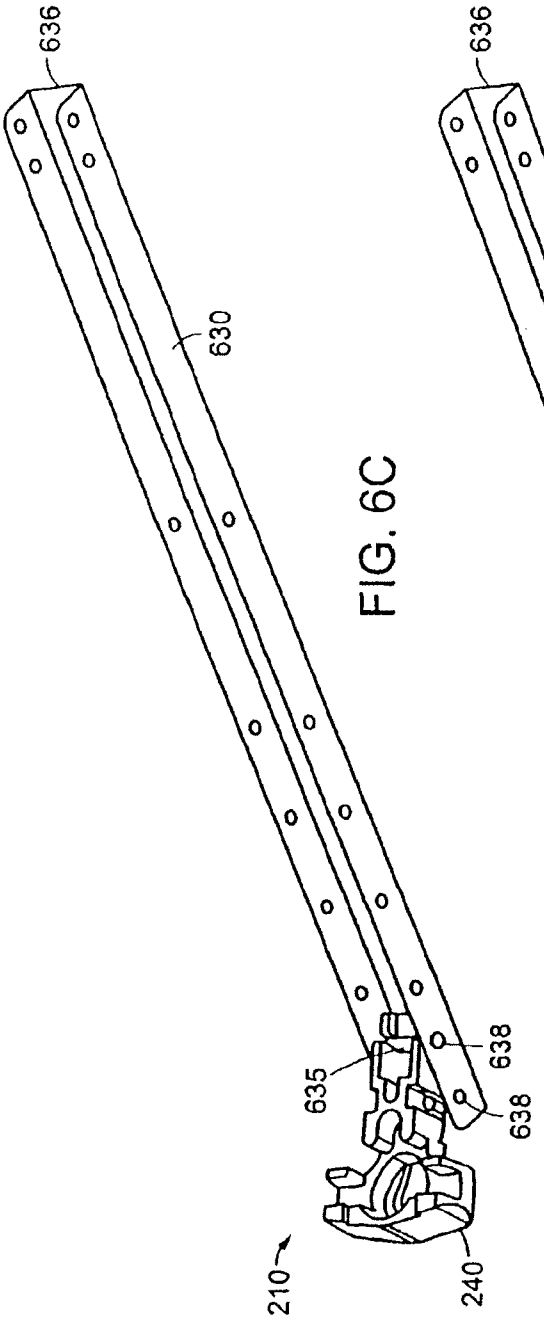


FIG. 6C

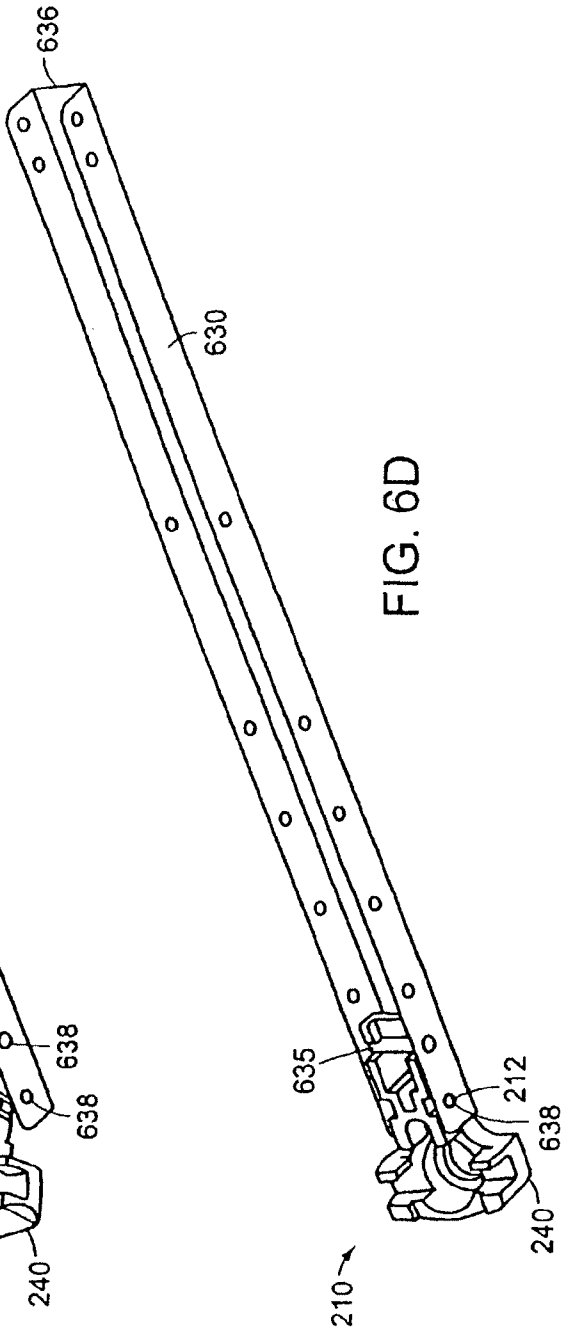


FIG. 6D

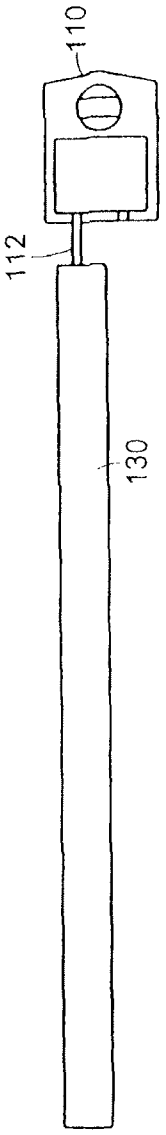


FIG. 7A
PRIOR ART

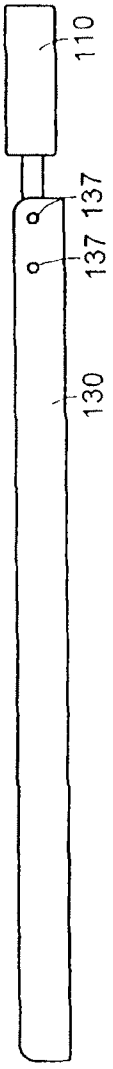


FIG. 7B
PRIOR ART

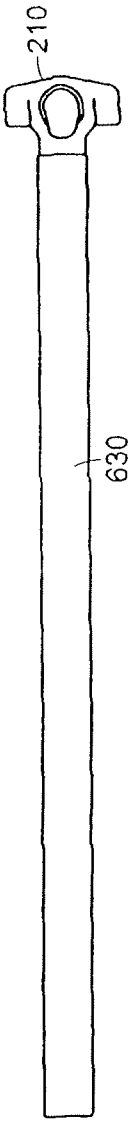


FIG. 8A

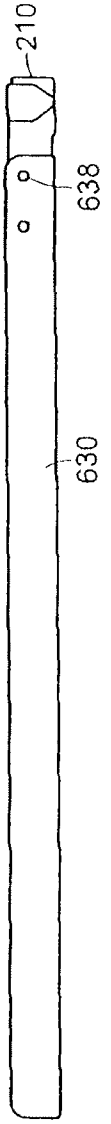


FIG. 8B

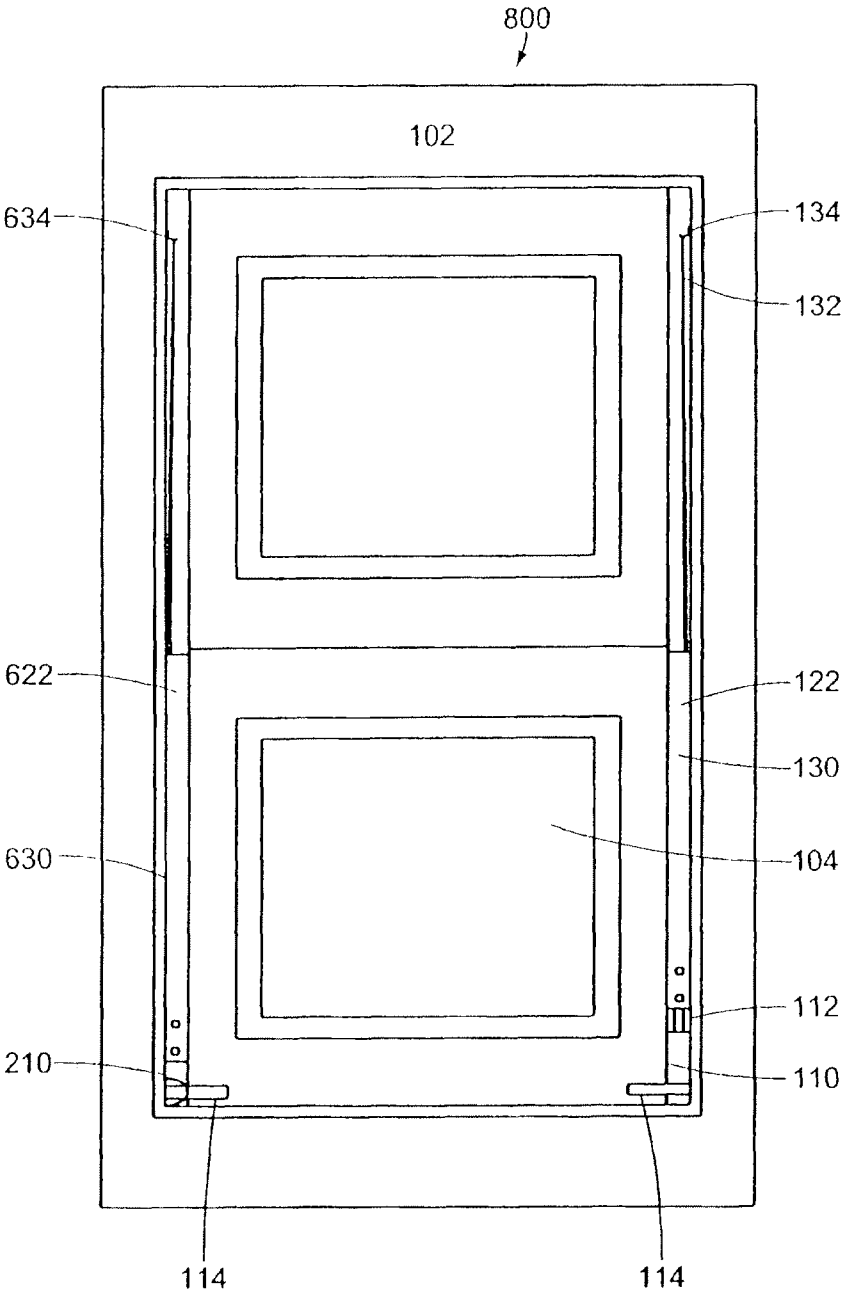


FIG. 9

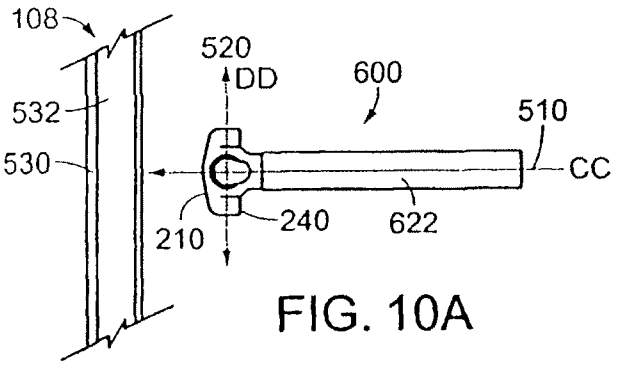


FIG. 10A

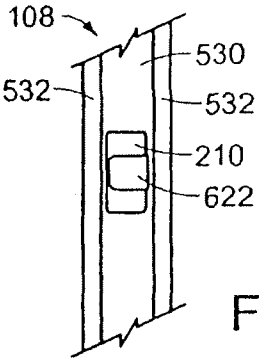


FIG. 10B

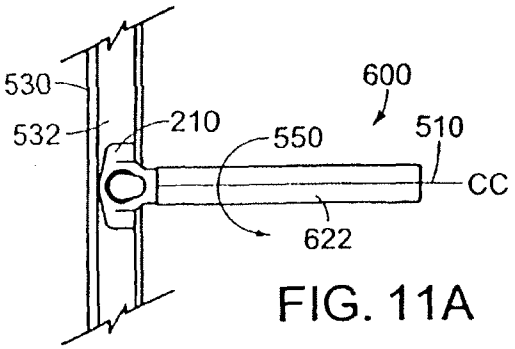


FIG. 11A

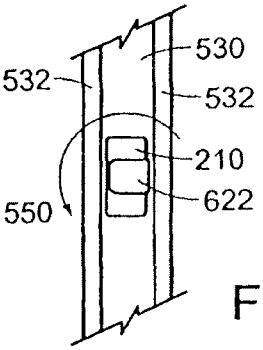


FIG. 11B

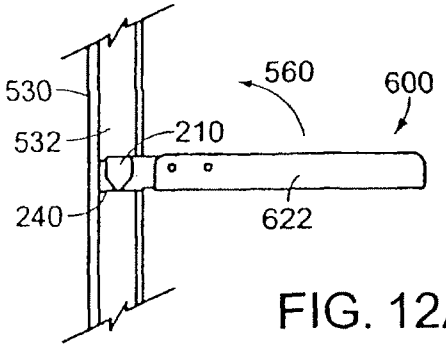


FIG. 12A

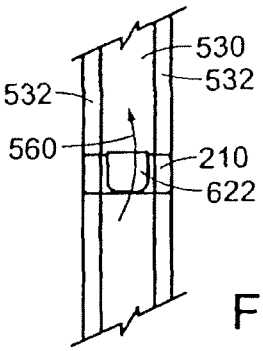


FIG. 12B

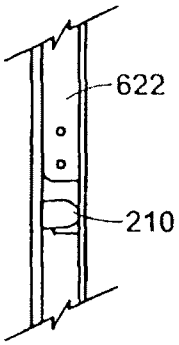


FIG. 13A

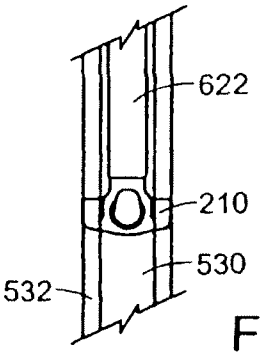


FIG. 13B

METHOD OF INSTALLING A LOCKING BALANCE SHOE AND SYSTEM FOR A PIVOTABLE WINDOW

RELATED APPLICATION

This application incorporates by reference in its entirety and is a division of U.S. patent application Ser. No. 11/654,120, filed Jan. 17, 2007; which incorporates by reference in its entirety and is a continuation of U.S. patent application Ser. No. 11/101,689, filed Apr. 8, 2005, now U.S. Pat. No. 7,191,562; which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/862,950, filed Jun. 8, 2004, now U.S. Pat. No. 6,931,788; which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/446,279, filed on May 23, 2003, now U.S. Pat. No. 6,820,368; which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/044,005, filed on Jan. 11, 2002, now U.S. Pat. No. 6,679,000; which incorporates by reference in its entirety and claims priority to U.S. Provisional Patent Application Ser. No. 60/261,501 entitled Snap Lock Balance Shoe and System for a Pivotable Window filed on Jan. 12, 2001.

FIELD OF THE INVENTION

This invention relates to a window balance system for use in a pivotable window assembly.

BACKGROUND OF THE INVENTION

This invention relates to the field of tilt-in windows. More particularly this invention relates to a balance shoe of a window balance system used in conjunction with a pivot bar mounted on a window sash for rotating the window sash relative to a window frame.

Typical pivotable double hung windows include two window sashes disposed in tracks located in a window frame to allow vertical sliding movement of the sashes. Pivot bars are provided to allow rotational movement of a pivotable window sash about the pivot bars to facilitate cleaning of glazing. To control vertical movement, window balances are used so that the window sashes remain in a position in which they are placed. Balance shoes are used to guide the rotational movement of the window sashes with respect to the window frame. Typically, the balance shoes are coupled to window balances with a connecting member. See, for example, U.S. Pat. No. 6,119,398, entitled "Tilt Window Balance Shoe Assembly with Three Directional Locking" issued to H. Dale Yates, Jr., the disclosure of which is herein incorporated by reference in its entirety.

One of the problems with balance shoes and window balances for pivotable double hung windows is that they are difficult to install. In order to install a pivotable double hung window with balance shoes and window balances, the following installation steps typically must be followed. First, before the window frame is assembled, the balance shoes are inserted into jamb tracks. Next, connecting members are used to attach the balance shoes to the window balances. The balance shoes generally have an opening to accept the pivot bars that are mounted on window sashes. Finally, the sashes are made operable by inserting the pivot bars into the balance shoes and rotating the window sash up to a vertical position in the jamb tracks. The installation process is rather complex and difficult. Repair costs for replacing balance shoes are also significant. In order to change a malfunctioning or failed balance shoe, the jamb tracks either need to be deformed or replaced to gain access to the problematic balance shoe for removal and replacement.

SUMMARY OF THE INVENTION

In general, in one aspect, the invention relates to a balance shoe. The balance shoe includes a frame, a locking member at least partially disposed within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within a window balance. Embodiments of the invention can include the following features. The connecting device can include one or more retractable tabs that engage the window balance directly. The frame can further include a frame pocket sized to receive a fastener. The cam can include at least one camming surface and a keyhole opening for receiving a pivot bar attached to a window sash. The cam is at least partially housed within the frame and is disposed within a space enclosed by the locking member. Upon rotating the cam with the pivot bar, the locking member engages the window jamb. In one embodiment, the locking member includes two opposing ends integrally connected by a spring member. The cam is located within a space between the opposing ends of the locking member, and upon rotating the cam with the pivot bar, the opposing ends engage the window jamb. In another embodiment, the locking member includes a plate, which is parallel to a back surface of the frame. The cam is located within a space between the plate and the frame such that rotating the cam with the pivot bar forces the plate to engage the window jamb.

In another aspect, the invention relates to an inverted window balance system for use within a pivotable double hung window assembly. The inverted window balance system includes a rigid U-shaped channel with a plurality of openings in the channel walls for securing the contents in the channel, which include an extension spring, a system of pulleys, a cord to connect the extension spring via the system of pulleys with the window sash, and a balance shoe. The balance shoe includes a frame, a locking member at least partially disposed within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within the rigid U-shaped channel. Embodiments of this aspect of the invention can include the following features. At least a portion of the balance shoe is disposed within the rigid U-shaped channel. The connecting device can include one or more retractable tabs for engaging the rigid U-shaped channel. The retractable tabs can partially extend through at least one of the plurality of openings in the rigid U-shaped channel. The balance shoe can be further secured to the rigid U-shaped channel with a fastener that interfaces with a frame pocket in the balance shoe. The cam can include at least one camming surface and a keyhole opening for receiving a pivot bar attached to a window sash. The cam is at least partially housed within the frame and is disposed within a space enclosed by the locking member. Upon rotating the cam with the pivot bar, the locking member engages the window jamb. In one embodiment, the locking member includes two opposing ends integrally connected by a spring member. The cam is located within a space between the opposing ends of the locking member, and upon rotating the cam with the pivot bar, the opposing ends engage the window jamb. In another embodiment, the locking member includes a plate, which is parallel to a back surface of the frame. The cam is located within a space between the plate and the frame such that rotating the cam with the pivot bar forces the plate to engage the window jamb.

In still another aspect, the invention relates to a method of installing an inverted window balance system within a window jamb in a window frame. The method includes four basic steps. The first step is to provide an inverted window balance system that includes a rigid U-shaped channel with a plurality of openings in the channel walls for securing the contents in the channel, an extension spring and a system of pulleys disposed within the rigid U-shaped channel, a cord to connect the extension spring via the system of pulleys with the window sash, and a balance shoe. The balance shoe includes a frame, a locking member located at least partially within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within the rigid U-shaped channel. The frame of the balance shoe has a frame bottom surface, a frame front surface, and two frame edge surfaces. The second step is to insert the inverted window balance system into a jamb track of the window jamb, such that an axis extending along a longitudinal direction of the rigid U-shaped channel is perpendicular to a back wall of the jamb track and an axis that is perpendicular to the two frame edge surfaces is parallel to the back wall while the frame front surface faces a side wall of the jamb track. The third step is to rotate the window balance system within the jamb track 90 degrees about the axis extending along the longitudinal direction of the rigid U-shaped channel, such that the frame front surface faces in a downward direction. The final step is to rotate the window balance system 90 degrees about the axis that is perpendicular to the two frame edge surfaces, such that the frame bottom surface faces in the downward direction.

These and other features of the invention will be made apparent from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

FIG. **1** is a perspective view of a pivotable double hung window assembly;

FIG. **2**A is a rear view of inverted window balance system for use with a prior art balance shoe;

FIG. **2**B is a rear view of a window balance;

FIG. **3**A is one perspective view of an embodiment of a snap lock balance shoe of the present invention;

FIG. **3**B is another perspective view of the embodiment of the snap lock balance shoe of FIG. **3**A;

FIG. **3**C is a rear view of one embodiment of a snap lock inverted balance system;

FIG. **3**D is a bottom view of one embodiment of a snap lock balance shoe;

FIG. **3**E is a front view of one embodiment of a snap lock balance shoe;

FIG. **3**F is a side view of one embodiment of a snap lock balance shoe;

FIG. **4** is a perspective view of an embodiment of a snap lock balance shoe of the present invention;

FIG. **5**A is one perspective view of another embodiment of a snap lock balance shoe of the present invention;

FIG. **5**B is another perspective view of the embodiment of the snap lock balance shoe of FIG. **5**A;

FIG. **6**A is a perspective view of one embodiment of a balance shoe of the invention and a rigid U-shaped channel;

FIG. **6**B is a perspective view showing the first step of connecting one embodiment of the balance shoe of the invention to the rigid U-shaped channel;

FIG. **6**C is a perspective view showing the second step of connecting one embodiment of the balance shoe of the invention to the rigid U-shaped channel;

FIG. **6**D is a perspective view showing one embodiment of the balance shoe of the invention connected to the rigid U-shaped channel;

FIG. **7**A is a front view of a prior art balance shoe attached to a rigid U-shaped channel;

FIG. **7**B is a side view of the prior art balance shoe attached to the rigid U-shaped channel;

FIG. **8**A is a front view of one embodiment of a snap lock balance shoe of the present invention attached to a rigid U-shaped channel;

FIG. **8**B is a side view of one embodiment of the snap lock balance shoe of the present invention attached to the rigid U-shaped channel;

FIG. **9** is a front view of a window assembly including one snap lock inverted window balance system of the present invention and one prior art inverted window balance system installed in a window frame;

FIG. **10**A is a side view illustrating the first step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **10**B is a front view illustrating the first step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **11**A is a side view illustrating the second step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **11**B is a front view illustrating the second step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **12**A is a side view illustrating the third step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **12**B is a front view illustrating the third step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **13**A is a side view illustrating the last step of installing the snap lock inverted window balance system of the invention into the jamb track; and

FIG. **13**B is a front view illustrating the last step of installing the snap lock inverted window balance system of the invention into the jamb track.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, shown is a pivotable double hung window assembly **100** in which a snap lock balance shoe constructed in accordance with the teachings of the present invention can be used. The pivotable double hung window assembly **100** includes of a window frame **102**, a pivotable lower window sash **104**, a pivotable upper window sash **106**, and a window jamb **107**. The pivotable lower window sash **104** and the pivotable upper window sash **106** slide vertically in jamb track **108** within the window jamb **107**, while also being able to pivot about a pivot bar **114**, as shown in FIG. **9**.

