(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 816 296 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.08.2007 Bulletin 2007/32

(51) Int Cl.:
E05F 1/10 *(2006.01)* ***E05F 1/12*** *(2006.01)*

(21) Application number: **07250390.7**

(22) Date of filing: **30.01.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **03.02.2006 EP 06075245**

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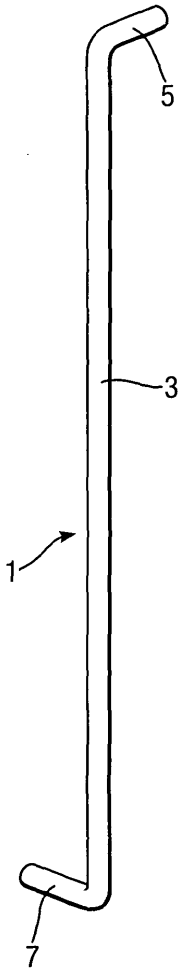
(54) Wing actuator system

(57) A wing actuator system for a hinged wing is provided having:
- a torsion member comprising an elongated torsion bar and a first torsion bar foot extending laterally from a first end of the torsion bar and a second torsion bar foot extending laterally from a second end of the torsion bar; and
- a pair of first and second mounting means for securing the first torsion bar foot to a wing and the second torsion bar foot to a wing frame member adjacent the wing and thereby extending the torsion member between the two mounting means in a first direction; and
- wherein one of the first and second mounting means is provided with a first receiving means for receiving the first or second torsion bar feet and which receiving means is arranged to allow displacement of the torsion member relative to said mounting means in said first direction.

Fig.1.



EP 1 816 296 A2

Description

[0001] This invention relates to a wing actuator system which includes a torsion member.

[0002] Such devices are known in the art, and generally include an elongated torsion member arranged to extend in the direction of the hinge axis of door, window or other hinged member, generally indicated as 'wing', and means for rigidly securing the opposite ends of the torsion member to the wing or door and to the door frame. Depending on the manner of mounting of the torsion member the wing will be biased to the closed or opened position. When the wing is then moved to the opposite opened or closed position the torsion member will become tensioned and upon release of the wing, the torsion member will return it to its previous state and thereby close or open the wing.

[0003] The opposite ends of the torsion member to be secured to the wing and wing frame are lateral portions or feet, generally at right angles to the torsion member and the securing means can be brackets adapted receive the feet prior or after fixing the securing means to the door and door frame. The torsion member is preferably a length of spring steel with the feet as right angled bends at both ends.

[0004] Such wing actuator systems with torsion members are disclosed in GB 2,144,651 and GB 678,208. In GB 2,144,651 the torsion member or torsion spring is mounted by inserting the feet into simple holes which have been drilled into the door for one end and into the rebate frame for the other, or in another embodiment of the same publication, by hammering the feet of the torsion member into the door and frame. For the GB 678,208 system, one of the feet of the torsion member which are at opposite right angles from the main body is inserted into a sleeve of a bracket that is secured to the door and the other foot is than twisted 180 degrees in order to insert it in a sleeve of another bracket that is secured to the door post.

[0005] Thus, both systems require careful manipulation, such a rotational or translational movement of one of the feet relative to the other in order to install the torsion member and optionally put pre-tension on the torsion bar. Both systems require the feet to be inserted into a sleeved bracket or an opening. Thus correct mounting of the torsion member is difficult.

[0006] Additionally, the distance and orientation between the two mounting positions of the torsion member, which are either the holes or the brackets, has to be exact so as to prevent the torsion member from bowing or buckling.

[0007] It is an object of the invention to provide a wing actuator system which solves the difficulties encountered during mounting a torsion member to a wing and adjacent wing frame member.

[0008] This is