FIG. **2**A shows a rear view of an inverted window balance system **120** for use in the pivotable double hung window assembly **100**. The inverted window balance system **120** includes an inverted window balance **122** used for balancing the weight of either the pivotable lower window sash **104** or the pivotable upper window sash **106** at any vertical position within the window frame **102**, and a prior art balance shoe **110**

for guiding the rotation of the pivotable lower window sash **104** about the pivot bar **114**. A hanging connector **112** connects the prior art balance shoe **110** to the inverted window balance **122**. The inverted window balance **122** includes an extension spring **126** connected to a system of pulleys **128** housed within a rigid U-shaped channel **130**, and a cord **132** for connecting the system of pulleys **128** to a jamb mounting attachment **134**. The jamb mounting attachment **134** is used for connecting the inverted window balance system **120** to the window jamb **107**. One difference between the inverted window balance **122** and a window balance **140**, shown in FIG. **2**B, includes the placement of the extension spring **146** above a system of pulleys **148** within the rigid U-shaped channel **150**. A cord **152** connects the system of pulleys **148** to a jamb mounting attachment **154**. Another difference is that while inverted window balances **122** travel with either the pivotable lower window sash **104** or pivotable upper window sash **106**, the window balance **140** remains in a fixed position in the window jamb **107** due to an attachment to the window jamb **107** through an attachment opening **155**.

FIGS. **3**A and **3**B are perspective views of a snap lock balance shoe **210** of one embodiment of the present invention. The snap lock balance shoe **210** has a frame **211** in which is housed a connecting device **212**, a locking device **214**, and a cam **218**. The connecting device **212** can be integral with the frame **211** and attaches the snap lock balance shoe **210** directly within an inverted window balance **622**, shown in FIG. **3**C. The inverted window balance **622** in combination with the snap lock balance shoe **210** forms a snap lock inverted window balance system **600**. The inverted window balance **622** includes an extension spring **626** connected to a system of pulleys **628** housed within a rigid U-shaped channel **630**, and a cord **632** for connecting the system of pulleys **628** to a jamb mounting attachment **634**, such as a cord terminal or hook.

In the depicted embodiment, the connecting device **212** is a pair of retractable tabs that snap into the rigid U-shaped channel **630**. In other embodiments, other connecting devices such as a screw, may be used to secure the frame **211** to the rigid U-shaped channel **630**. A fastener **635** located in the inverted window balance **622** can be used to further secure the connection between the snap lock balance shoe **210** and the inverted window balance **622**. To accommodate the fastener **635**, the snap lock balance shoe **210** can form a connection pocket **213** sized to receive or mate with the fastener **635**.

Another element of the snap lock balance shoe **210** visible in FIG. **3**A is a keyhole opening **219** located within the cam **218**. The keyhole opening **219** is sized to accept the pivot bar **114** extending from either the pivotable lower window sash **104** or the pivotable upper window sash **106**, and serves as a connection point between the pivotable lower or upper window sash **104**, **106** and the snap lock balance shoe **210**. FIG. **3**B shows a perspective view of the snap lock balance shoe **210** showing another face of the cam **218**.

In the embodiment shown in FIG. **3**B, the locking device **214** surrounds the cam **218** and includes of a pair of opposing ends **215** connected by a spring member **216**. When the pivotable lower window sash **104** is tilted open, the pivot bar **114** rotates, which in turn rotates the cam **218** forcing the opposing ends **215** outward to engage the jamb track **108** of the window frame **102**, thereby locking the balance shoe **210** in that location.

FIGS. **3**D-**3**F show different views of one of the embodiments of the snap lock balance shoe **210** of the invention. FIG. **3**D is a bottom view of the snap lock balance shoe **210** that shows a frame bottom surface **230**. FIG. **3**E is a front view of the same embodiment of the snap lock balance shoe **210** that illustrates a frame front surface **240**, and FIG. **3**F is an side view that shows one of the two frame edge surfaces **250** of the snap lock balance shoe **210**.

FIG. **4** shows another embodiment of a snap lock balance shoe **310**. The snap lock balance shoe **310** has an elongated frame **311** in which is housed a connecting device **312**, a locking device **314**, and a cam **318**. Within the cam is a keyhole opening **319** sized to receive the pivot bar **114**. The elongated frame **311** has a length L that is greater than about 1.25 inches. When attached to the rigid U-shaped channel **630**, the balance shoe **310** extends further outward from the rigid U-shaped channel **630** than the balance shoe **210** attached to a similar sized rigid U-shaped channel **630**. The balance shoe **310** allows a fixed-sized rigid U-shaped channel **630** to be used in a larger window having a greater travel distance by extending the length of the entire window balance system by having a longer balance shoe **310**. One of the advantages of the present invention is that an installer can create a custom window balance system for a particular window by fitting a fixed-length rigid U-shaped channel **630** with an appropriately sized snap lock balance shoe.

FIG. **4** shows another embodiment of a snap lock balance shoe **310**. The snap lock balance shoe **310** has an elongated frame **311** in which is housed a connecting device **312**, a locking device **314**, and a cam **318**. Within the cam is a keyhole opening **319** sized to receive the pivot bar **114**. The elongated frame **311** has a length L **325** that is greater than about 1.25 inches. When attached to the rigid U-shaped channel **630**, the balance shoe **310** extends further outward from the rigid U-shaped channel **630** than the balance shoe **210** attached to a similar sized rigid U-shaped channel **630**. The balance shoe **310** allows a fixed-sized rigid U-shaped channel **630** to be used in a larger window having a greater travel distance by extending the length of the entire window balance system by having a longer balance shoe **310**. One of the advantages of the present invention is that an installer can create a custom window balance system for a particular window by fitting a fixed-length rigid U-shaped channel **630** with an appropriately sized snap lock balance shoe.

Referring to FIGS. **5**A-**5**B, shown is another embodiment of the present invention of a snap lock balance shoe **410**. The snap lock balance shoe **410** has a locking member **422** which engages a back wall of the jamb track **108** locking the balance shoe **410** in that location. The locking member **422** is partially disposed in the frame **411** and includes a plate **423** that engages the back wall of the jamb track **108**. The balance shoe **410** also includes a frame **411**, a connecting device **412**, and a cam **418**. The cam **418** is partially disposed within the frame **411** in a space enclosed by the locking member **422**. The cam **418** includes a keyhole opening **419** sized to receive the pivot bar **114**. Upon rotation of the cam **418** with the pivot bar **114**, the locking member **422** is forced away from the frame **411** towards the back wall of the jamb track **108**, thereby anchoring the balance shoe **410** in that location within the window frame **102**.

FIGS. **6**A-**6**D show one embodiment of a method for securing the snap lock balance shoe **210** within a rigid U-shaped channel **630** with multiple openings **638**. It should be noted that each opening **638** on one side of the rigid U-shaped channel **630** has a corresponding opening **638** on the other side of the rigid U-shaped channel **630** to form a pair of openings. The first step, shown in FIG. **6**A, is to place a fastener **635**, such as a rivet, in one of the pairs of openings **638** in the rigid U-shaped channel **630**. The next step, as depicted in FIG. **6**B, is to slide the snap lock balance shoe **210** into the rigid U-shaped channel **630** such that the fastener **635** is received in the connection pocket **213** of the snap lock

balance shoe **210**. As shown in FIG. **6**C, the snap lock balance shoe **210** is then rotated down so that the front frame surface **240** is aligned with a bottom wall **636** of the rigid U-shaped channel **630**. FIG. **6**D shows the last step of attaching the snap lock balance shoe **210** within the rigid U-shaped channel **630**. In this step, the connecting device **212** of the snap lock balance shoe **210** snaps into one of the pairs of openings **638** located on the rigid U-shaped channel **630**. In alternative embodiments the connection device **212** of the snap lock balance shoe **210** can extend through off-set openings in the rigid U-shaped channel **630**. In some embodiments, the snap lock balance shoe **210** is attached to the rigid U-shaped channel **630** with the fastener **635**. In other embodiments, the snap lock balance shoe **210** is attached to the rigid U-shaped channel **630** without the fastener **635**. It should also be noted that in some embodiments, the snap lock balance shoe **210** can be aligned and secured to the rigid U-shaped channel **630** such that the front frame surface **240** faces upwards instead of downwards as depicted in FIG. **6**D.

FIG. **7**A is a front view of the prior art balance shoe **110** attached to the rigid U-shaped channel **130**. The rigid U-shaped channel **130** is connected to the prior art balance shoe **110** by the hanging connector **112**. No part of the prior art balance shoe **110** lies within the rigid U-shaped channel **130**. FIG. **7**B is a side view of the prior art balance shoe **110** attached to the rigid U-shaped channel **130** illustrating channel openings **137**. Fasteners (not shown) are installed through the channel openings **137** to secure the hanging connector **112** to the rigid U-shaped channel **130**.

Referring to FIGS. **8**A and **8**B, shown is an embodiment of the snap lock balance shoe **210** of the present invention attached to the rigid U-shaped channel **630**. The snap lock balance shoe **210** is directly attached within the rigid U-shaped channel **630** by a connecting device **212** located on the frame **211** of the snap lock balance shoe **210**. The connecting device **212** extends through a pair of openings **638** located on the rigid U-shaped channel **630**.

FIG. **9** is a front view of a pivotable double hung window assembly **800** in which an inverted window balance **122** is attached to a prior art balance shoe **110** by using the hanging connector **112**, and the inverted window balance **622** is attached to the snap lock balance shoe **210** of an embodiment of the present invention. Pivot bars **114**, as shown in FIG. **9**, are secured to the pivotable lower window sash **104**. The pivot bars **114** are slidably receivable by both the prior art balance shoe **110** and the snap lock balance shoe **210** and serve as connections between the pivotable lower window sash **104** and respective inverted window balances **122**, **622**.

An advantage of the type of balance shoe presently disclosed is that the snap lock balance shoe **210** is attached within the rigid U-shaped channel **630** resulting in a longer rigid U-shaped channel **630** than in the inverted balance systems **120** for a given window sash. The longer rigid U-shaped channel **630** of the inverted window balance **622** allows for the use of longer extension springs that provide greater control of the vertical positioning of the window sash than a shorter rigid U-shaped channel **130** with a shorter extension spring. Another advantage of the present invention is that the snap lock balance shoe **210** contains a smaller number of parts than prior art balance shoes **110**.

One installation method used to place a snap lock inverted window balance system **600** within the jamb tracks **108** is schematically illustrated in the remaining figures. The snap lock inverted window balance system **600** includes one inverted window balance **622** and one snap lock window balance **210**. FIGS. **10**A, **11**A, **12**A, and **13**A show the installation method from a side view, while FIGS. **10**B, **11**B, **12**B, and **13**B show the method from a front view. The installation method involves an orientation step, a first rotation step, and a second rotation step. FIGS. **10**A and **10**B show the orientation step in the installation method. In the orientation step, the snap lock inverted window balance system **600** is inserted the jamb tracks **108** such that an axis CC **510** in FIG. **10**A is perpendicular to a back wall **530** of the jamb tracks **108**, while an axis DD **520** in FIG. **10**A is parallel to the back wall **530** and the frame front surface **240** is adjacent to a side wall **532** of the jamb tracks **108**. FIGS. **11**A and **11**B show the snap lock inverted window balance system **600** inserted in the jamb tracks **108** as well as an arrow **550** indicating the direction of rotation of the snap lock inverted window balance system **600** required to complete the first rotation step. The first rotation step involves rotating the snap lock inverted window balance system **600** 90-degrees about the axis CC **510** such that the frame front surface **240** faces downward. FIGS. **12**A and **12**B show the snap lock inverted window balance system **600** after the 90-degree rotation around the axis CC **510** has been completed. The second rotation step involves a 90-degree rotation about the axis DD **520**. An arrow **560** showing the direction of the second rotation step is shown in FIGS. **12**A and **12**B. FIGS. **13**A and **13**B show in two different views the snap lock inverted window balance system **600** after the installation method has been completed. The cord terminal or any other jamb mounting attachment **634** (see FIG. **9**) can then be screwed or hooked into place to anchor the snap lock inverted window balance system **600**.

The installation method just described can be carried out in reverse to remove the snap lock inverted window balance system **600** from the jamb track **108** of the window frame **102** to allow for easy replacement of the snap lock balance shoe **210** or the snap lock inverted window balance system **600** itself. In order to replace inverted window balance systems **120** with prior art balance shoes **110**, either the jamb tracks **108** need to be warped or completely removed in order to replace the prior art balance shoe **110** of the inverted window balance system **120**.

While there have been described several embodiments of the invention, other variants and alternatives will be obvious to those skilled in the art. Accordingly, the scope of the invention is not limited to the specific embodiments shown.

What is claimed is:

1. A method of installing an inverted window balance system within a window jamb in a window frame, the method comprising the steps of:

providing the inverted window balance system comprising:

a U-shaped channel; and

a balance shoe comprising a balance shoe frame;

inserting a portion of the balance shoe frame within a jamb track of the window jamb in an orientation position;

rotating the balance shoe frame about a first axis 90 degrees relative to the orientation position; and

rotating the balance shoe frame 90 degrees about a second axis perpendicular to the first axis such that the balance shoe frame is substantially fully disposed within the jamb track.

2. The method of claim **1**, wherein the balance shoe frame further comprises:

means for receiving a fastener for pivotally connecting the balance shoe frame to the U-shaped channel; and

means for securing the balance shoe frame against rotation relative to the U-shaped channel.

3. The method of claim **2**, wherein the receiving means comprises a connecting pocket.

4. The method of claim 3, further comprising the step of pivoting the fastener relative to the connecting pocket.

5. The method of claim 2, further comprising the steps of:

inserting the fastener into the receiving means to connect the shoe to the U-shaped channel;

pivoting the balance shoe frame relative to the U-shaped channel; and

securing the balance shoe frame against rotation relative to the U-shaped channel.

6. The method of claim 5, wherein the securing step comprises extending the securing means through an opening defined by the U-shaped channel.

7. The method of claim 5, wherein the pivoting step comprises pivoting the balance shoe frame relative to the U-shaped channel about an axis defined at least in part by the fastener.

8. The method of claim 5, further comprising the step of fixing the fastener to the U-shaped channel.

9. The method of claim 2, wherein the fastener comprises a rivet.

10. The method of claim 2, wherein the securing means comprises resilient tabs.

11. The method of claim 10, wherein the resilient tabs extend from edge surfaces of the balance shoe frame.

12. The method of claim 1, wherein the balance shoe frame further comprises:

a cam at least partially disposed within the balance shoe frame; and

a locking member in contact with the cam.

13. The method of claim 12, wherein the locking member is located at edge surfaces of the balance shoe frame.

14. The method of claim 12, wherein the balance shoe frame further comprises a keyhole opening for receiving a pivot bar.

15. The method of claim 12, wherein the locking member comprises a pair of opposing surfaces connected by an elastic member.

16. The method of claim 12, wherein the locking member further comprises a surface adapted to engage the window jamb track.

17. The method of claim 12, wherein rotation of the cam forces the locking member toward side walls of the window jamb track when the balance shoe frame is installed in the window jamb track.

18. The method of claim 1, wherein the balance shoe frame comprises a unitary construction.

* * * * *

EXHIBIT C

Window & Door

www.WindowandDoor.com The Information Source for the Fenestration Industry Volume 25, Number 5 | August 2017

GlassBuild America

Window & Door Dealer Days

THE SOURCE FOR SOLUTIONS

VISION High Performance Hardware

BALANCE SYSTEMS

New Inverted Balance System

Balance shoe comes attached to the balance eliminating the need to order an additional SKU's.

Steel springs chemically sealed with a rust preventive coating

Features:

- Multiple balance shoe and mounting hook options designed for easy installation and removal
- Balance shoe can come attached to the balance or separate to allow use of interchangeable shoes for multiple system applications
- Balances do not lose tension over time
- All balances are pretensioned specifically for each window size to match existing industry systems
- Protective metal channel that is resistant to construction dirt, sheet rock dust, and cleaning materials that would damage standard balances
- Steel springs chemically sealed with a rust preventive coating
- Use of industry leading cord has been rated to exceed requirements consistently and quietly.

Balance shoe and mounting hook have been designed for easy installation and removal!

The Vision Balance will enhance your windows by providing a long, dependable service life combined with smooth operating movements. Available in inverted tilt, standard tilt and sideload options.

Vision's balance program makes use of our current supply agreement program which puts 90 days of inventory at one of our 5 regional warehouses near you to allow JIT delivery or pick up. Signed supply agreements guarantee product availability based on your projections and **lock pricing for a minimum of 2 years!**

See us at GlassBuild America, booth 1227.

VISION® HARDWARE
Consistently Reliable

OCT 2018 NGA

Visit visionhardware.com to order free samples or call (800) 220-4756 to speak to a sales representative.

(800) 220-4756 • WWW.VISIONHARDWARE.COM

EXHIBIT D

Merchant & Gould
An Intellectual Property Law Firm

3200 IDS Center
80 South Eighth Street
Minneapolis, MN 55402-2215
Telephone: 612.332.5300
Fax: 612.332.9081
www.merchantgould.com
A Professional Corporation

Direct Contact | 612-336-4665
tleach@merchantgould.com

August 18, 2017

VIA UPS And E-mail

Thomas A. O'Rourke, Esq.
Bodner & O'Rourke, LLP
425 Broadhollow Road
Suite 120
Melville, New York 11747-9034

RE: Amesbury Group, Inc. – Intellectual Property Rights
Our File No. 17546.0020USAA

Dear Mr. O'Rourke:

We understand that you represented Vision Hardware, Inc. ("Vision"), at least in October 2009; as such, we are writing this letter to you as Vision's counsel. In the event you no longer present Vision, we have copied Vision as well, and ask that you please disregard this letter.

Merchant & Gould represents Amesbury Group, Inc. ("Amesbury") in intellectual property matters. As you know, Amesbury makes innovative and patented locking balance shoes for pivotable windows. This letter notifies Vision that it is infringing patents owned by Amesbury covering locking balance shoes.

Amesbury is a leader in designing and developing innovative window hardware, including locking balance shoes and systems. To protect Amesbury's significant investments in research and development of new technology, Amesbury actively obtains and enforces patents covering its technologies. Amesbury owns and holds exclusive rights to practice the inventions claimed in, at least, the following U.S. Patents related to locking balance shoe technology:

- U.S. Patent No. 8,424,248 ("the '248 patent")
- U.S. Patent No. 9,580,950 ("the '950 patent")

Copies of these patents are attached. Vision is directly and indirectly infringing such patents by, at least, making, using, and selling balance shoes and systems that practice the inventions claimed in the above-identified patents in violation of Amesbury's exclusive

rights. In particular, at least claim 1 of the ’950 patent, and claim 1 of the ’248 patent, are infringed by Vision’s Block and Tackle Inverted Balances and their use. Pictures of these products are attached. We understand these products, or colorable imitations thereof, were the subject of correspondence between you and Amesbury’s prior counsel, Goodwin Procter LLP, in late 2009. We also understand that Vision has recently begun to again market such products to window manufacturers.

Additionally, Amesbury has continuation patents pending and is committed to obtain broad coverage of all alternative innovative designs described in its patent disclosures. Thus, should Vision attempt to design products that fall within Amesbury’s patents’ disclosures and obtain the benefits of Amesbury’s innovative technology, Amesbury will obtain and enforce patents covering those designs as well.

Amesbury demands that Vision immediately cease and desist from all sales and/or offers for sale of any product that infringes upon its patent rights, including Vision’s Block and Tackle Inverted Balances (as well as any colorable imitations thereof) for use in the United States. Amesbury also demands that Vision provide an accounting of all past sales of Block and Tackle Inverted Balances (as well as any colorable imitations thereof) so that Amesbury can determine the amount of past damages sufficient to compensate Amesbury for Vision’s infringement.

Amesbury takes this matter very seriously. Please let me know no later than **Friday, September 1, 2017** if you are willing to resolve this matter voluntarily.

Neither this letter nor your response to it constitutes a waiver of any of Amesbury’s rights, all of which are expressly reserved.

Very truly yours,

Thomas J. Leach

Enclosures

cc: Luke Liang, Executive Director
Joe Blackwell, General Manager
Vision Hardware, Inc.
500 Metuchen Road
South Plainfield, New Jersey 07080

US009580950B2

(12) **United States Patent**
Uken et al.

(10) **Patent No.: US 9,580,950 B2**
(45) **Date of Patent: Feb. 28, 2017**

(54) **LOCKING BALANCE SHOE AND SYSTEM FOR A PIVOTABLE WINDOW**

(75) Inventors: **Stuart J. Uken**, Sioux Falls, SD (US); **Gary R. Newman**, Valley Springs, SD (US); **Lawrence J. VerSteeg**, Sioux Falls, SD (US)

(73) Assignee: **Amesbury Group, Inc.**, Amesbury, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 7 days.

(21) Appl. No.: **11/654,120**

(22) Filed: **Jan. 17, 2007**

(65) **Prior Publication Data**

US 2007/0113479 A1 May 24, 2007

Related U.S. Application Data

(63) Continuation of application No. 11/101,689, filed on Apr. 8, 2005, now Pat. No. 7,191,562, which is a continuation of application No. 10/862,950, filed on Jun. 8, 2004, now Pat. No. 6,931,788, which is a continuation of application No. 10/446,279, filed on May 23, 2003, now Pat. No. 6,820,368, which is a continuation of application No. 10/044,005, filed on Jan. 11, 2002, now Pat. No. 6,679,000.

(60) Provisional application No. 60/261,501, filed on Jan. 12, 2001.

(51) **Int. Cl.**

E05D 15/08	(2006.01)
E05C 17/64	(2006.01)
E05D 13/00	(2006.01)
E05D 15/22	(2006.01)

(52) **U.S. Cl.**

CPC ***E05D 15/08*** (2013.01); ***E05D 13/08*** (2013.01); ***E05D 13/1207*** (2013.01); ***E05D 15/22*** (2013.01); *E05Y 2201/67* (2013.01); *E05Y 2900/148* (2013.01); *Y10T 16/64* (2015.01)

(58) **Field of Classification Search**

USPC ..... 49/181, 176, 446, 183, 184, 185, 186, 49/445, 449, 455, 453, 454, 177, 161; 292/DIG. 63, DIG. 47, DIG. 37; 16/197

IPC E05D 15/08,15/22, 13/1207

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,312,665	A	8/1919	Almquist
2,178,533	A	10/1939	Viehweger
2,952,884	A	9/1960	Dinsmore

(Continued)

FOREIGN PATENT DOCUMENTS

CA	2382933	12/2002
GB	740223	11/1955

(Continued)

OTHER PUBLICATIONS

BSI's Hidden Advantage: It's as Easy as 1-2-3, Balance Systems—BSI, Amesbury Group, Inc., 2001, 3 pgs.

(Continued)

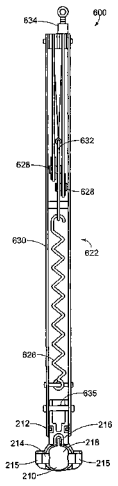
Primary Examiner — Gregory Strimbu

(74) *Attorney, Agent, or Firm* — Goodwin Procter LLP

(57) **ABSTRACT**

Locking balance shoes and balance systems to be incorporated in pivotable double hung windows include, in one embodiment, a pair of retractable tabs that partially extend through openings within an inverted window balance. In one embodiment of the method of installing such a system, an enlarged portion of the balance shoe is inserted into a window jamb and then rotated into position.

45 Claims, 13 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

3,007,194	A	11/1961	Griswold	
3,105,576	A	10/1963	Jones et al.	
3,461,608	A	8/1969	Johnson	
3,497,999	A	3/1970	Hendra	
3,529,381	A	9/1970	Grossman	
3,676,956	A	7/1972	Taylor et al.	
3,732,594	A	5/1973	Mills	
3,869,754	A	3/1975	Foster	
4,028,849	A	6/1977	Anderson	
4,068,406	A	1/1978	Wood	
4,079,549	A	3/1978	Wood	
4,089,085	A	5/1978	Fitzgibbon	
4,190,930	A	3/1980	Prosser	
4,300,316	A	11/1981	Ficurilli	
4,332,054	A	6/1982	Paist et al.	
4,506,478	A	3/1985	Anderson	
4,510,713	A	4/1985	Anderson	
4,610,108	A	9/1986	Marshik	
4,697,304	A	10/1987	Overgard	
4,704,821	A	11/1987	Berndt	
4,930,254	A	6/1990	Valentin	
4,941,285	A	7/1990	Westfall	
4,949,425	A	8/1990	Dodson et al.	
4,958,462	A	9/1990	Cross	
5,069,001	A	12/1991	Makarowski	
5,127,192	A	7/1992	Cross	
5,140,769	A	8/1992	Hickson et al.	
5,189,838	A	3/1993	Westfall	
5,210,976	A	5/1993	Cripps	
5,251,401	A	10/1993	Prete et al.	
5,301,467	A	4/1994	Schmidt et al.	
5,353,548	A	10/1994	Westfall	
5,371,971	A	12/1994	Prete	
5,377,384	A	1/1995	Riegelman	
D355,262	S	2/1995	Chaney et al.	
5,445,364	A	8/1995	Tibbals, Jr.	
5,448,858	A	9/1995	Briggs et al.	
5,452,495	A	9/1995	Briggs	
5,463,793	A	11/1995	Westfall	
5,530,991	A	7/1996	deNormand et al.	
5,553,903	A	9/1996	Prete et al.	
5,566,507	A	10/1996	Schmidt et al.	
5,572,828	A	11/1996	Westfall	
5,615,452	A	4/1997	Habbersett	
5,632,117	A	5/1997	Prete et al.	
5,632,118	A	5/1997	Stark	
5,661,927	A	9/1997	Polowinczak et al.	
5,669,180	A	9/1997	Maier	
5,697,188	A	12/1997	Fullick et al.	
5,704,165	A	1/1998	Slocomb et al.	
5,737,877	A	4/1998	Meunier et al.	
5,802,767	A	9/1998	Slocomb et al.	
5,806,243	A	9/1998	Prete et al.	
5,806,900	A	9/1998	Bratcher et al.	
5,829,196	A	11/1998	Maier	
5,855,092	A	1/1999	Raap et al.	
5,873,199	A	2/1999	Meunier et al.	
5,924,243	A	7/1999	Polowinczak et al.	
5,927,013	A	7/1999	Slocomb et al.	
5,943,822	A	8/1999	Slocomb et al.	
6,032,417	A	3/2000	Jakus et al.	
6,041,475	A	3/2000	Nidelkoff	
6,041,476	A *	3/2000	deNormand	16/197
6,041,550	A	3/2000	Tix	
6,058,653	A	5/2000	Slocomb et al.	
6,119,398	A	9/2000	Yates, Jr.	
D434,637	S	12/2000	Habeck et al.	
6,155,615	A	12/2000	Schultz	
6,161,335	A	12/2000	Beard et al.	
6,178,696	B1	1/2001	Liang	
6,226,923	B1	5/2001	Hicks et al.	
6,467,128	B1	10/2002	Damani	
6,470,530	B1	10/2002	Trunkle	
D467,490	S	12/2002	Uken et al.	
6,622,342	B1	9/2003	Annes et al.	
6,679,000	B2	1/2004	Uken et al.	
6,820,368	B2	11/2004	Uken et al.	
6,840,011	B2 *	1/2005	Thompson et al.	49/181
1,007,212	A1	10/2011	Lasersohn	
2002/0092241	A1	7/2002	Uken et al.	
2002/0129463	A1	9/2002	Newman	
2003/0074764	A1	4/2003	Pettit et al.	
2003/0213096	A1	11/2003	Annes et al.	

FOREIGN PATENT DOCUMENTS

GB	2 195 691	4/1988
GB	2236786	4/1991
GB	2280697	2/1995
GB	2292168	2/1996

OTHER PUBLICATIONS

BSI Tilt Balance Systems, Balance Systems—BSI, Amesbury Group, Inc., 1996-2001, 4 pgs.

Crossbow Balance! Another New Balance in BSI's Quiver, Balance Systems—BSI, Amesbury Group, Inc., Jun. 7, 1999, 3 pgs.

Heinberg, "Latest Trends in Window and Door Hardware," Shelter Magazine, Jul. 2001, cover and p. 11.

Dakota Balance—Balances and Accessories brochure, May 2001, 2 pgs.

Balance Systems—BSI Amesbury Group, Inc. Crossbow Balance Advertisment dated Jun. 7, 1999, 2 pgs.

Photographs of the Crossbow Balance Component shown in C6, 7 views; 3pgs.

* cited by examiner

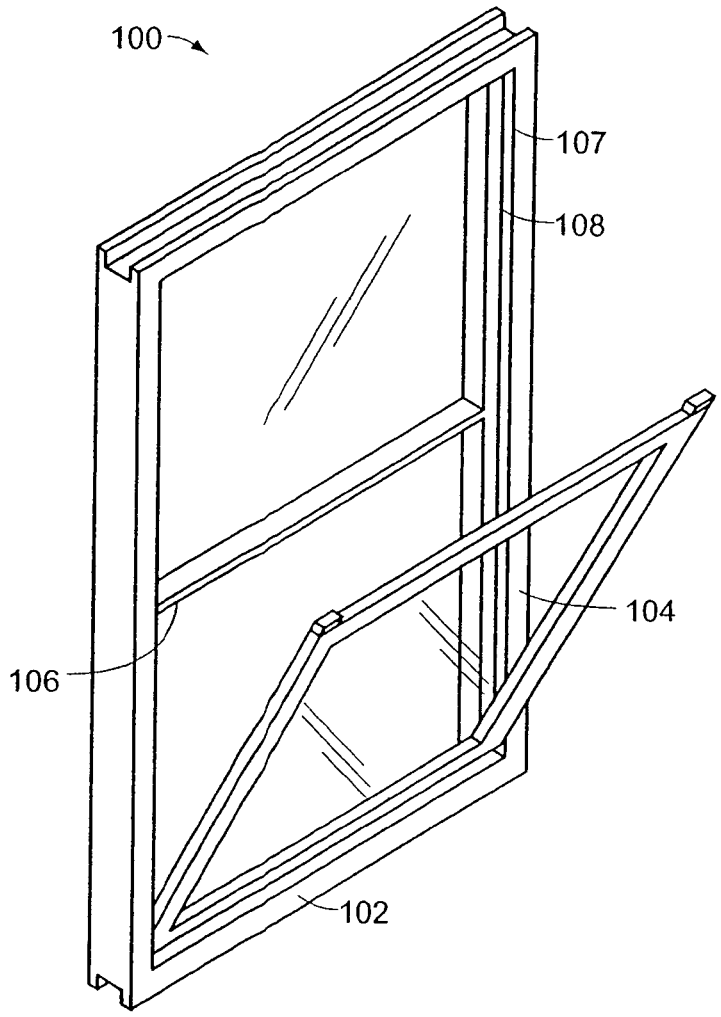


FIG. 1

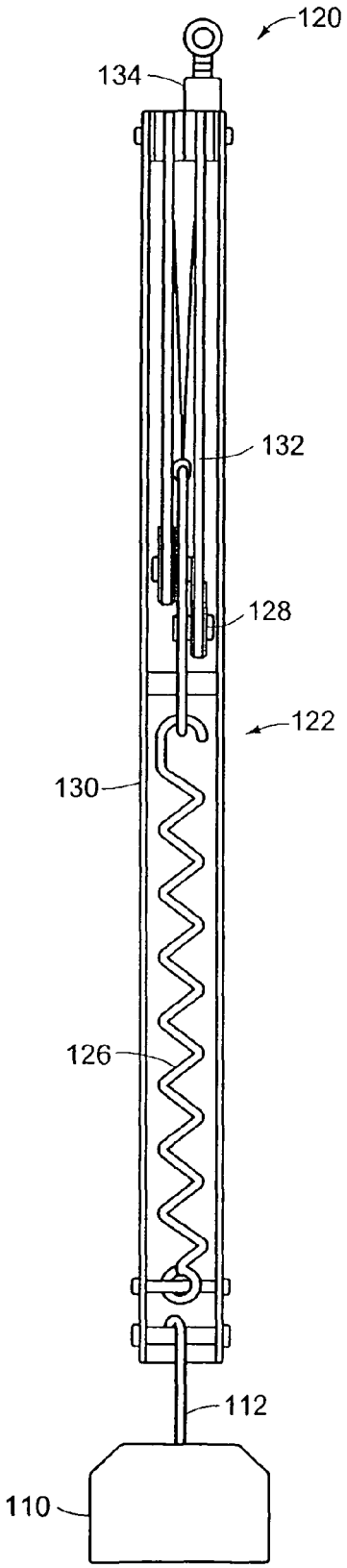


FIG. 2A
PRIOR ART

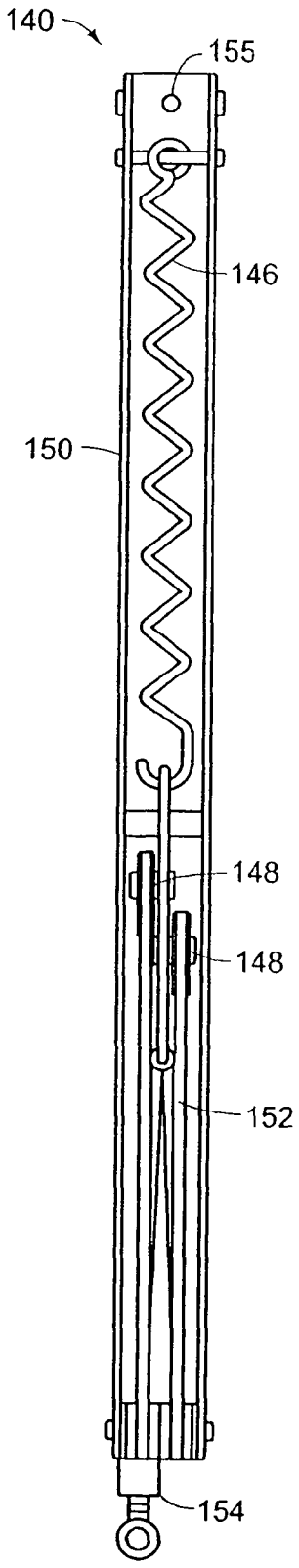


FIG. 2B

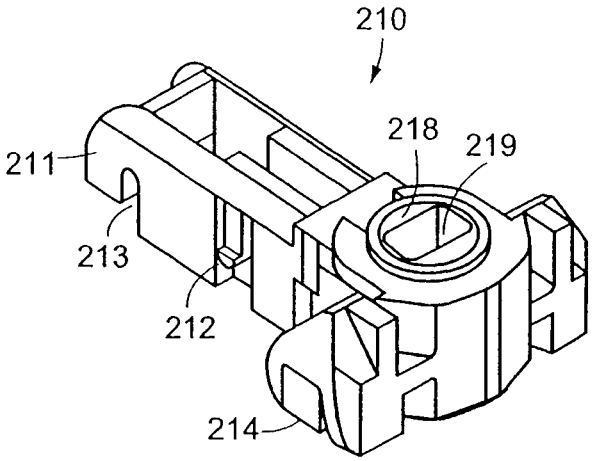


FIG. 3A

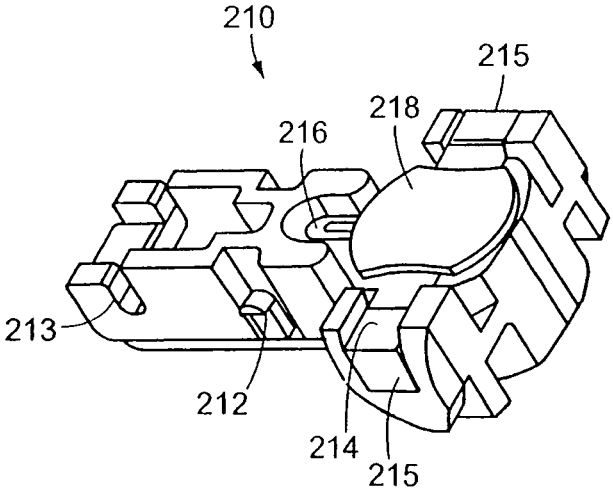


FIG. 3B

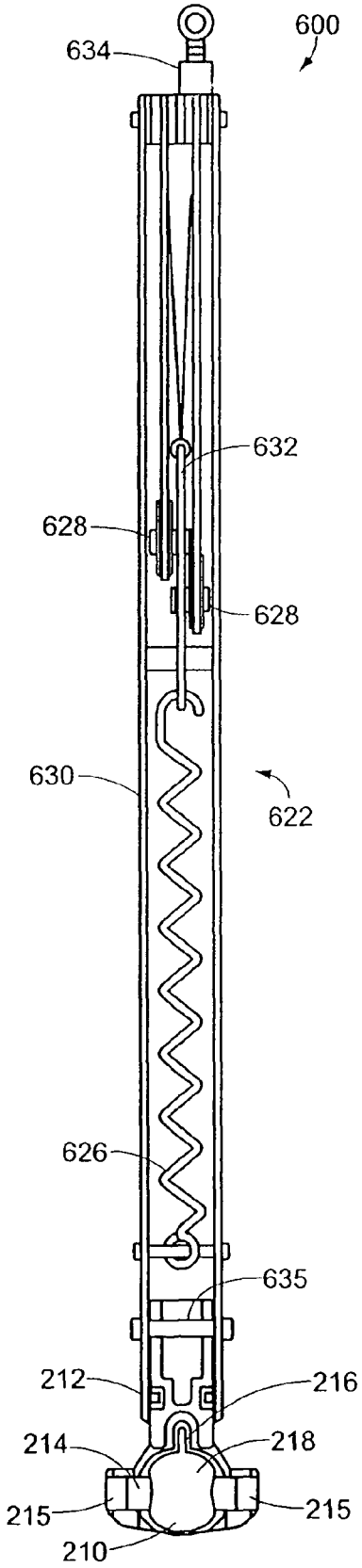


FIG. 3C

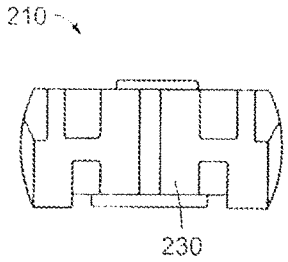


FIG. 3D

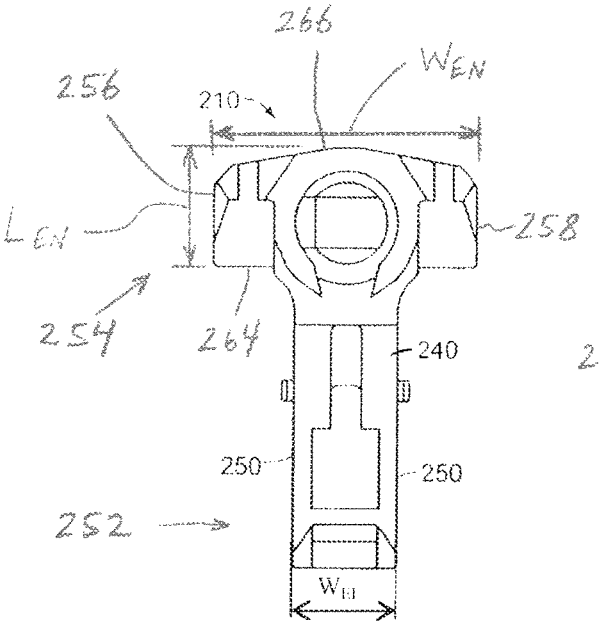


FIG. 3E

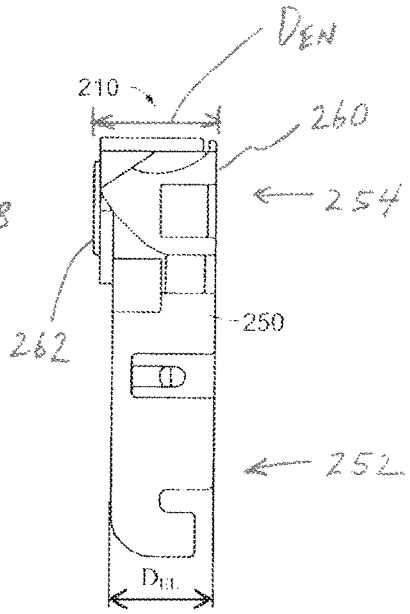


FIG. 3F

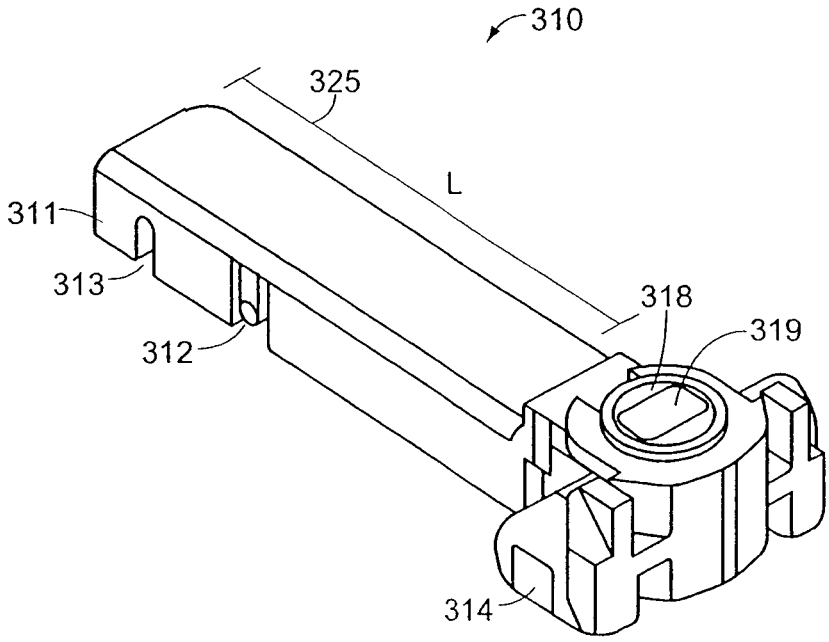


FIG. 4

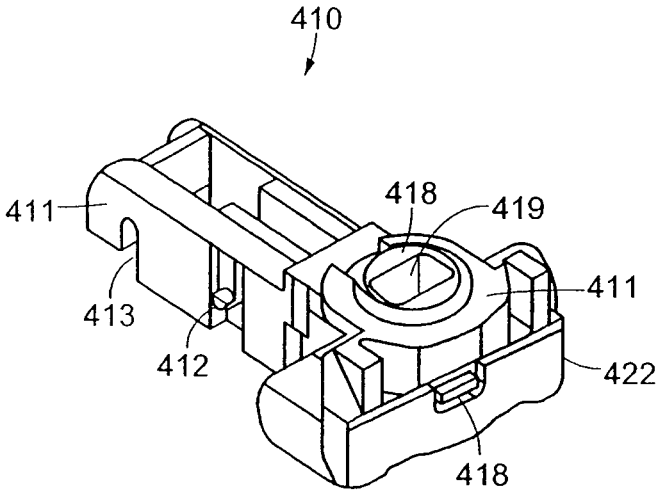


FIG. 5A

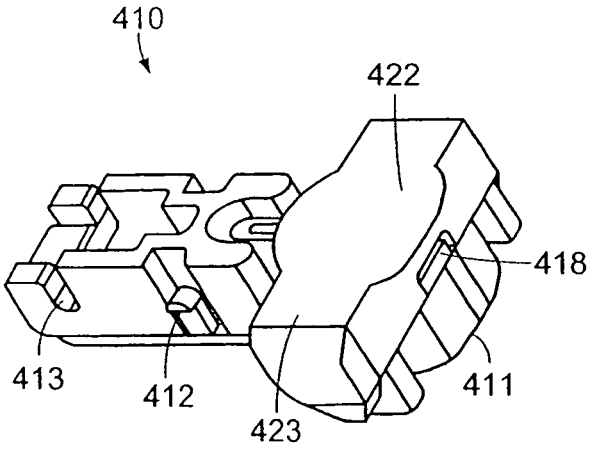


FIG. 5B

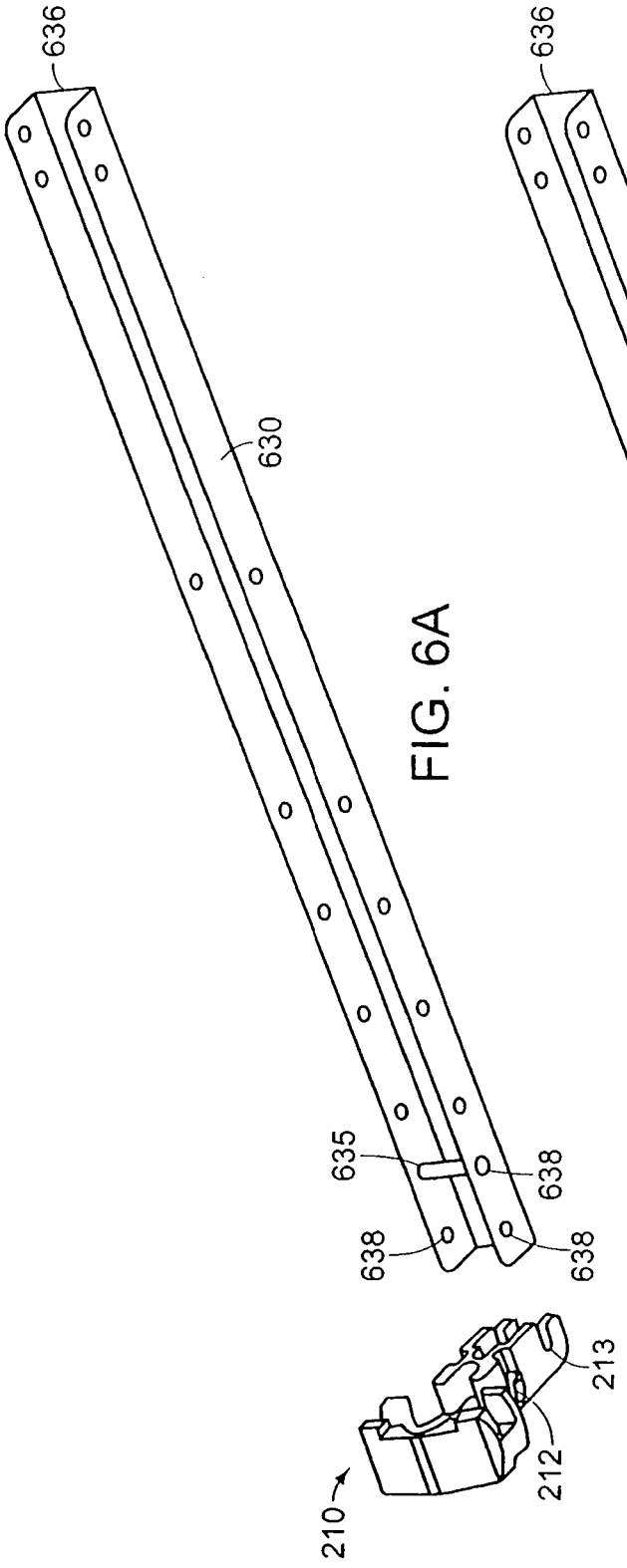


FIG. 6A

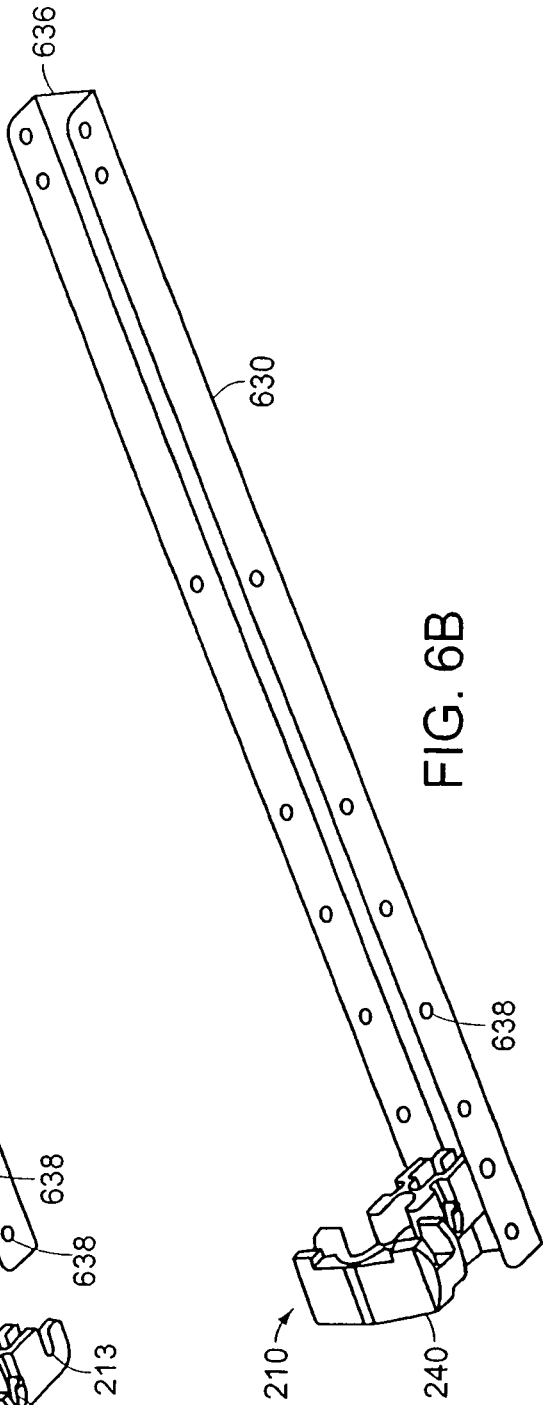


FIG. 6B

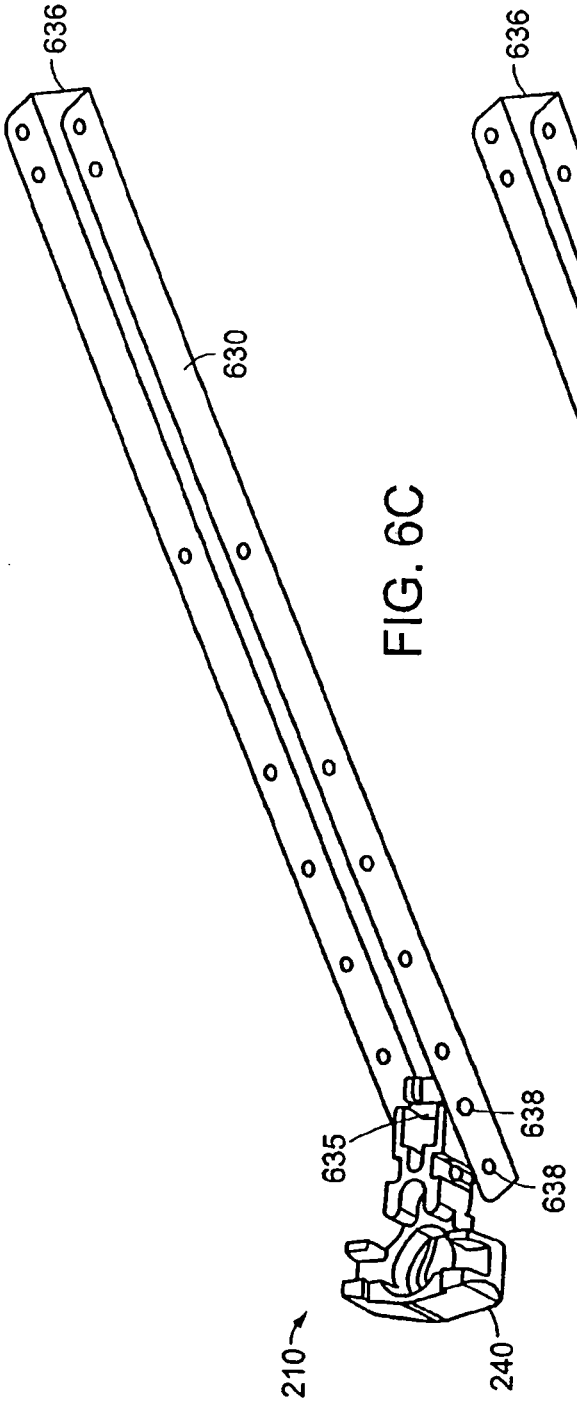


FIG. 6C

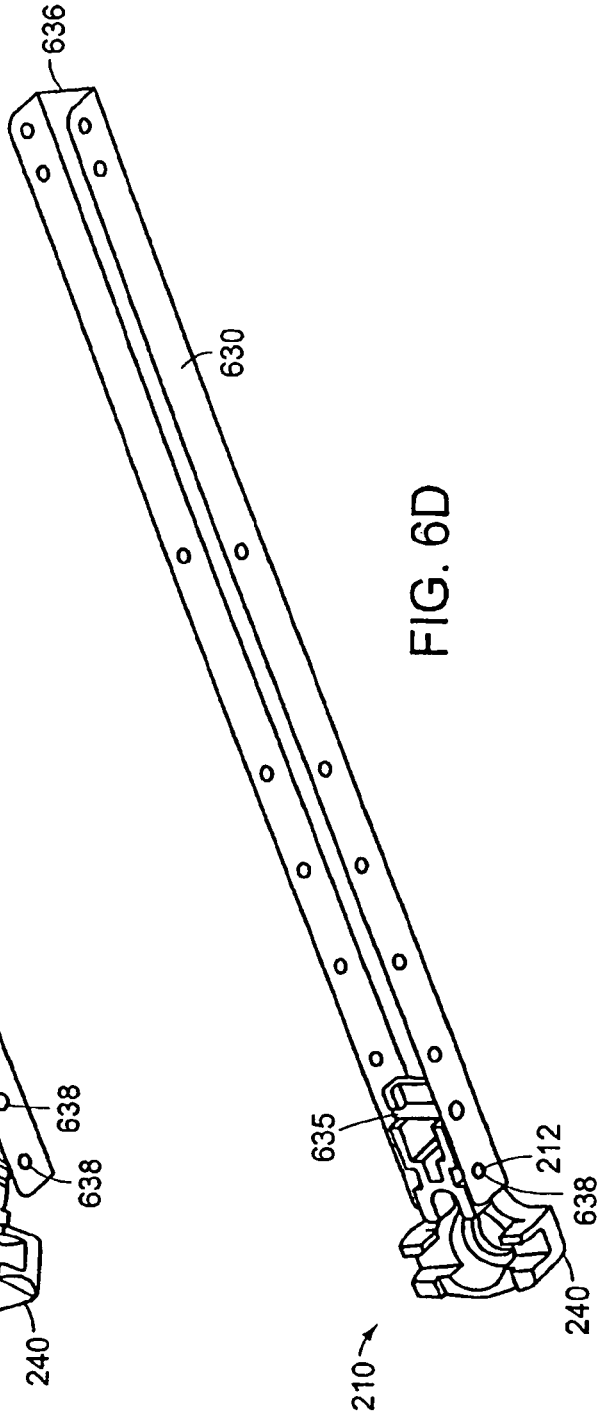


FIG. 6D

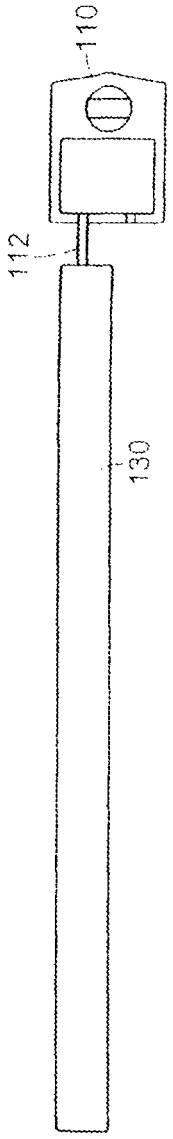


FIG. 7A
PRIOR ART

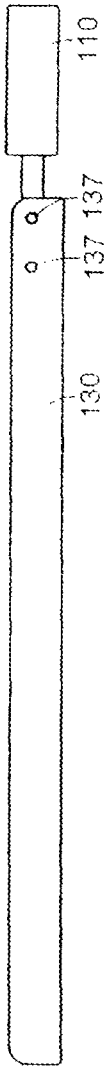


FIG. 7B
PRIOR ART

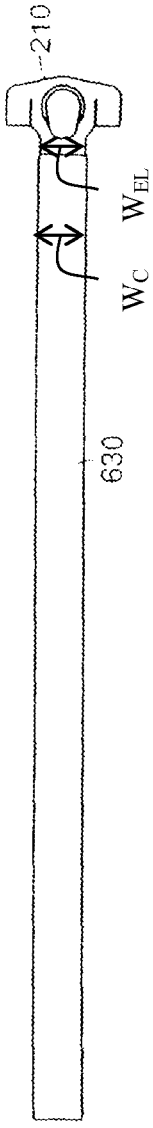


FIG. 8A

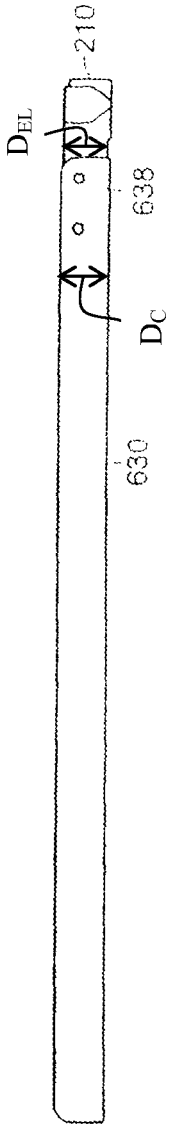


FIG. 8B

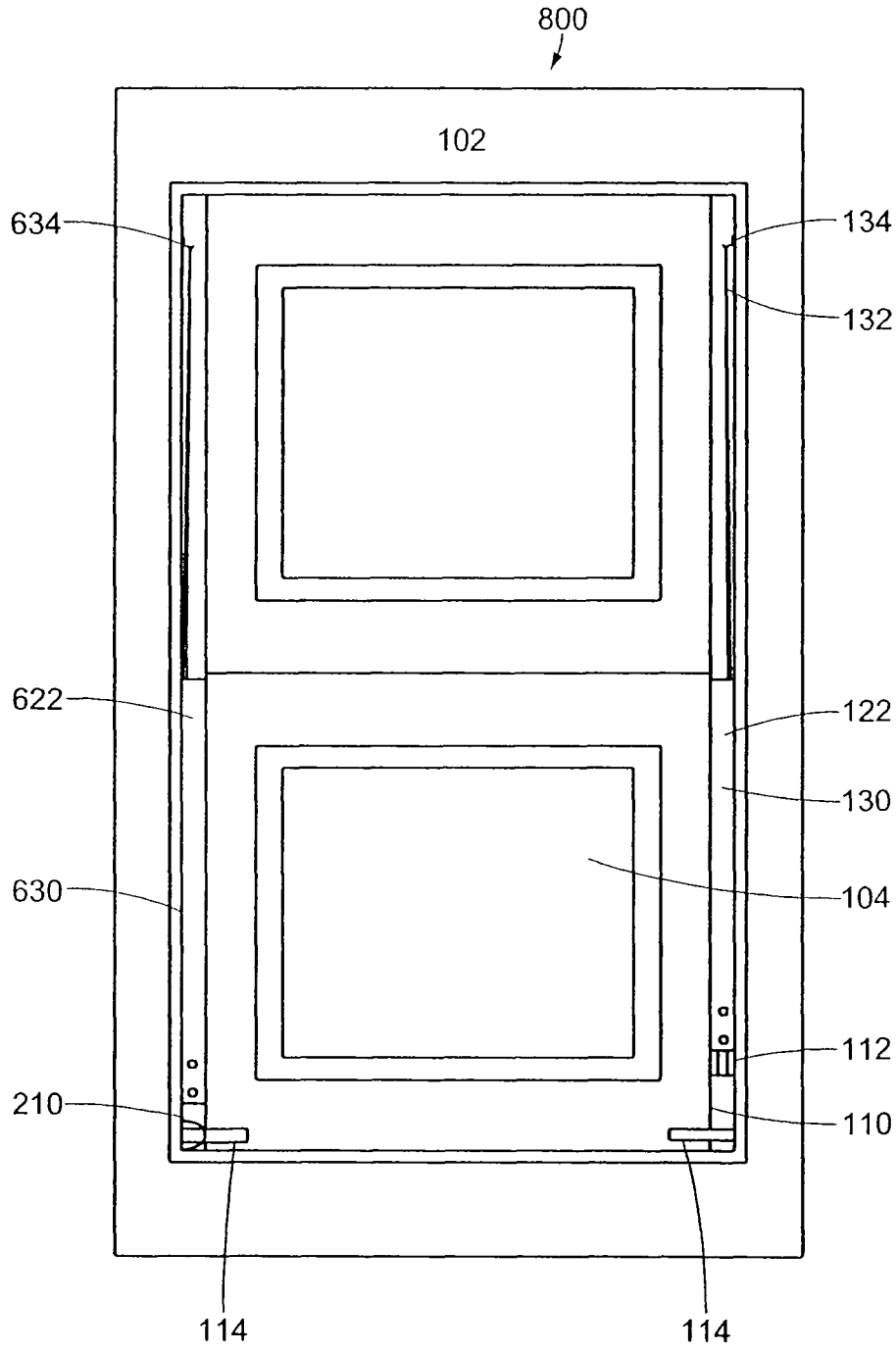


FIG. 9

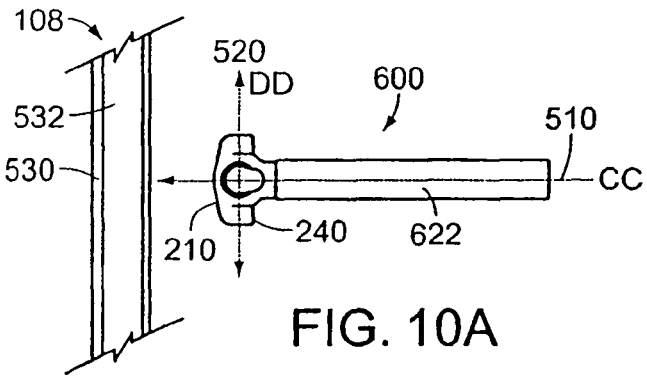


FIG. 10A

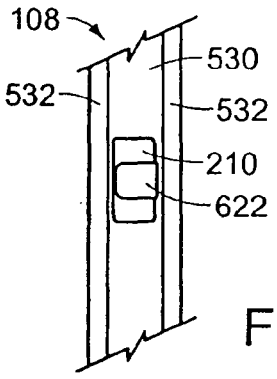


FIG. 10B

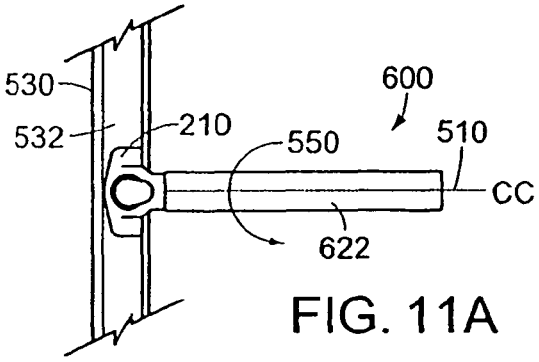


FIG. 11A

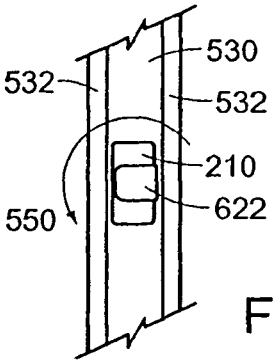


FIG. 11B

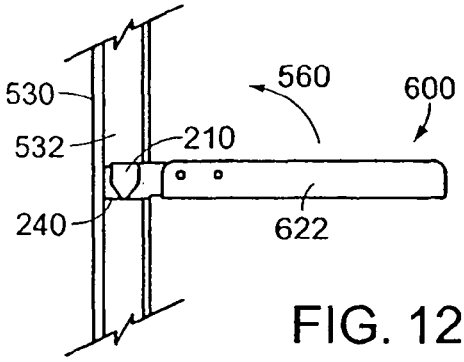


FIG. 12A

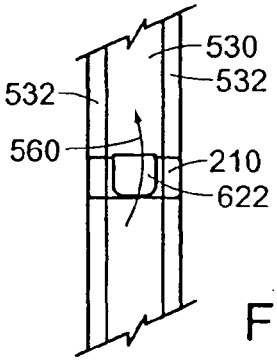


FIG. 12B

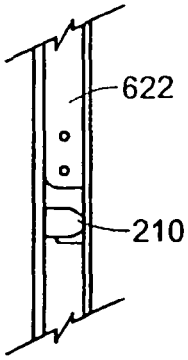


FIG. 13A

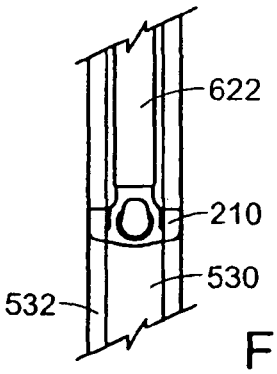


FIG. 13B

LOCKING BALANCE SHOE AND SYSTEM FOR A PIVOTABLE WINDOW

RELATED APPLICATION

This application incorporates by reference in its entirety and is a continuation of U.S. patent application Ser. No. 11/101,689, filed Apr. 8, 2005, which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/862,950, filed June 8, 2004, now U.S. Pat. No. 6,931,788, which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/446,279, filed on May 23, 2003, now U.S. Pat. No. 6,820,368, which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/044,005, filed on Jan. 11, 2002, now U.S. Pat. No. 6,679,000, which incorporates by reference in its entirety and claims priority to U.S. Provisional Patent Application Ser. No. 60/261,501 entitled Snap Lock Balance Shoe and System for a Pivotable Window filed on Jan. 12, 2001.

FIELD OF THE INVENTION

This invention relates to a window balance system for use in a pivotable window assembly.

BACKGROUND OF THE INVENTION

This invention relates to the field of tilt-in windows. More particularly this invention relates to a balance shoe of a window balance system used in conjunction with a pivot bar mounted on a window sash for rotating the window sash relative to a window frame.

Typical pivotable double hung windows include two window sashes disposed in tracks located in a window frame to allow vertical sliding movement of the sashes. Pivot bars are provided to allow rotational movement of a pivotable window sash about the pivot bars to facilitate cleaning of glazing. To control vertical movement, window balances are used so that the window sashes remain in a position in which they are placed. Balance shoes are used to guide the rotational movement of the window sashes with respect to the window frame. Typically, the balance shoes are coupled to window balances with a connecting member. See, for example, U.S. Pat. No. 6,119,398, entitled "Tilt Window Balance Shoe Assembly with Three Directional Locking" issued to H. Dale Yates, Jr., the disclosure of which is herein incorporated by reference in its entirety.

One of the problems with balance shoes and window balances for pivotable double hung windows is that they are difficult to install. In order to install a pivotable double hung window with balance shoes and window balances, the following installation steps typically must be followed. First, before the window frame is assembled, the balance shoes are inserted into jamb tracks. Next, connecting members are used to attach the balance shoes to the window balances. The balance shoes generally have an opening to accept the pivot bars that are mounted on window sashes. Finally, the sashes are made operable by inserting the pivot bars into the balance shoes and rotating the window sash up to a vertical position in the jamb tracks. The installation process is rather complex and difficult. Repair costs for replacing balance shoes are also significant. In order to change a malfunctioning or failed balance shoe, the jamb tracks either need to be deformed or replaced to gain access to the problematic balance shoe for removal and replacement.

SUMMARY OF THE INVENTION

In general, in one aspect, the invention relates to a balance shoe. The balance shoe includes a frame, a locking member at least partially disposed within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within a window balance. Embodiments of the invention can include the following features. The connecting device can include one or more retractable tabs that engage the window balance directly. The frame can further include a frame pocket sized to receive a fastener. The cam can include at least one camming surface and a keyhole opening for receiving a pivot bar attached to a window sash. The cam is at least partially housed within the frame and is disposed within a space enclosed by the locking member. Upon rotating the cam with the pivot bar, the locking member engages the window jamb. In one embodiment, the locking member includes two opposing ends integrally connected by a spring member. The cam is located within a space between the opposing ends of the locking member, and upon rotating the cam with the pivot bar, the opposing ends engage the window jamb. In another embodiment, the locking member includes a plate, which is parallel to a back surface of the frame. The cam is located within a space between the plate and the frame such that rotating the cam with the pivot bar forces the plate to engage the window jamb.

In another aspect, the invention relates to an inverted window balance system for use within a pivotable double hung window assembly. The inverted window balance system includes a rigid U-shaped channel with a plurality of openings in the channel walls for securing the contents in the channel, which include an extension spring, a system of pulleys, a cord to connect the extension spring via the system of pulleys with the window sash, and a balance shoe. The balance shoe includes a frame, a locking member at least partially disposed within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within the rigid U-shaped channel. Embodiments of this aspect of the invention can include the following features. At least a portion of the balance shoe is disposed within the rigid U-shaped channel. The connecting device can include one or more retractable tabs for engaging the rigid U-shaped channel. The retractable tabs can partially extend through at least one of the plurality of openings in the rigid U-shaped channel. The balance shoe can be further secured to the rigid U-shaped channel with a fastener that interfaces with a frame pocket in the balance shoe. The cam can include at least one camming surface and a keyhole opening for receiving a pivot bar attached to a window sash. The cam is at least partially housed within the frame and is disposed within a space enclosed by the locking member. Upon rotating the cam with the pivot bar, the locking member engages the window jamb. In one embodiment, the locking member includes two opposing ends integrally connected by a spring member. The cam is located within a space between the opposing ends of the locking member, and upon rotating the cam with the pivot bar, the opposing ends engage the window jamb. In another embodiment, the locking member includes a plate, which is parallel to a back surface of the frame. The cam is located within a space between the plate and the frame such that rotating the cam with the pivot bar forces the plate to engage the window jamb.

In still another aspect, the invention relates to a method of installing an inverted window balance system within a window jamb in a window frame. The method includes four

basic steps. The first step is to provide an inverted window balance system that includes a rigid U-shaped channel with a plurality of openings in the channel walls for securing the contents in the channel, an extension spring and a system of pulleys disposed within the rigid U-shaped channel, a cord to connect the extension spring via the system of pulleys with the window sash, and a balance shoe. The balance shoe includes a frame, a locking member located at least partially within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within the rigid U-shaped channel. The frame of the balance shoe has a frame bottom surface, a frame front surface, and two frame edge surfaces. The second step is to insert the inverted window balance system into a jamb track of the window jamb, such that an axis extending along a longitudinal direction of the rigid U-shaped channel is perpendicular to a back wall of the jamb track and an axis that is perpendicular to the two frame edge surfaces is parallel to the back wall while the frame front surface faces a side wall of the jamb track. The third step is to rotate the window balance system within the jamb track 90 degrees about the axis extending along the longitudinal direction of the rigid U-shaped channel, such that the frame front surface faces in a downward direction. The final step is to rotate the window balance system 90 degrees about the axis that is perpendicular to the two frame edge surfaces, such that the frame bottom surface faces in the downward direction.

These and other features of the invention will be made apparent from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

FIG. **1** is a perspective view of a pivotable double hung window assembly;

FIG. **2**A is a rear view of inverted window balance system for use with a prior art balance shoe;

FIG. **2**B is a rear view of a window balance;

FIG. **3**A is one perspective view of an embodiment of a snap lock balance shoe of the present invention;

FIG. **3**B is another perspective view of the embodiment of the snap lock balance shoe of FIG. **3**A;

FIG. **3**C is a rear view of one embodiment of a snap lock inverted balance system;

FIG. **3**D is a bottom view of one embodiment of a snap lock balance shoe;

FIG. **3**E is a front view of one embodiment of a snap lock balance shoe;

FIG. **3**F is a side view of one embodiment of a snap lock balance shoe;

FIG. **4** is a perspective view of an embodiment of a snap lock balance shoe of the present invention;

FIG. **5**A is one perspective view of another embodiment of a snap lock balance shoe of the present invention;

FIG. **5**B is another perspective view of the embodiment of the snap lock balance shoe of FIG. **5**A;

FIG. **6**A is a perspective view of one embodiment of a balance shoe of the invention and a rigid U-shaped channel;

FIG. **6**B is a perspective view showing the first step of connecting one embodiment of the balance shoe of the invention to the rigid U-shaped channel;

FIG. **6**C is a perspective view showing the second step of connecting one embodiment of the balance shoe of the invention to the rigid U-shaped channel;

FIG. **6**D is a perspective view showing one embodiment of the balance shoe of the invention connected to the rigid U-shaped channel;

FIG. **7**A is a front view of a prior art balance shoe attached to a rigid U-shaped channel;

FIG. **7**B is a side view of the prior art balance shoe attached to the rigid U-shaped channel;

FIG. **8**A is a front view of one embodiment of a snap lock balance shoe of the present invention attached to a rigid U-shaped channel;

FIG. **8**B is a side view of one embodiment of the snap lock balance shoe of the present invention attached to the rigid U-shaped channel;

FIG. **9** is a front view of a window assembly including one snap lock inverted window balance system of the present invention and one prior art inverted window balance system installed in a window frame;

FIG. **10**A is a side view illustrating the first step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **10**B is a front view illustrating the first step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **11**A is a side view illustrating the second step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **11**B is a front view illustrating the second step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **12**A is a side view illustrating the third step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **12**B is a front view illustrating the third step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **13**A is a side view illustrating the last step of installing the snap lock inverted window balance system of the invention into the jamb track; and

FIG. **13**B is a front view illustrating the last step of installing the snap lock inverted window balance system of the invention into the jamb track.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, shown is a pivotable double hung window assembly **100** in which a snap lock balance shoe constructed in accordance with the teachings of the present invention can be used. The pivotable double hung window assembly **100** includes of a window frame **102**, a pivotable lower window sash **104**, a pivotable upper window sash **106**, and a window jamb **107**. The pivotable lower window sash **104** and the pivotable upper window sash **106** slide vertically in jamb track **108** within the window jamb **107**, while also being able to pivot about a pivot bar **114**, as shown in FIG. **9**.

FIG. **2**A shows a rear view of an inverted window balance system **120** for use in the pivotable double hung window assembly **100**. The inverted window balance system **120** includes an inverted window balance **122** used for balancing the weight of either the pivotable lower window sash **104** or the pivotable upper window sash **106** at any vertical position within the window frame **102**, and a prior art balance shoe **110** for guiding the rotation of the pivotable lower window

sash **104** about the pivot bar **114**. A hanging connector **112** connects the prior art balance shoe **110** to the inverted window balance**122**. The inverted window balance **122** includes an extension spring **126** connected to a system of pulleys **128** housed within a rigid U-shaped channel **130** having a width (W_C) and a depth (D_C) (see FIGS. **8**A and **8**B), and a cord **132** for connecting the system of pulleys **128** to a jamb mounting attachment **134**. The jamb mounting attachment **134** is used for connecting the inverted window balance system **120** to the window jamb **107**. One difference between the inverted window balance **122** and a window balance **140**, shown in FIG. **2**B, includes the placement of the extension spring **146** above a system of pulleys **148** within the rigid U-shaped channel **150**. A cord **152**connects the system of pulleys **148** to a jamb mounting attachment **154**. Another difference is that while inverted window balances **122** travel with either the pivotable lower window sash **104** or pivotable upper window sash **106**, the window balance **140** remains in a fixed position in the window jamb **107** due to an attachment to the window jamb **107** through an attachment opening **155**.

FIGS. **3**A and **3**B are perspective views of a snap lock balance shoe **210** of one embodiment of the present invention. The snap lock balance shoe **210** has a frame **211** in which is housed a connecting device **212**, a locking device **214**, and a cam **218**. The connecting device **212** can be integral with the frame **211** and attaches the snap lock balance shoe **210** directly within an inverted window balance **622**, shown in FIG. **3**C. The inverted window balance **622** in combination with the snap lock balance shoe **210** forms a snap lock inverted window balance system **600**. The inverted window balance **622** includes an extension spring **626** connected to a system of pulleys **628** housed within a rigid U-shaped channel **630**, and a cord **632** for connecting the system of pulleys **628** to a jamb mounting attachment **634**, such as a cord terminal or hook.

In the depicted embodiment, the connecting device **212** is a pair of retractable tabs that snap into the rigid U-shaped channel **630**. In other embodiments, other connecting devices such as a screw, may be used to secure the frame **211** to the rigid U-shaped channel **630**. A fastener **635** located in the inverted window balance **622** can be used to further secure the connection between the snap lock balance shoe **210** and the inverted window balance **622**. To accommodate the fastener **635**, the snap lock balance shoe **210** can form a connection pocket **213** sized to receive or mate with the fastener **635**.

Another element of the snap lock balance shoe **210** visible in FIG. **3**A is a keyhole opening **219** located within the cam **218**. The keyhole opening **219** is sized to accept the pivot bar **114** extending from either the pivotable lower window sash **104** or the pivotable upper window sash **106**, and serves as a connection point between the pivotable lower or upper window sash **104**, **106** and the snap lock balance shoe **210**. FIG. **3**B shows a perspective view of the snap lock balance shoe **210** showing another face of the cam **218**.

In the embodiment shown in FIG. **3**B, the locking device **214** surrounds the cam **218** and includes of a pair of opposing ends **215** connected by a spring member **216**. When the pivotable lower window sash **104** is tilted open, the pivot bar **114** rotates, which in turn rotates the cam **218** forcing the opposing ends **215** outward to engage the jamb track **108** of the window frame **102**, thereby locking the balance shoe **210** in that location.

FIGS. **3**D-**3**F show different views of one of the embodiments of the snap lock balance shoe **210** of the invention. FIG. **3**D is a bottom view of the snap lock balance shoe **210** that shows a frame bottom surface **230**. FIG. **3**E is a front view of the same embodiment of the snap lock balance shoe **210** that illustrates a frame front surface **240** and with a frame back surface defining a depth (D_{EL}) therebetween (see FIG. **3**F), and FIG. **3**F is a side view that shows one of the two frame edge surfaces **250** of the snap lock balance shoe **210** which together form a width (WEL) therebetween (see FIG. **3**E). As shown in FIGS. **3**E and **3**F, the snap lock balance shoe **210** is substantially T-shaped and includes an elongate portion **252** and an enlarged portion **254**. Outer surfaces **256** and **258** define a width (W_{EN}) of the enlarged portion **254**. A front surface **260** and a back surface **262** define a depth (D_{EN}) of the enlarged portion **254**. Opposing surfaces **264** and **266** define a length (L_{EN}) of the enlarged portion **254**. Referring to FIGS. **3**E, **3**F, **8**A, and **8**B, the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C) are similarly dimensioned. Also, the enlarged portion width (W_{EN}) is substantially greater than the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C).

FIG. **4** shows another embodiment of a snap lock balance shoe **310**. The snap lock balance shoe **310** has an elongated frame **311** in which is housed a collecting device **312**, a locking device **314**, and a cam **318**. Within the cam is a keyhole opening **319** sized to receive the pivot bar **114**. The elongated frame **311** has a length L 325 that is greater than about 1.25 inches. When attached to the rigid U-shaped channel **630**, the balance shoe **310** extends further outward from the rigid U-shaped channel **630** than the balance shoe **210** attached to a similar sized rigid U-shaped channel **630**. The balance shoe **310** allows a fixed-sized rigid U-shaped channel **630** to be used in a larger window having a greater travel distance by extending the length of the entire window balance system by having a longer balance shoe **310**. One of the advantages of the present invention is that an installer can create a custom window balance system for a particular window by fitting a fixed-length rigid U-shaped channel **630** with an appropriately sized snap lock balance shoe.

Referring to FIGS. **5**A-**5**B, shown is another embodiment of the present invention of a snap lock balance shoe **410**. The snap lock balance shoe **410** has a locking member **422** which engages a back wall of the jamb track **108** locking the balance shoe **410** in that location. The locking member **422** is partially disposed in the frame **411** and includes a plate **423** that engages the back wall of the jamb track **108**. The balance shoe **410** also includes a frame **411**, a connecting device **412**, and a cam **418**. The cam **418** is partially disposed within the frame **411** in a space enclosed by the locking member **422**. The cam **418** includes a keyhole opening **419** sized to receive the pivot bar **114**. Upon rotation of the cam **418** with the pivot bar **114**, the locking member **422** is forced away from the frame **411** towards the back wall of the jamb track **108**, thereby anchoring the balance shoe **410** in that location within the window frame **102**.

FIGS. **6**A-**6**D show one embodiment of a method for securing the snap lock balance shoe **210** within a rigid U-shaped channel **630** with multiple openings **638**. It should be noted that each opening **638** on one side of the rigid U-shaped channel **630** has a corresponding opening **638** on the other side of the rigid U-shaped channel **630** to form a pair of openings. The first step, shown in FIG. **6**A, is to place a fastener **635**, such as a rivet, in one of the pairs of openings

638 in the rigid U-shaped channel 630. The next step, as depicted in FIG. 6B, is to slide the snap lock balance shoe 210 into the rigid U-shaped shaped channel 630 such that the fastener 635 is received in the connection pocket 213 of the snap lock balance shoe 210. As shown in FIG. 6C, the snap lock balance shoe 210 is then rotated down so that the front frame surface 240 is aligned with a bottom wall 636 of the rigid U-shaped channel 630. FIG. 6D shows the last step of attaching the snap lock balance shoe 210 within the rigid U-shaped channel 630. In this step, the connecting device 212 of the snap lock balance shoe 210 snaps into one of the pairs of openings 638 located on the rigid U-shaped channel 630. In alternative embodiments the connection device 212 of the snap lock balance shoe 210 can extend through off-set openings in the rigid U-shaped channel 630. In some embodiments, the snap lock balance shoe 210 is attached to the rigid U-shaped channel 630 with the fastener 635. In other embodiments, the snap lock balance shoe 210 is attached to the rigid U-shaped channel 630 without the fastener 635. It should also be noted that in some embodiments, the snap lock balance shoe 210 can be aligned and secured to the rigid U-shaped channel 630 such that the front frame surface 240 faces upwards instead of downwards as depicted in FIG. 6D.

FIG. 7A is a front view of the prior art balance shoe 110 attached to the rigid U-shaped channel 130. The rigid U-shaped channel 130 is connected to the prior art balance shoe 110 by the hanging connector 112. No part of the prior art balance shoe 110 lies within the rigid U-shaped channel 130. FIG. 7B is a side view of the prior art balance shoe 110 attached to the rigid U-shaped channel 130 illustrating channel openings 137. Fasteners (not shown) are installed through the channel openings 137 to secure the hanging connector 112 to the rigid U-shaped channel 130.

Referring to FIGS. 8A and 8B, shown is an embodiment of the snap lock balance shoe 210 of the present invention attached to the rigid U-shaped channel 630. The snap lock balance shoe 210 is directly attached within the rigid U-shaped channel 630 by a connecting device 212 located on the frame 211 of the snap lock balance shoe 210. The connecting device 212 extends through a pair of openings 638 located on the rigid U-shaped channel 630.

FIG. 9 is a front view of a pivotable double hung window assembly 800 in which an inverted window balance 122 is attached to a prior art balance shoe 110 by using the hanging connector 112, and the inverted window balance 622 is attached to the snap lock balance shoe 210 of an embodiment of the present invention. Pivot bars 114, as shown in FIG. 9, are secured to the pivotable lower window sash 104. The pivot bars 114 are slidably receivable by both the prior art balance shoe 110 and the snap lock balance shoe 210 and serve as connections between the pivotable lower window sash 104 and respective inverted window balances 122, 622.

An advantage of the type of balance shoe presently disclosed is that the snap lock balance shoe 210 is attached within the rigid U-shaped channel 630 resulting in a longer rigid U-shaped channel 630 than in the inverted balance systems 120 for a given window sash. The longer rigid U-shaped channel 630 of the inverted window balance 622 allows for the use of longer extension springs that provide greater control of the vertical positioning of the window sash than a shorter rigid U-shaped channel 130 with a shorter extension spring. Another advantage of the present invention is that the snap lock balance shoe 210 contains a smaller number of parts than prior art balance shoes 110.

One installation method used to place a snap lock inverted window balance system 600 within the jamb tracks 108 is schematically illustrated in the remaining figures. The snap lock inverted window balance system 600 includes one inverted window balance 622 and one snap lock window balance 210. FIGS. 10A, 11A, 12A, and 13A show the installation method from a side view, while FIGS. 10B, 11B, 12B, and 13B show the method from a front view. The installation method involves an orientation step, a first rotation step, and a second rotation step. FIGS. 10A and 10B show the orientation step in the installation method. In the orientation step, the snap lock inverted window balance system 600 is inserted the jamb tracks 108 such that an axis CC 510 in FIG. 10A is perpendicular to a back wall 530 of the jamb tracks 108, while an axis DD 520 in FIG. 10A is parallel to the back wall 530 and the frame front surface 240 is adjacent to a side wall 532 of the jamb tracks 108. FIGS. 11A and 11B show the snap lock inverted window balance system 600 inserted in the jamb tracks 108 as well as an arrow 550 indicating the direction of rotation of the snap lock inverted window balance system 600 required to complete the first rotation step. The first rotation step involves rotating the snap lock inverted window balance system 600 90-degrees about the axis CC 510 such that the frame front surface 240 faces downward. FIGS. 12A and 12B show the snap lock inverted window balance system 600 after the 90-degree rotation around the axis CC 510 has been completed. The second rotation step involves a 90-degree rotation about the axis DD 520. An arrow 560 showing the direction of the second rotation step is shown in FIGS. 12A and 12B. FIGS. 13A and 13B show in two different views the snap lock inverted window balance system 600 after the installation method has been completed. The cord terminal or any other jamb mounting attachment 634 (see FIG. 9) can then be screwed or hooked into place to anchor the snap lock inverted window balance system 600.

The installation method just described can be carried out in reverse to remove the snap lock inverted window balance system 600 from the jamb track 108 of the window frame 102 to allow for easy replacement of the snap lock balance shoe 210 or the snap lock inverted window balance system 600 itself. In order to replace inverted window balance systems 120 with prior art balance shoes 110, either the jamb tracks 108 need to be warped or completely removed in order to replace the prior art balance shoe 110 of the inverted window balance system 120.

While there have been described several embodiments of the invention, other variants and alternatives will be obvious to those skilled in the art. Accordingly, the scope of the invention is not limited to the specific embodiments shown.

What is claimed is:

1. A window balance system adapted to be received in a window jamb track, the window balance system comprising:

a U-shaped channel defining a plurality of openings, a channel width (W_C), and a channel depth (D_C);

a spring connected to a system of pulleys located within the U-shaped channel;

a cord with a first cord end and a second cord end, the first cord end connected to and threaded through the system of pulleys, the second cord end connected to a jamb mounting attachment; and

a T-shaped balance shoe, wherein the balance shoe comprises:

a frame comprising an elongate portion and an enlarged portion,

wherein the elongate portion comprises two frame edge surfaces defining an elongate portion width (W_{EL})

therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween,

wherein the enlarged portion comprises two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth (D_C) and the elongate portion width (W_{EL}) is substantially the same as the channel width (W_C),

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C),and

wherein the elongate portion is received at least partially within the U-shaped channel, and wherein the two outer surfaces of the enlarged portion are adapted to slide within the window jamb track;

a cam at least partially disposed within the enlarged portion, wherein the cam is adapted for rotation between a first position and a second position;

a locking device in contact with the cam and at least partially disposed within the enlarged portion, the locking device comprising opposed locking surfaces, wherein the locking surfaces are adapted to extend beyond the two outer surfaces of the enlarged portion when the cam is in the first position; and

a connecting device for attaching the balance shoe to the U-shaped channel.

2. The balance system of claim **1**, wherein the locking surfaces are adapted to retract to locations within the enlarged portion when the cam is in the second position.

3. The balance system of claim **1**, wherein the locking surfaces are joined by a spring member.

4. The balance system of claim **1**, wherein the cam defines an opening adapted to receive therein a pivot pin.

5. The window balance system of claim **1**, wherein the enlarged portion comprises a plastic.

6. The window balance system of claim **5**, wherein the elongate portion comprises the plastic.

7. The balance system of claim **1**, wherein the elongate portion includes an opening through the two frame edge surfaces of the elongate portion.

8. The balance system of claim **1**, wherein the locking surfaces are forced toward the window jamb track when the cam is in the first position.

9. The balance system of claim **8**, wherein the locking surfaces are adapted to engage the window jamb track when the cam is in the first position.

10. The balance system of claim **1**, wherein the locking device at least partially surrounds the cam.

11. The balance system of claim **1**, wherein the cam is in direct contact with the locking device.

12. The window balance system of claim **1**, wherein the frame comprises a resilient member for securing the balance shoe to the U-shaped channel.

13. The window balance system of claim **12**, wherein the elongate portion comprises the resilient member.

14. The window balance system of claim **13**, wherein the resilient member comprises a tab.

15. The balance system of claim **1**, wherein the locking device comprises a plate.

16. The balance system of claim **15**, wherein the plate is adapted to engage the window jamb track when the cam is in the first position.

17. The window balance system of claim **1**, wherein the frame comprises a unitary construction.

18. The window balance system of claim **1**, wherein the connecting device comprises a rivet.

19. The window balance system of claim **18**, wherein the elongate portion defines at least one opening adapted to mate with the rivet.

20. A window balance system adapted to be received in a window jamb track, the window balance system comprising:

a U-shaped channel defining a plurality of openings, a channel width (W_C), and a channel depth (D_C);

a spring connected to a system of pulleys located within the U-shaped channel;

a cord with a first cord end and a second cord end, the first cord end connected to and threaded through the system of pulleys, the second cord end connected to a jamb mounting attachment; and

a T-shaped balance shoe, wherein the balance shoe comprises:

a frame comprising an elongate portion and an enlarged portion,

wherein the elongate portion comprises two frame edge surfaces defining an elongate portion width (W_{EL}) therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween,

wherein the enlarged portion comprises two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth (D_C) and, the elongate portion width (W_{EL}) is substantially the same as the channel width (W_C),

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C), and

wherein the elongate portion is received at least partially within the U-shaped channel, and wherein the two outer surfaces of the enlarged portion are adapted to slide within the window jamb track;

a cam at least partially disposed within the enlarged portion, wherein the cam is adapted for rotation between a first position and a second position; and

a locking device in contact with the cam, the locking device adapted to be forced toward the window jamb track when the cam is in the first position.

21. The balance system of claim **20**, the frame further comprising a resilient tab.

22. The balance system of claim **21**, wherein the resilient tab is located on the elongate portion.

23. The balance system of claim **20**, wherein the elongate portion includes an opening through the two frame edge surfaces of the elongate portion define an opening therebetween.

24. The balance system of claim **23**, wherein the opening is adapted to receive a connecting device.

25. The balance system of claim **20**, wherein the locking device at least partially surrounds the cam.

26. The balance system of claim 20, wherein the cam defines an opening adapted to receive therein a pivot pin.

27. The balance system of claim 20, wherein the cam is in direct contact with the locking device.

28. A window balance system adapted to be received in a window jamb track, the window balance system comprising:

a U-shaped channel defining a plurality of openings, an axis, a channel width (W_C), and a channel depth (D_C);

a spring connected to a system of pulleys located within the U-shaped channel;

a cord with a first cord end and a second cord end, the first cord end connected to and threaded through the system of pulleys, the second cord end connected to a jamb mounting attachment;

a fastener; and

a frame comprising:

means defined by the frame for receiving the fastener for pivotally connecting the frame to the U-shaped channel;

means for securing the frame against rotation relative to the U-shaped channel;

an elongate portion comprising two frame edge surfaces defining an elongate portion width (W_{EL}) therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween; and

an enlarged portion comprising two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth, the elongate portion width (W_{EL}) is substantially the same as the channel width (W_C), and

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C).

29. The window balance system of claim 28, wherein the two outer surfaces of the enlarged portion of the frame are adapted to slide within the window jamb track.

30. The window balance system of claim 29, further comprising:

a cam located within the frame, wherein the cam is adapted for rotation between a first position and a second position; and

a locking device in contact with the cam and comprising opposed locking surfaces, wherein the locking surfaces are adapted to extend toward the window jamb track when the window balance system is received in the window jamb track and the cam is in the first position.

31. The window balance system of claim 30, wherein the elongate portion is integral with the frame.

32. The window balance system of claim 31, wherein the frame comprises a balance shoe.

33. The window balance system of claim 28, wherein the securing means comprises at least one tab.

34. The window balance system of claim 33, wherein the at least one tab engages an opening defined by the U-shaped channel when the frame is connected to the U-shaped channel.

35. The window balance system of claim 28, wherein the fastener comprises a rivet.

36. A window balance system adapted to be received in a window jamb track and counterbalance a window sash, the window balance system comprising:

a U-shaped channel defining a channel width (W_C) and a channel depth (D_C);

a fastener; and

a frame pivotally connected to the U-shaped channel, the frame comprising:

means defined by the frame for receiving the fastener for pivotally connecting the frame to the U-shaped channel;

means for securing the frame against rotation relative to the U-shaped channel;

an elongate portion comprising two frame edge surfaces defining an elongate portion width (W_{EL}) therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween; and

an enlarged portion comprising two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth, the elongate portion width (W_{EL}) is substantially the same as the channel width (W_C), and

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C).

37. The window balance system of claim 36, further comprising:

a cam substantially located within the frame, wherein the cam is adapted for rotation between a first position and a second position; and

a locking device in contact with the cam and comprising opposed locking surfaces, wherein the locking surfaces are adapted to extend toward the window jamb track when the window balance system is received in the window jamb track and the cam is in the first position.

38. The window balance system of claim 36, wherein the elongate portion is received within the U-shaped channel.

39. The window balance system of claim 38, wherein the frame comprises a plastic.

40. The window balance system of claim 38, wherein the elongate portion comprises a plastic.

41. The window balance system of claim 38, wherein the means for securing the frame against rotation comprises a resilient member.

42. The window balance system of claim 41, wherein the resilient member comprises a tab.

43. The window balance system of claim 38, wherein the elongate portion defines the receiving means.

44. A window balance system adapted to be received in a window jamb track, the window balance system comprising:

a U-shaped channel defining an axis, a channel width (W_C), and a channel depth (D_C);

a spring connected to a system of pulleys located within the U-shaped channel;

a cord comprising a first cord end and a second cord end, the first cord end connected to and threaded through the system of pulleys, the second cord end connected to a jamb mounting attachment;

a fastener; and

a frame comprising:

means defined by the frame for receiving the fastener for pivotally connecting the frame to the U-shaped channel;

means for securing the frame against rotation relative to the U-shaped channel, an elongate portion comprising two frame edge surfaces defining an elongate portion width (W_{EL}) therebetween and a frame front surface and a frame back surface defining an elongate portion depth (D_{EL}) therebetween; and

an enlarged portion comprising two outer surfaces defining an enlarged portion width (W_{EN}) therebetween, a front surface and a back surface defining an enlarged portion depth (D_{EN}) therebetween, and opposing surfaces defining an enlarged portion length (L_{EN}) therebetween,

wherein the elongate portion depth (D_{EL}) is substantially the same as the channel depth, the elongate portion width (W_{EL}) is subtantially the same as the channel width (W_C),

wherein the enlarged portion width (W_{EN}) is greater than each of the elongate portion depth (D_{EL}), the elongate portion width (W_{EL}), the enlarged portion depth (D_{EN}), the enlarged portion length (L_{EN}), the channel width (W_C), and the channel depth (D_C), and

wherein the U-shaped channel and the frame are T-shaped when connected.

45. The window balance system of claim **44**, wherein the frame further comprises:

a cam located within the frame, wherein the cam is adapted for rotation between a first position and a second position; and

a locking device in contact with the cam and comprising opposed locking surfaces, wherein the locking surfaces are adapted to extend substantially orthogonal to the axis toward the window jamb track when the window balance system is received in the window jamb track and the cam is in the first position.

* * * * *

US008424248B2

(12) **United States Patent**
Uken et al.

(10) **Patent No.: US 8,424,248 B2**
(45) **Date of Patent: *Apr. 23, 2013**

(54) **METHOD OF INSTALLING A LOCKING BALANCE SHOE AND SYSTEM FOR A PIVOTABLE WINDOW**

(75) Inventors: **Stuart J. Uken**, Sioux Falls, SD (US); **Gary R. Newman**, Valley Spring, SD (US); **Lawrence J. Versteeg**, Sioux Falls, SD (US)

(73) Assignee: **Amesbury Group, Inc.**, Amesbury, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 363 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/690,266**

(22) Filed: **Jan. 20, 2010**

(65) **Prior Publication Data**

US 2010/0115854 A1 May 13, 2010

Related U.S. Application Data

(60) Division of application No. 11/654,120, filed on Jan. 17, 2007, which is a continuation of application No. 11/101,689, filed on Apr. 8, 2005, now Pat. No. 7,191,562, which is a continuation of application No. 10/862,950, filed on Jun. 8, 2004, now Pat. No. 6,931,788, which is a continuation of application No. 10/446,279, filed on May 23, 2003, now Pat. No. 6,820,368, which is a continuation of application No. 10/044,005, filed on Jan. 11, 2002, now Pat. No. 6,679, 000.

(60) Provisional application No. 60/261,501, filed on Jan. 12, 2001.

(51) **Int. Cl.**
E06B 3/00 (2006.01)

(52) **U.S. Cl.**
USPC **49/506**; 49/181; 49/176; 49/445

(58) **Field of Classification Search** ..... 49/181, 49/176, 446, 183, 184, 185, 186, 445, 449, 49/455, 453, 454, 177, 161, 506; 292/DIG. 63, 292/DIG. 47, DIG. 37; 16/197
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,007,212 A 10/1911 Lasersohn
1,312,665 A 8/1919 Almquist
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2382933 A1 12/2002
GB 740223 A 11/1955
(Continued)

OTHER PUBLICATIONS

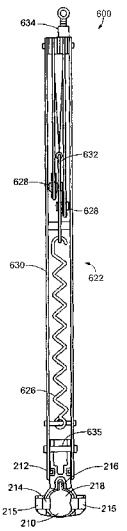
Crossbow Balance! Another New Balance in BSI's Quiver, Balance Systems—BSI, Amesbury Group, Inc., Jun. 7, 1999, 3 pgs.
(Continued)

Primary Examiner — Gregory J. Strimbu
(74) *Attorney, Agent, or Firm* — Goodwin Procter LLP

(57) **ABSTRACT**

A snap lock balance shoe and system to be incorporated in pivotable double hung windows. In one embodiment, the snap lock balance shoe includes a pair of retractable tabs that partially extend through openings within an inverted window balance. Embodiments of methods for installing the system include inserting a frame of the balance shoe within a jamb track of the window jamb, rotating the frame 90 degrees about a first axis, and rotating the frame 90 degrees about a second axis such that the frame is substantially fully disposed within the jamb track.

18 Claims, 13 Drawing Sheets



U.S. PATENT DOCUMENTS

2,178,533	A	10/1939	Viehweger	
2,952,884	A	9/1960	Dinsmore	
3,007,194	A	11/1961	Griswold	
3,105,576	A	10/1963	Jones et al.	
3,461,608	A	8/1969	Johnson	
3,497,999	A	3/1970	Hendra	
3,529,381	A	9/1970	Grossman	
3,676,956	A	7/1972	Taylor et al.	
3,732,594	A	5/1973	Mills	
3,869,754	A	3/1975	Foster	
4,028,849	A	6/1977	Anderson	
4,068,406	A	1/1978	Wood	
4,079,549	A	3/1978	Wood	
4,089,085	A	5/1978	Fitzgibbon	
4,190,930	A	3/1980	Prosser	
4,300,316	A	11/1981	Ficurilli	
4,332,054	A	6/1982	Paist et al.	
4,506,478	A	3/1985	Anderson	
4,510,713	A	4/1985	Anderson	
4,610,108	A	9/1986	Marshik	
4,697,304	A	10/1987	Overgard	
4,704,821	A	11/1987	Berndt	
4,930,254	A	6/1990	Valentin	
4,941,285	A	7/1990	Westfall	
4,949,425	A	8/1990	Dodson et al.	
4,958,462	A	9/1990	Cross	
5,069,001	A	12/1991	Makarowski	
5,127,192	A	7/1992	Cross	
5,140,769	A	8/1992	Hickson et al.	
5,189,838	A	3/1993	Westfall	
5,210,976	A	5/1993	Cripps	
5,251,401	A	10/1993	Prete et al.	
5,301,467	A	4/1994	Schmidt et al.	
5,353,548	A	10/1994	Westfall	
5,371,971	A	12/1994	Prete	
5,377,384	A	1/1995	Riegelman	
D355,262	S	2/1995	Chaney et al.	
5,445,364	A	8/1995	Tibbals, Jr.	
5,448,858	A	9/1995	Briggs et al.	
5,452,495	A	9/1995	Briggs	
5,463,793	A	11/1995	Westfall	
5,530,991	A	7/1996	deNormand et al.	
5,553,903	A	9/1996	Prete et al.	
5,566,507	A	10/1996	Schmidt et al.	
5,572,828	A	11/1996	Westfall	
5,615,452	A	4/1997	Habbersett	
5,632,117	A	5/1997	Prete et al.	
5,632,118	A	5/1997	Stark	
5,661,927	A	9/1997	Polowinczak et al.	
5,669,180	A	9/1997	Maier	
5,697,188	A	12/1997	Fullick et al.	
5,704,165	A	1/1998	Slocomb et al.	
5,737,877	A	4/1998	Meunier et al.	
5,802,767	A	9/1998	Slocomb et al.	
5,806,243	A	9/1998	Prete et al.	
5,806,900	A	9/1998	Bratcher et al.	
5,829,196	A	11/1998	Maier	
5,855,092	A	1/1999	Raap et al.	
5,873,199	A	2/1999	Meunier et al.	
5,924,243	A	7/1999	Polowinczak et al.	
5,927,013	A	7/1999	Slocomb et al.	
5,943,822	A	8/1999	Slocomb et al.	
6,032,417	A	3/2000	Jakus et al.	
6,041,475	A	3/2000	Nidelkoff	
6,041,476	A	3/2000	deNormand	
6,041,550	A	3/2000	Tix	
6,058,653	A	5/2000	Slocomb et al.	
6,119,398	A	9/2000	Yates, Jr.	
D434,637	S	12/2000	Habeck et al.	
6,155,615	A	12/2000	Schultz	
6,161,335	A	12/2000	Beard et al.	
6,178,696	B1	1/2001	Liang	
6,226,923	B1	5/2001	Hicks et al.	
6,467,128	B1	10/2002	Damani	
6,470,530	B1	10/2002	Trunkle	
D467,490	S	12/2002	Uken et al.	
6,622,342	B1	9/2003	Annes et al.	
6,679,000	B2	1/2004	Uken et al.	
6,820,368	B2	11/2004	Uken et al.	
6,840,011	B2	1/2005	Thompson et al.	
7,945,994	B2 *	5/2011	Dallas et al.	16/193
2002/0092241	A1	7/2002	Uken et al.	
2002/0129463	A1	9/2002	Newman	
2003/0074764	A1	4/2003	Pettit et al.	
2003/0213096	A1	11/2003	Annes et al.	

FOREIGN PATENT DOCUMENTS

GB	2195691	A	4/1988
GB	2236786	A	4/1991
GB	2280697	A	2/1995
GB	2292168	A	2/1996
JP	63-3785		1/1988

OTHER PUBLICATIONS

Heinberg, "Latest Trends in Window and Door Hardware," Shelter Magazine, Jul. 2001, cover and p. 11.

Dakota Balance—Balances and Accessories brochure, May 2001, 2 pgs.

Balance Systems—BSI Amesbury Group, Inc. Crossbow Balance Advertisment dated Jun. 7, 1999, 2 pgs.

Photographs of the Crossbow Balance Component shown in C6, 7 views; 3pgs.

* cited by examiner

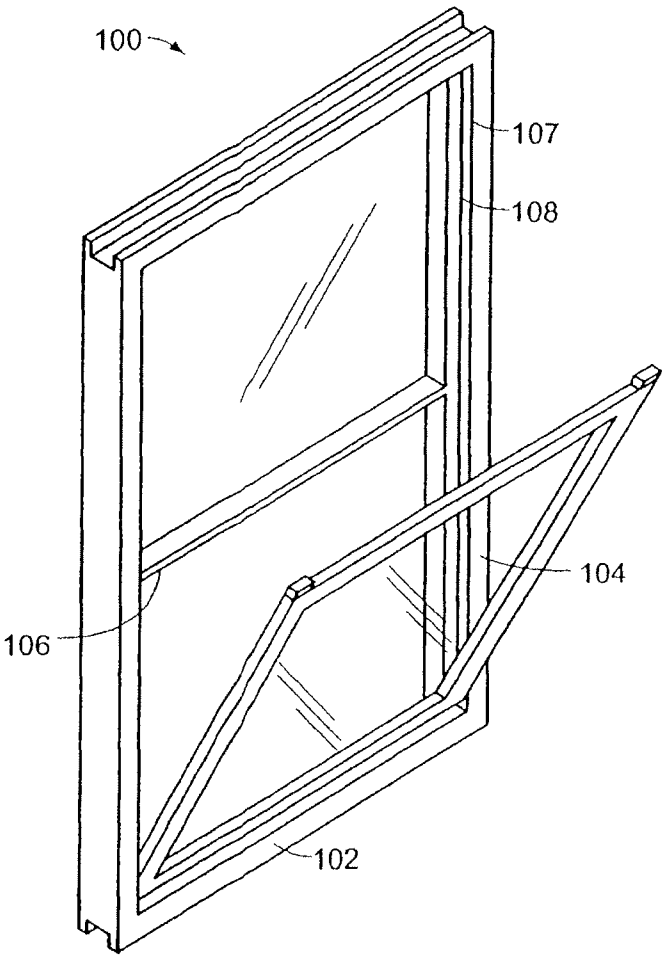


FIG. 1

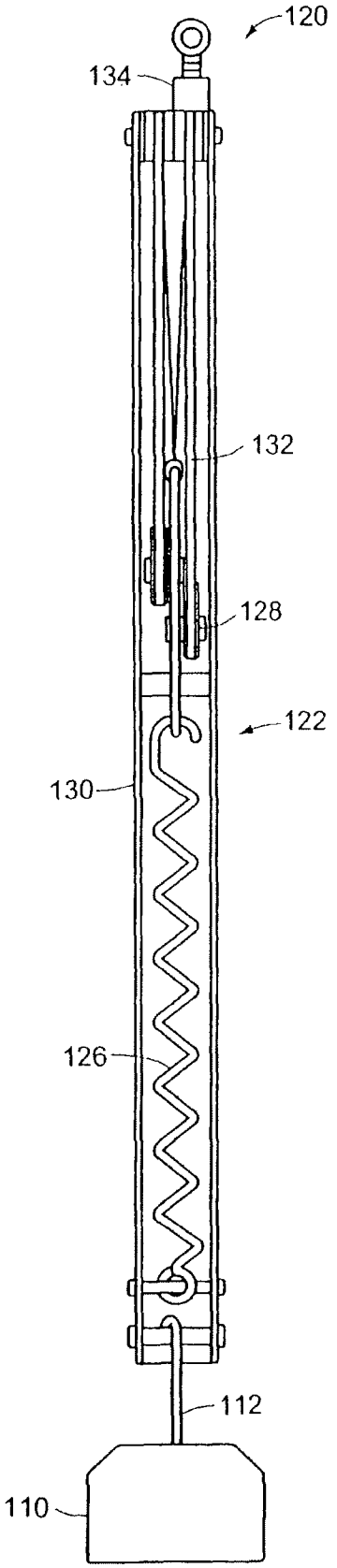


FIG. 2A
PRIOR ART

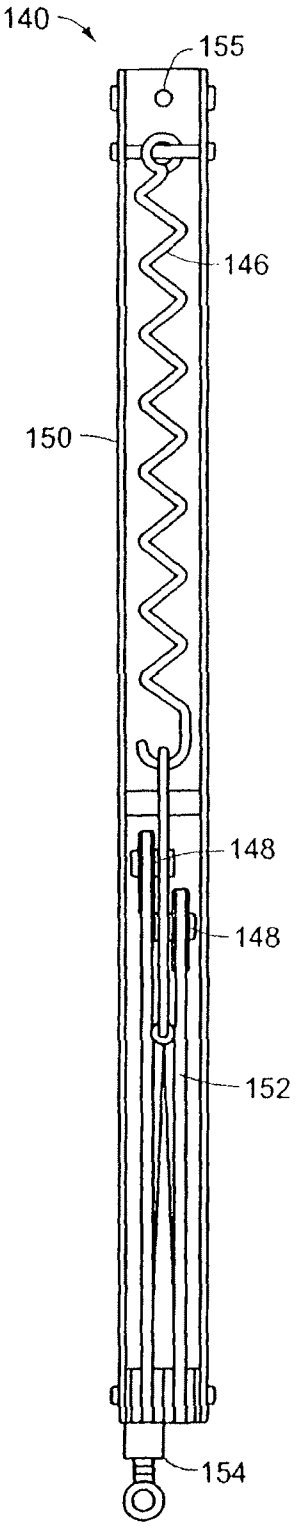


FIG. 2B

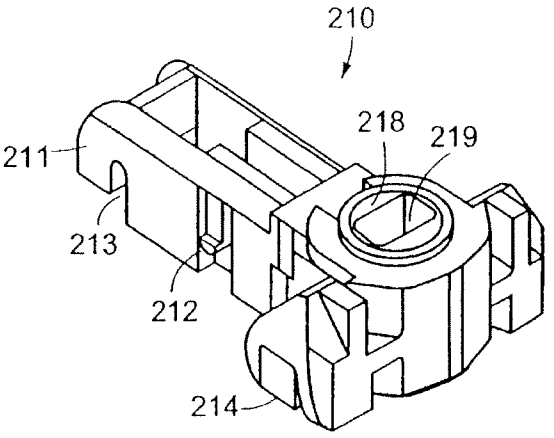


FIG. 3A

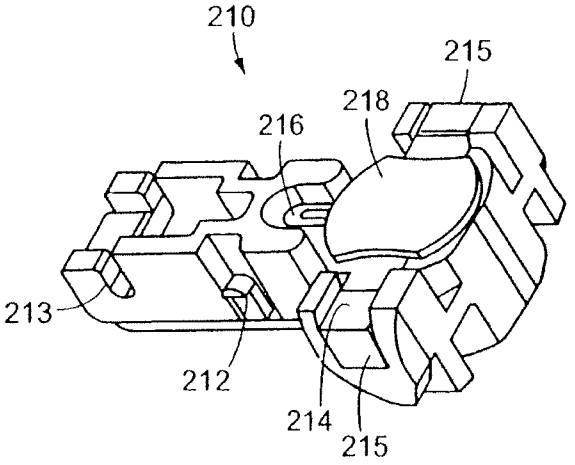


FIG. 3B

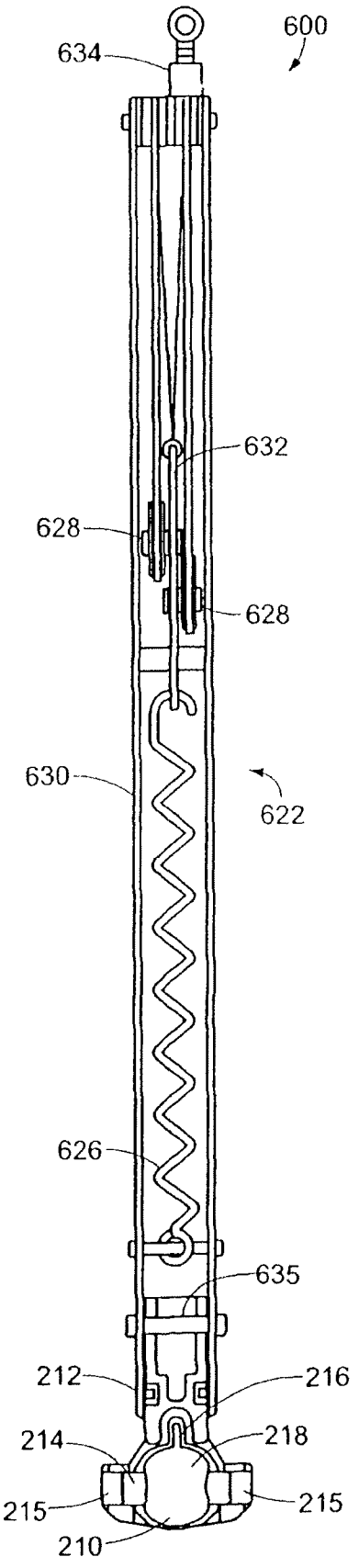


FIG. 3C

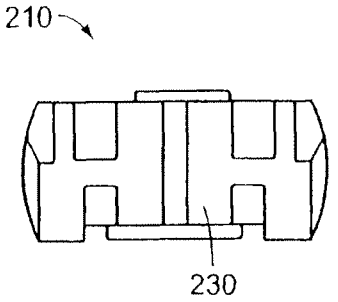


FIG. 3D

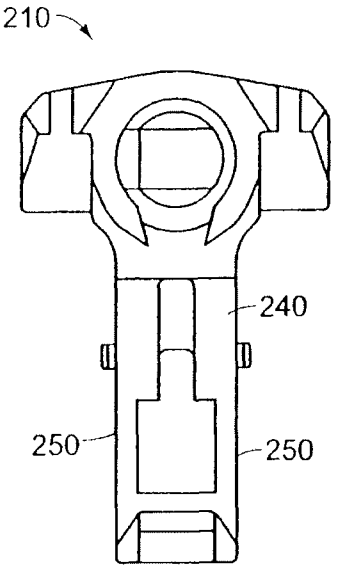


FIG. 3E

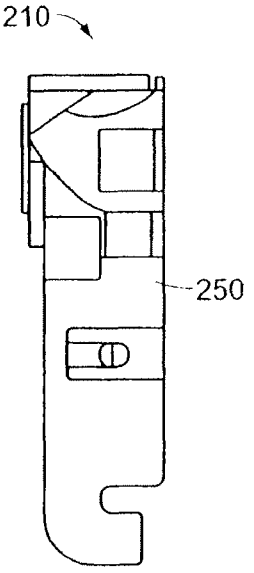


FIG. 3F

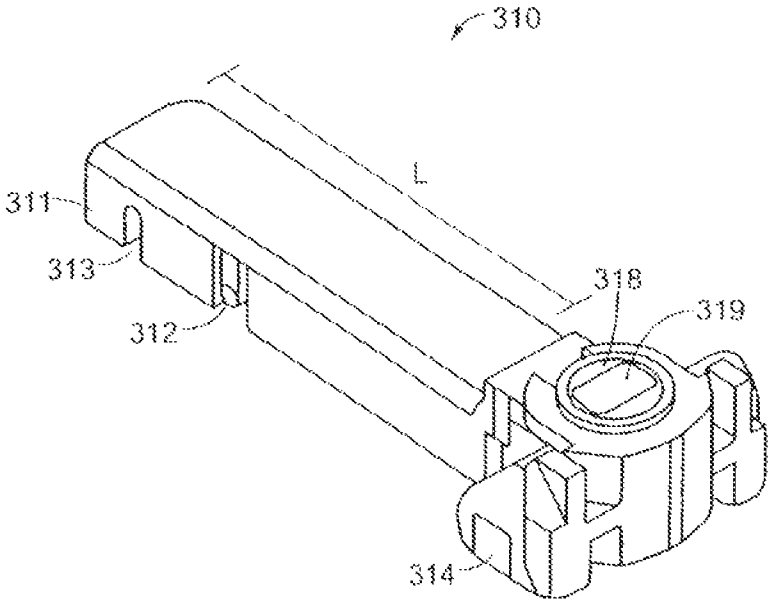


FIG. 4

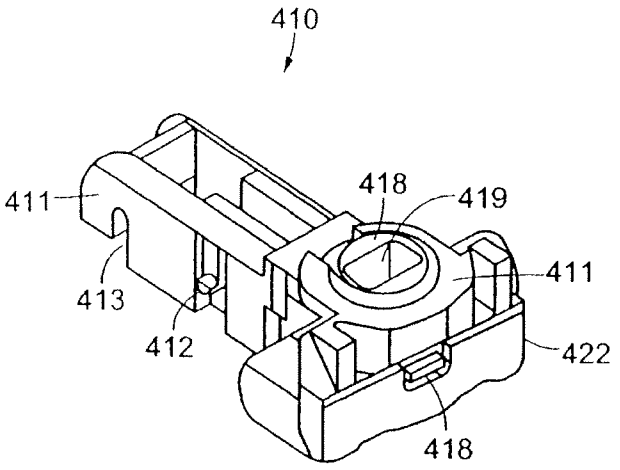


FIG. 5A

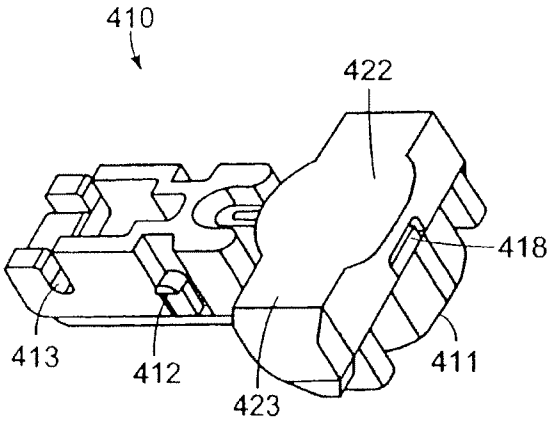


FIG. 5B

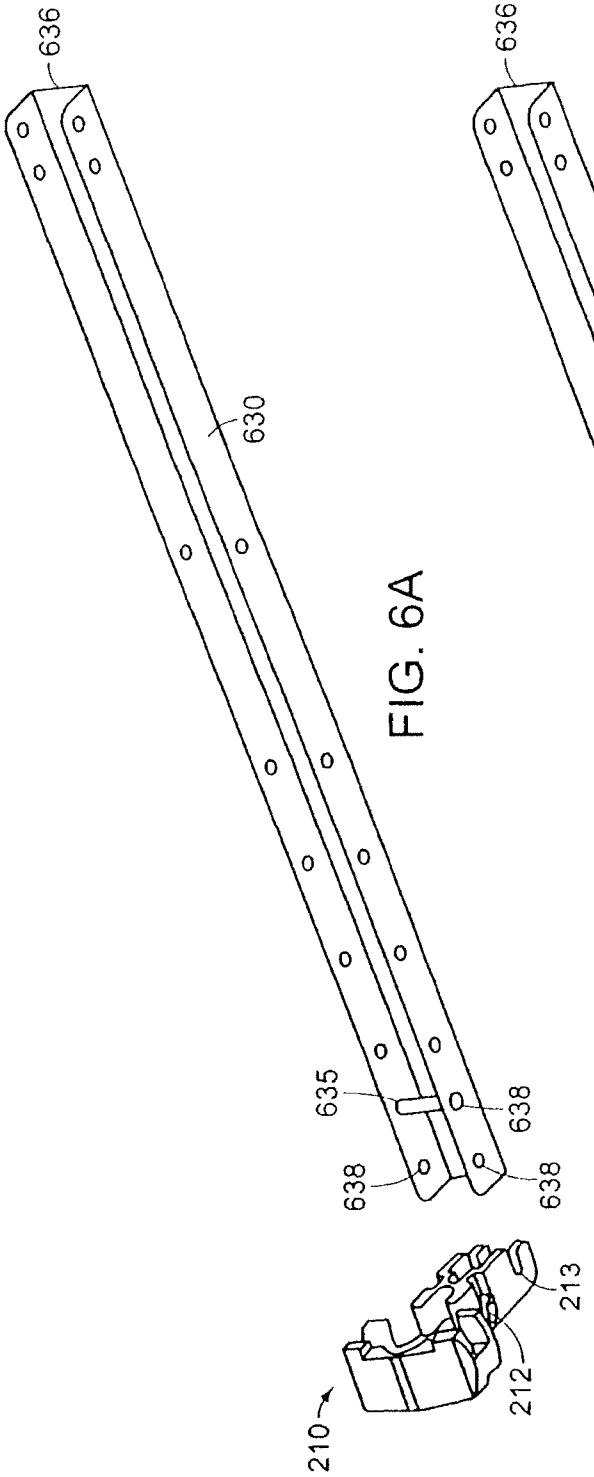


FIG. 6A

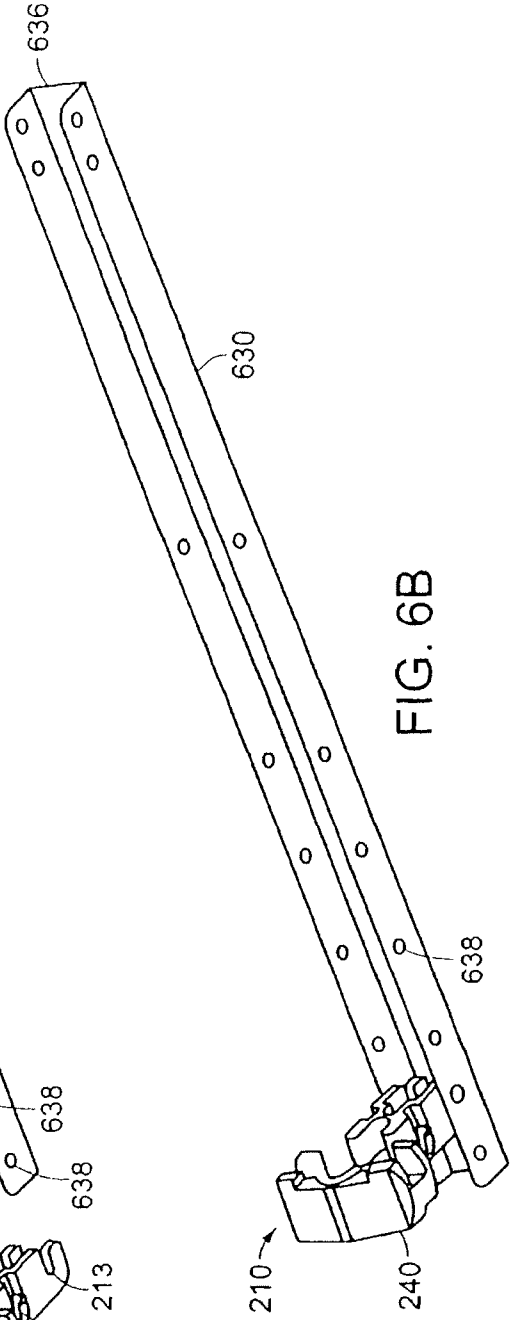


FIG. 6B

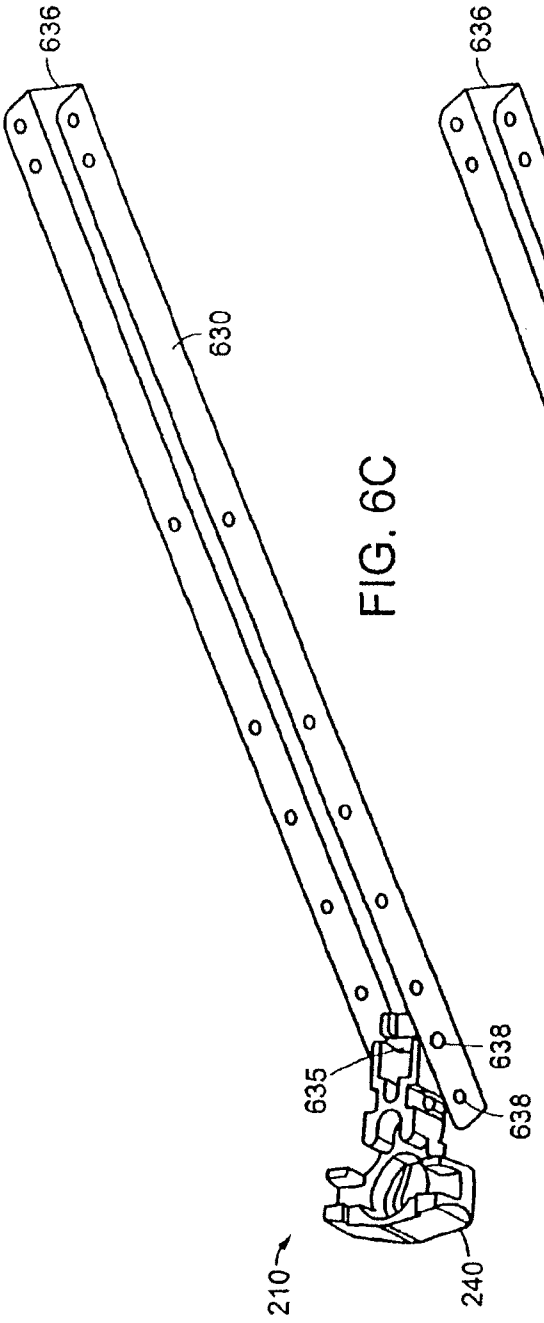


FIG. 6C

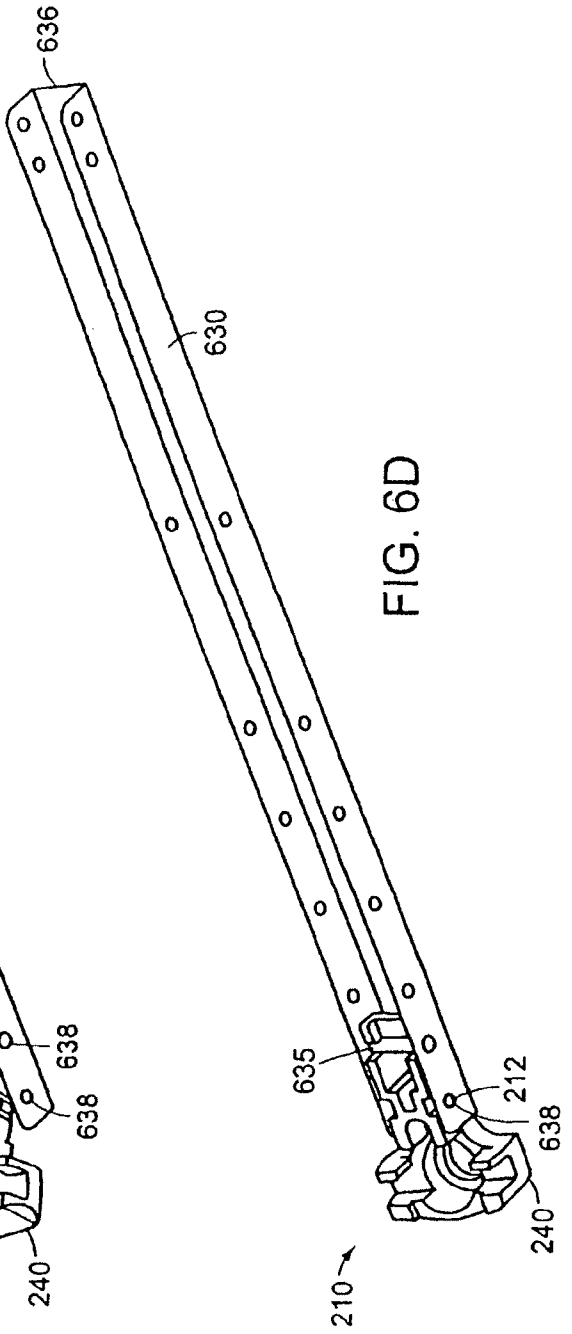


FIG. 6D

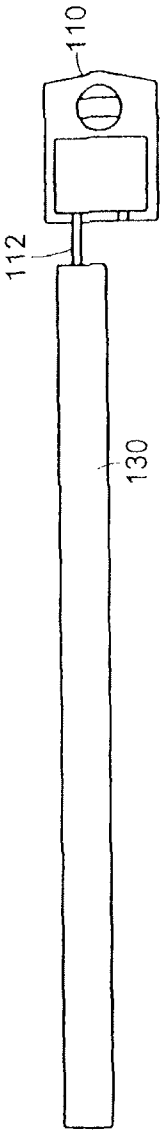


FIG. 7A
PRIOR ART

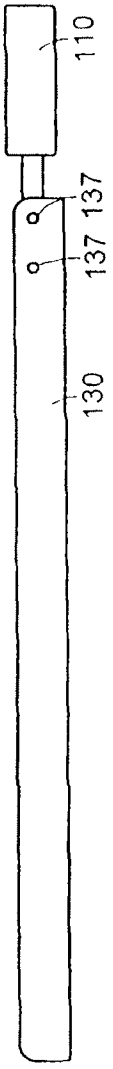


FIG. 7B
PRIOR ART

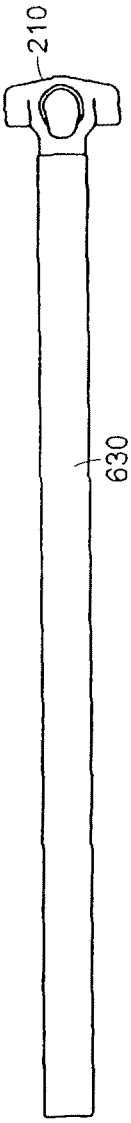


FIG. 8A

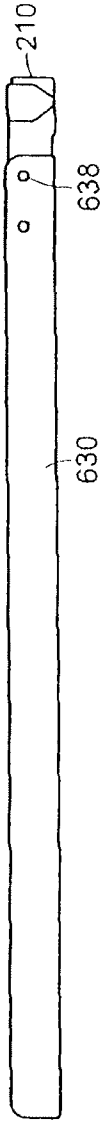


FIG. 8B

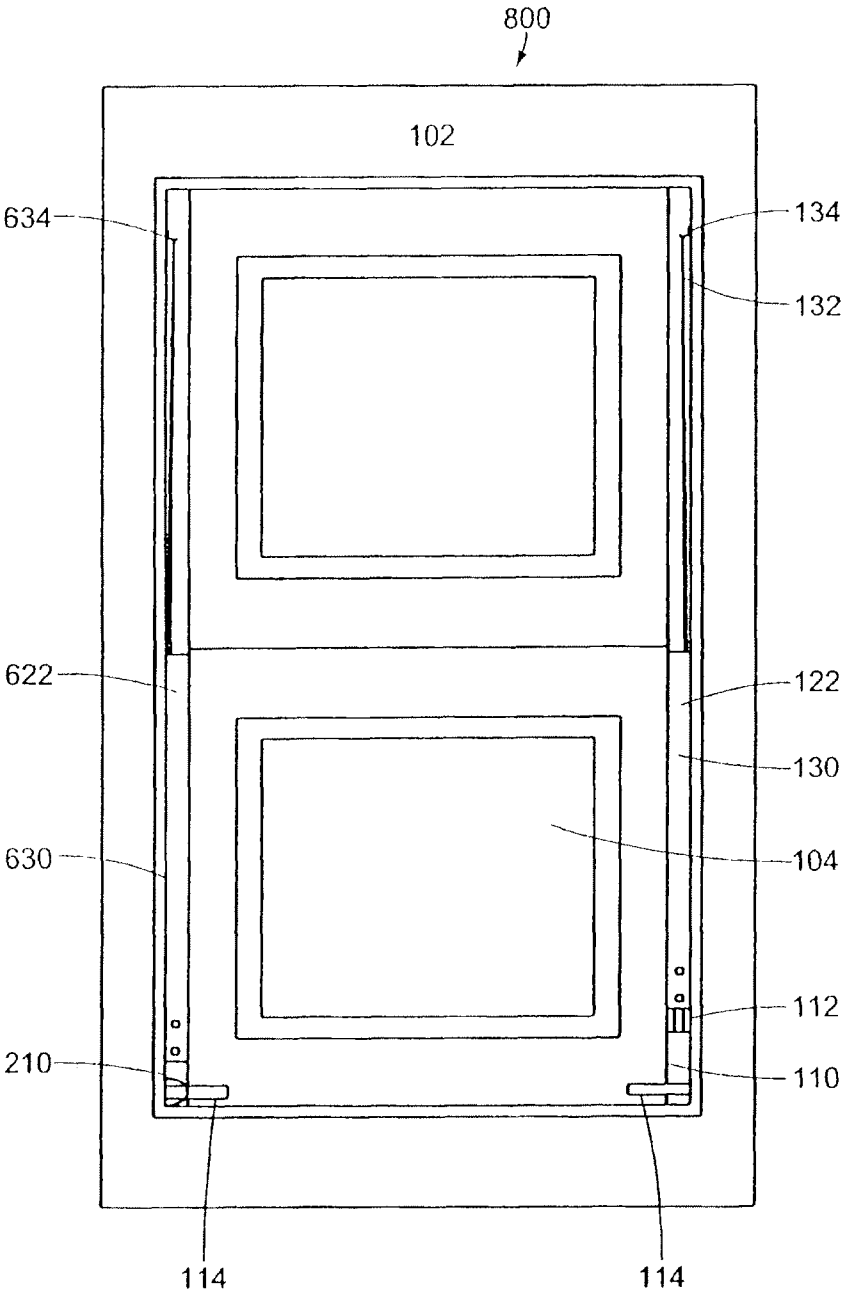


FIG. 9

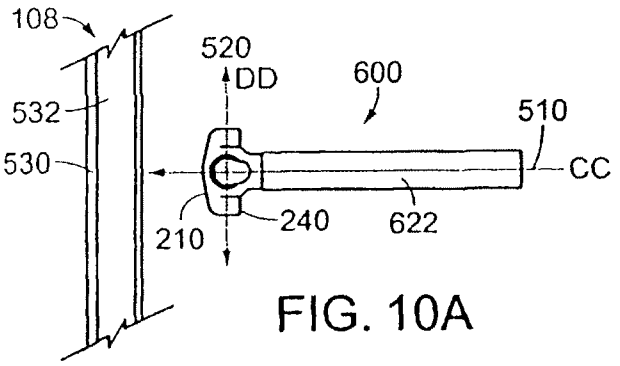


FIG. 10A

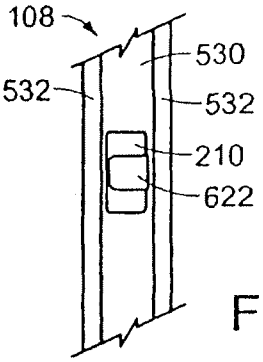


FIG. 10B

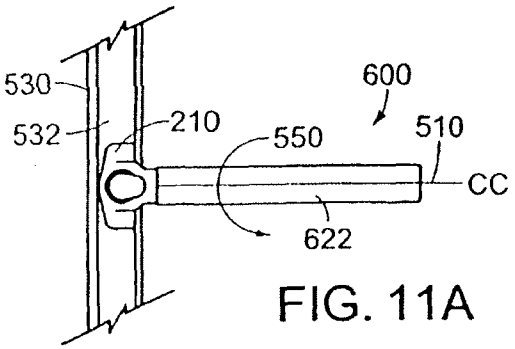


FIG. 11A

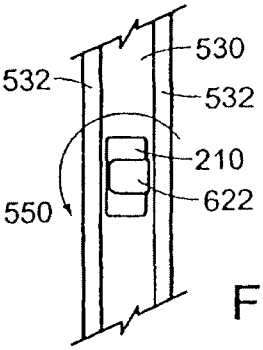


FIG. 11B

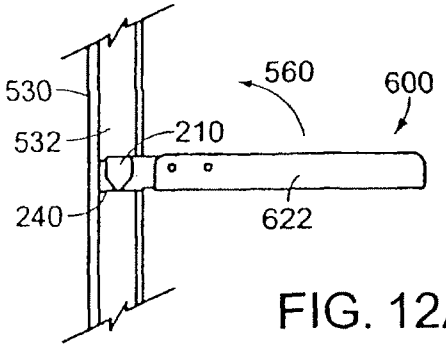


FIG. 12A

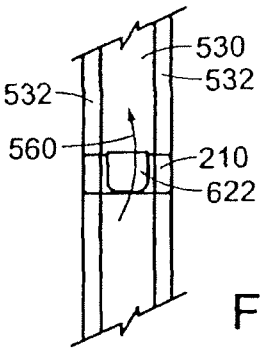


FIG. 12B

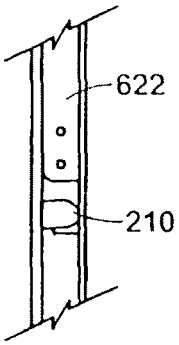


FIG. 13A

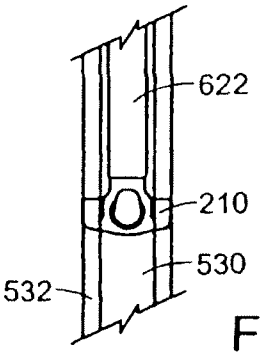


FIG. 13B

METHOD OF INSTALLING A LOCKING BALANCE SHOE AND SYSTEM FOR A PIVOTABLE WINDOW

RELATED APPLICATION

This application incorporates by reference in its entirety and is a division of U.S. patent application Ser. No. 11/654,120, filed Jan. 17, 2007; which incorporates by reference in its entirety and is a continuation of U.S. patent application Ser. No. 11/101,689, filed Apr. 8, 2005, now U.S. Pat. No. 7,191,562; which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/862,950, filed Jun. 8, 2004, now U.S. Pat. No. 6,931,788; which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/446,279, filed on May 23, 2003, now U.S. Pat. No. 6,820,368; which incorporates by reference in its entirety and is a continuation of U.S. application Ser. No. 10/044,005, filed on Jan. 11, 2002, now U.S. Pat. No. 6,679,000; which incorporates by reference in its entirety and claims priority to U.S. Provisional Patent Application Ser. No. 60/261,501 entitled Snap Lock Balance Shoe and System for a Pivotable Window filed on Jan. 12, 2001.

FIELD OF THE INVENTION

This invention relates to a window balance system for use in a pivotable window assembly.

BACKGROUND OF THE INVENTION

This invention relates to the field of tilt-in windows. More particularly this invention relates to a balance shoe of a window balance system used in conjunction with a pivot bar mounted on a window sash for rotating the window sash relative to a window frame.

Typical pivotable double hung windows include two window sashes disposed in tracks located in a window frame to allow vertical sliding movement of the sashes. Pivot bars are provided to allow rotational movement of a pivotable window sash about the pivot bars to facilitate cleaning of glazing. To control vertical movement, window balances are used so that the window sashes remain in a position in which they are placed. Balance shoes are used to guide the rotational movement of the window sashes with respect to the window frame. Typically, the balance shoes are coupled to window balances with a connecting member. See, for example, U.S. Pat. No. 6,119,398, entitled "Tilt Window Balance Shoe Assembly with Three Directional Locking" issued to H. Dale Yates, Jr., the disclosure of which is herein incorporated by reference in its entirety.

One of the problems with balance shoes and window balances for pivotable double hung windows is that they are difficult to install. In order to install a pivotable double hung window with balance shoes and window balances, the following installation steps typically must be followed. First, before the window frame is assembled, the balance shoes are inserted into jamb tracks. Next, connecting members are used to attach the balance shoes to the window balances. The balance shoes generally have an opening to accept the pivot bars that are mounted on window sashes. Finally, the sashes are made operable by inserting the pivot bars into the balance shoes and rotating the window sash up to a vertical position in the jamb tracks. The installation process is rather complex and difficult. Repair costs for replacing balance shoes are also significant. In order to change a malfunctioning or failed balance shoe, the jamb tracks either need to be deformed or replaced to gain access to the problematic balance shoe for removal and replacement.

SUMMARY OF THE INVENTION

In general, in one aspect, the invention relates to a balance shoe. The balance shoe includes a frame, a locking member at least partially disposed within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within a window balance. Embodiments of the invention can include the following features. The connecting device can include one or more retractable tabs that engage the window balance directly. The frame can further include a frame pocket sized to receive a fastener. The cam can include at least one camming surface and a keyhole opening for receiving a pivot bar attached to a window sash. The cam is at least partially housed within the frame and is disposed within a space enclosed by the locking member. Upon rotating the cam with the pivot bar, the locking member engages the window jamb. In one embodiment, the locking member includes two opposing ends integrally connected by a spring member. The cam is located within a space between the opposing ends of the locking member, and upon rotating the cam with the pivot bar, the opposing ends engage the window jamb. In another embodiment, the locking member includes a plate, which is parallel to a back surface of the frame. The cam is located within a space between the plate and the frame such that rotating the cam with the pivot bar forces the plate to engage the window jamb.

In another aspect, the invention relates to an inverted window balance system for use within a pivotable double hung window assembly. The inverted window balance system includes a rigid U-shaped channel with a plurality of openings in the channel walls for securing the contents in the channel, which include an extension spring, a system of pulleys, a cord to connect the extension spring via the system of pulleys with the window sash, and a balance shoe. The balance shoe includes a frame, a locking member at least partially disposed within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within the rigid U-shaped channel. Embodiments of this aspect of the invention can include the following features. At least a portion of the balance shoe is disposed within the rigid U-shaped channel. The connecting device can include one or more retractable tabs for engaging the rigid U-shaped channel. The retractable tabs can partially extend through at least one of the plurality of openings in the rigid U-shaped channel. The balance shoe can be further secured to the rigid U-shaped channel with a fastener that interfaces with a frame pocket in the balance shoe. The cam can include at least one camming surface and a keyhole opening for receiving a pivot bar attached to a window sash. The cam is at least partially housed within the frame and is disposed within a space enclosed by the locking member. Upon rotating the cam with the pivot bar, the locking member engages the window jamb. In one embodiment, the locking member includes two opposing ends integrally connected by a spring member. The cam is located within a space between the opposing ends of the locking member, and upon rotating the cam with the pivot bar, the opposing ends engage the window jamb. In another embodiment, the locking member includes a plate, which is parallel to a back surface of the frame. The cam is located within a space between the plate and the frame such that rotating the cam with the pivot bar forces the plate to engage the window jamb.

In still another aspect, the invention relates to a method of installing an inverted window balance system within a window jamb in a window frame. The method includes four basic steps. The first step is to provide an inverted window balance system that includes a rigid U-shaped channel with a plurality of openings in the channel walls for securing the contents in the channel, an extension spring and a system of pulleys disposed within the rigid U-shaped channel, a cord to connect the extension spring via the system of pulleys with the window sash, and a balance shoe. The balance shoe includes a frame, a locking member located at least partially within the frame, a cam in communication with the locking member, and a connecting device for attaching the balance shoe within the rigid U-shaped channel. The frame of the balance shoe has a frame bottom surface, a frame front surface, and two frame edge surfaces. The second step is to insert the inverted window balance system into a jamb track of the window jamb, such that an axis extending along a longitudinal direction of the rigid U-shaped channel is perpendicular to a back wall of the jamb track and an axis that is perpendicular to the two frame edge surfaces is parallel to the back wall while the frame front surface faces a side wall of the jamb track. The third step is to rotate the window balance system within the jamb track 90 degrees about the axis extending along the longitudinal direction of the rigid U-shaped channel, such that the frame front surface faces in a downward direction. The final step is to rotate the window balance system 90 degrees about the axis that is perpendicular to the two frame edge surfaces, such that the frame bottom surface faces in the downward direction.

These and other features of the invention will be made apparent from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

FIG. **1** is a perspective view of a pivotable double hung window assembly;

FIG. **2**A is a rear view of inverted window balance system for use with a prior art balance shoe;

FIG. **2**B is a rear view of a window balance;

FIG. **3**A is one perspective view of an embodiment of a snap lock balance shoe of the present invention;

FIG. **3**B is another perspective view of the embodiment of the snap lock balance shoe of FIG. **3**A;

FIG. **3**C is a rear view of one embodiment of a snap lock inverted balance system;

FIG. **3**D is a bottom view of one embodiment of a snap lock balance shoe;

FIG. **3**E is a front view of one embodiment of a snap lock balance shoe;

FIG. **3**F is a side view of one embodiment of a snap lock balance shoe;

FIG. **4** is a perspective view of an embodiment of a snap lock balance shoe of the present invention;

FIG. **5**A is one perspective view of another embodiment of a snap lock balance shoe of the present invention;

FIG. **5**B is another perspective view of the embodiment of the snap lock balance shoe of FIG. **5**A;

FIG. **6**A is a perspective view of one embodiment of a balance shoe of the invention and a rigid U-shaped channel;

FIG. **6**B is a perspective view showing the first step of connecting one embodiment of the balance shoe of the invention to the rigid U-shaped channel;

FIG. **6**C is a perspective view showing the second step of connecting one embodiment of the balance shoe of the invention to the rigid U-shaped channel;

FIG. **6**D is a perspective view showing one embodiment of the balance shoe of the invention connected to the rigid U-shaped channel;

FIG. **7**A is a front view of a prior art balance shoe attached to a rigid U-shaped channel;

FIG. **7**B is a side view of the prior art balance shoe attached to the rigid U-shaped channel;

FIG. **8**A is a front view of one embodiment of a snap lock balance shoe of the present invention attached to a rigid U-shaped channel;

FIG. **8**B is a side view of one embodiment of the snap lock balance shoe of the present invention attached to the rigid U-shaped channel;

FIG. **9** is a front view of a window assembly including one snap lock inverted window balance system of the present invention and one prior art inverted window balance system installed in a window frame;

FIG. **10**A is a side view illustrating the first step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **10**B is a front view illustrating the first step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **11**A is a side view illustrating the second step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **11**B is a front view illustrating the second step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **12**A is a side view illustrating the third step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **12**B is a front view illustrating the third step of installing the snap lock inverted window balance system of the invention into the jamb track;

FIG. **13**A is a side view illustrating the last step of installing the snap lock inverted window balance system of the invention into the jamb track; and

FIG. **13**B is a front view illustrating the last step of installing the snap lock inverted window balance system of the invention into the jamb track.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, shown is a pivotable double hung window assembly **100** in which a snap lock balance shoe constructed in accordance with the teachings of the present invention can be used. The pivotable double hung window assembly **100** includes of a window frame **102**, a pivotable lower window sash **104**, a pivotable upper window sash **106**, and a window jamb **107**. The pivotable lower window sash **104** and the pivotable upper window sash **106** slide vertically in jamb track **108** within the window jamb **107**, while also being able to pivot about a pivot bar **114**, as shown in FIG. **9**.

FIG. **2**A shows a rear view of an inverted window balance system **120** for use in the pivotable double hung window assembly **100**. The inverted window balance system **120** includes an inverted window balance **122** used for balancing the weight of either the pivotable lower window sash **104** or the pivotable upper window sash **106** at any vertical position within the window frame **102**, and a prior art balance shoe **110**

for guiding the rotation of the pivotable lower window sash **104** about the pivot bar **114**. A hanging connector **112** connects the prior art balance shoe **110** to the inverted window balance **122**. The inverted window balance **122** includes an extension spring **126** connected to a system of pulleys **128** housed within a rigid U-shaped channel **130**, and a cord **132** for connecting the system of pulleys **128** to a jamb mounting attachment **134**. The jamb mounting attachment **134** is used for connecting the inverted window balance system **120** to the window jamb **107**. One difference between the inverted window balance **122** and a window balance **140**, shown in FIG. **2**B, includes the placement of the extension spring **146** above a system of pulleys **148** within the rigid U-shaped channel **150**. A cord **152** connects the system of pulleys **148** to a jamb mounting attachment **154**. Another difference is that while inverted window balances **122** travel with either the pivotable lower window sash **104** or pivotable upper window sash **106**, the window balance **140** remains in a fixed position in the window jamb **107** due to an attachment to the window jamb **107** through an attachment opening **155**.

FIGS. **3**A and **3**B are perspective views of a snap lock balance shoe **210** of one embodiment of the present invention. The snap lock balance shoe **210** has a frame **211** in which is housed a connecting device **212**, a locking device **214**, and a cam **218**. The connecting device **212** can be integral with the frame **211** and attaches the snap lock balance shoe **210** directly within an inverted window balance **622**, shown in FIG. **3**C. The inverted window balance **622** in combination with the snap lock balance shoe **210** forms a snap lock inverted window balance system **600**. The inverted window balance **622** includes an extension spring **626** connected to a system of pulleys **628** housed within a rigid U-shaped channel **630**, and a cord **632** for connecting the system of pulleys **628** to a jamb mounting attachment **634**, such as a cord terminal or hook.

In the depicted embodiment, the connecting device **212** is a pair of retractable tabs that snap into the rigid U-shaped channel **630**. In other embodiments, other connecting devices such as a screw, may be used to secure the frame **211** to the rigid U-shaped channel **630**. A fastener **635** located in the inverted window balance **622** can be used to further secure the connection between the snap lock balance shoe **210** and the inverted window balance **622**. To accommodate the fastener **635**, the snap lock balance shoe **210** can form a connection pocket **213** sized to receive or mate with the fastener **635**.

Another element of the snap lock balance shoe **210** visible in FIG. **3**A is a keyhole opening **219** located within the cam **218**. The keyhole opening **219** is sized to accept the pivot bar **114** extending from either the pivotable lower window sash **104** or the pivotable upper window sash **106**, and serves as a connection point between the pivotable lower or upper window sash **104**, **106** and the snap lock balance shoe **210**. FIG. **3**B shows a perspective view of the snap lock balance shoe **210** showing another face of the cam **218**.

In the embodiment shown in FIG. **3**B, the locking device **214** surrounds the cam **218** and includes of a pair of opposing ends **215** connected by a spring member **216**. When the pivotable lower window sash **104** is tilted open, the pivot bar **114** rotates, which in turn rotates the cam **218** forcing the opposing ends **215** outward to engage the jamb track **108** of the window frame **102**, thereby locking the balance shoe **210** in that location.

FIGS. **3**D-**3**F show different views of one of the embodiments of the snap lock balance shoe **210** of the invention. FIG. **3**D is a bottom view of the snap lock balance shoe **210** that shows a frame bottom surface **230**. FIG. **3**E is a front view of the same embodiment of the snap lock balance shoe **210** that illustrates a frame front surface **240**, and FIG. **3**F is an side view that shows one of the two frame edge surfaces **250** of the snap lock balance shoe **210**.

FIG. **4** shows another embodiment of a snap lock balance shoe **310**. The snap lock balance shoe **310** has an elongated frame **311** in which is housed a connecting device **312**, a locking device **314**, and a cam **318**. Within the cam is a keyhole opening **319** sized to receive the pivot bar **114**. The elongated frame **311** has a length L that is greater than about 1.25 inches. When attached to the rigid U-shaped channel **630**, the balance shoe **310** extends further outward from the rigid U-shaped channel **630** than the balance shoe **210** attached to a similar sized rigid U-shaped channel **630**. The balance shoe **310** allows a fixed-sized rigid U-shaped channel **630** to be used in a larger window having a greater travel distance by extending the length of the entire window balance system by having a longer balance shoe **310**. One of the advantages of the present invention is that an installer can create a custom window balance system for a particular window by fitting a fixed-length rigid U-shaped channel **630** with an appropriately sized snap lock balance shoe.

FIG. **4** shows another embodiment of a snap lock balance shoe **310**. The snap lock balance shoe **310** has an elongated frame **311** in which is housed a connecting device **312**, a locking device **314**, and a cam **318**. Within the cam is a keyhole opening **319** sized to receive the pivot bar **114**. The elongated frame **311** has a length L **325** that is greater than about 1.25 inches. When attached to the rigid U-shaped channel **630**, the balance shoe **310** extends further outward from the rigid U-shaped channel **630** than the balance shoe **210** attached to a similar sized rigid U-shaped channel **630**. The balance shoe **310** allows a fixed-sized rigid U-shaped channel **630** to be used in a larger window having a greater travel distance by extending the length of the entire window balance system by having a longer balance shoe **310**. One of the advantages of the present invention is that an installer can create a custom window balance system for a particular window by fitting a fixed-length rigid U-shaped channel **630** with an appropriately sized snap lock balance shoe.

Referring to FIGS. **5**A-**5**B, shown is another embodiment of the present invention of a snap lock balance shoe **410**. The snap lock balance shoe **410** has a locking member **422** which engages a back wall of the jamb track **108** locking the balance shoe **410** in that location. The locking member **422** is partially disposed in the frame **411** and includes a plate **423** that engages the back wall of the jamb track **108**. The balance shoe **410** also includes a frame **411**, a connecting device **412**, and a cam **418**. The cam **418** is partially disposed within the frame **411** in a space enclosed by the locking member **422**. The cam **418** includes a keyhole opening **419** sized to receive the pivot bar **114**. Upon rotation of the cam **418** with the pivot bar **114**, the locking member **422** is forced away from the frame **411** towards the back wall of the jamb track **108**, thereby anchoring the balance shoe **410** in that location within the window frame **102**.

FIGS. **6**A-**6**D show one embodiment of a method for securing the snap lock balance shoe **210** within a rigid U-shaped channel **630** with multiple openings **638**. It should be noted that each opening **638** on one side of the rigid U-shaped channel **630** has a corresponding opening **638** on the other side of the rigid U-shaped channel **630** to form a pair of openings. The first step, shown in FIG. **6**A, is to place a fastener **635**, such as a rivet, in one of the pairs of openings **638** in the rigid U-shaped channel **630**. The next step, as depicted in FIG. **6**B, is to slide the snap lock balance shoe **210** into the rigid U-shaped channel **630** such that the fastener **635** is received in the connection pocket **213** of the snap lock

balance shoe **210**. As shown in FIG. **6**C, the snap lock balance shoe **210** is then rotated down so that the front frame surface **240** is aligned with a bottom wall **636** of the rigid U-shaped channel **630**. FIG. **6**D shows the last step of attaching the snap lock balance shoe **210** within the rigid U-shaped channel **630**. In this step, the connecting device **212** of the snap lock balance shoe **210** snaps into one of the pairs of openings **638** located on the rigid U-shaped channel **630**. In alternative embodiments the connection device **212** of the snap lock balance shoe **210** can extend through off-set openings in the rigid U-shaped channel **630**. In some embodiments, the snap lock balance shoe **210** is attached to the rigid U-shaped channel **630** with the fastener **635**. In other embodiments, the snap lock balance shoe **210** is attached to the rigid U-shaped channel **630** without the fastener **635**. It should also be noted that in some embodiments, the snap lock balance shoe **210** can be aligned and secured to the rigid U-shaped channel **630** such that the front frame surface **240** faces upwards instead of downwards as depicted in FIG. **6**D.

FIG. **7**A is a front view of the prior art balance shoe **110** attached to the rigid U-shaped channel **130**. The rigid U-shaped channel **130** is connected to the prior art balance shoe **110** by the hanging connector **112**. No part of the prior art balance shoe **110** lies within the rigid U-shaped channel **130**. FIG. **7**B is a side view of the prior art balance shoe **110** attached to the rigid U-shaped channel **130** illustrating channel openings **137**. Fasteners (not shown) are installed through the channel openings **137** to secure the hanging connector **112** to the rigid U-shaped channel **130**.

Referring to FIGS. **8**A and **8**B, shown is an embodiment of the snap lock balance shoe **210** of the present invention attached to the rigid U-shaped channel **630**. The snap lock balance shoe **210** is directly attached within the rigid U-shaped channel **630** by a connecting device **212** located on the frame **211** of the snap lock balance shoe **210**. The connecting device **212** extends through a pair of openings **638** located on the rigid U-shaped channel **630**.

FIG. **9** is a front view of a pivotable double hung window assembly **800** in which an inverted window balance **122** is attached to a prior art balance shoe **110** by using the hanging connector **112**, and the inverted window balance **622** is attached to the snap lock balance shoe **210** of an embodiment of the present invention. Pivot bars **114**, as shown in FIG. **9**, are secured to the pivotable lower window sash **104**. The pivot bars **114** are slidably receivable by both the prior art balance shoe **110** and the snap lock balance shoe **210** and serve as connections between the pivotable lower window sash **104** and respective inverted window balances **122**, **622**.

An advantage of the type of balance shoe presently disclosed is that the snap lock balance shoe **210** is attached within the rigid U-shaped channel **630** resulting in a longer rigid U-shaped channel **630** than in the inverted balance systems **120** for a given window sash. The longer rigid U-shaped channel **630** of the inverted window balance **622** allows for the use of longer extension springs that provide greater control of the vertical positioning of the window sash than a shorter rigid U-shaped channel **130** with a shorter extension spring. Another advantage of the present invention is that the snap lock balance shoe **210** contains a smaller number of parts than prior art balance shoes **110**.

One installation method used to place a snap lock inverted window balance system **600** within the jamb tracks **108** is schematically illustrated in the remaining figures. The snap lock inverted window balance system **600** includes one inverted window balance **622** and one snap lock window balance **210**. FIGS. **10**A, **11**A, **12**A, and **13**A show the installation method from a side view, while FIGS. **10**B, **11**B, **12**B, and **13**B show the method from a front view. The installation method involves an orientation step, a first rotation step, and a second rotation step. FIGS. **10**A and **10**B show the orientation step in the installation method. In the orientation step, the snap lock inverted window balance system **600** is inserted the jamb tracks **108** such that an axis CC **510** in FIG. **10**A is perpendicular to a back wall **530** of the jamb tracks **108**, while an axis DD **520** in FIG. **10**A is parallel to the back wall **530** and the frame front surface **240** is adjacent to a side wall **532** of the jamb tracks **108**. FIGS. **11**A and **11**B show the snap lock inverted window balance system **600** inserted in the jamb tracks **108** as well as an arrow **550** indicating the direction of rotation of the snap lock inverted window balance system **600** required to complete the first rotation step. The first rotation step involves rotating the snap lock inverted window balance system **600** 90-degrees about the axis CC **510** such that the frame front surface **240** faces downward. FIGS. **12**A and **12**B show the snap lock inverted window balance system **600** after the 90-degree rotation around the axis CC **510** has been completed. The second rotation step involves a 90-degree rotation about the axis DD **520**. An arrow **560** showing the direction of the second rotation step is shown in FIGS. **12**A and **12**B. FIGS. **13**A and **13**B show in two different views the snap lock inverted window balance system **600** after the installation method has been completed. The cord terminal or any other jamb mounting attachment **634** (see FIG. **9**) can then be screwed or hooked into place to anchor the snap lock inverted window balance system **600**.

The installation method just described can be carried out in reverse to remove the snap lock inverted window balance system **600** from the jamb track **108** of the window frame **102** to allow for easy replacement of the snap lock balance shoe **210** or the snap lock inverted window balance system **600** itself. In order to replace inverted window balance systems **120** with prior art balance shoes **110**, either the jamb tracks **108** need to be warped or completely removed in order to replace the prior art balance shoe **110** of the inverted window balance system **120**.

While there have been described several embodiments of the invention, other variants and alternatives will be obvious to those skilled in the art. Accordingly, the scope of the invention is not limited to the specific embodiments shown.

What is claimed is:

1. A method of installing an inverted window balance system within a window jamb in a window frame, the method comprising the steps of:

providing the inverted window balance system comprising:

a U-shaped channel; and

a balance shoe comprising a balance shoe frame;

inserting a portion of the balance shoe frame within a jamb track of the window jamb in an orientation position;

rotating the balance shoe frame about a first axis 90 degrees relative to the orientation position; and

rotating the balance shoe frame 90 degrees about a second axis perpendicular to the first axis such that the balance shoe frame is substantially fully disposed within the jamb track.

2. The method of claim **1**, wherein the balance shoe frame further comprises:

means for receiving a fastener for pivotally connecting the balance shoe frame to the U-shaped channel; and

means for securing the balance shoe frame against rotation relative to the U-shaped channel.

3. The method of claim **2**, wherein the receiving means comprises a connecting pocket.

4. The method of claim 3, further comprising the step of pivoting the fastener relative to the connecting pocket.

5. The method of claim 2, further comprising the steps of:

inserting the fastener into the receiving means to connect the shoe to the U-shaped channel;

pivoting the balance shoe frame relative to the U-shaped channel; and

securing the balance shoe frame against rotation relative to the U-shaped channel.

6. The method of claim 5, wherein the securing step comprises extending the securing means through an opening defined by the U-shaped channel.

7. The method of claim 5, wherein the pivoting step comprises pivoting the balance shoe frame relative to the U-shaped channel about an axis defined at least in part by the fastener.

8. The method of claim 5, further comprising the step of fixing the fastener to the U-shaped channel.

9. The method of claim 2, wherein the fastener comprises a rivet.

10. The method of claim 2, wherein the securing means comprises resilient tabs.

11. The method of claim 10, wherein the resilient tabs extend from edge surfaces of the balance shoe frame.

12. The method of claim 1, wherein the balance shoe frame further comprises:

a cam at least partially disposed within the balance shoe frame; and

a locking member in contact with the cam.

13. The method of claim 12, wherein the locking member is located at edge surfaces of the balance shoe frame.

14. The method of claim 12, wherein the balance shoe frame further comprises a keyhole opening for receiving a pivot bar.

15. The method of claim 12, wherein the locking member comprises a pair of opposing surfaces connected by an elastic member.

16. The method of claim 12, wherein the locking member further comprises a surface adapted to engage the window jamb track.

17. The method of claim 12, wherein rotation of the cam forces the locking member toward side walls of the window jamb track when the balance shoe frame is installed in the window jamb track.

18. The method of claim 1, wherein the balance shoe frame comprises a unitary construction.

* * * * *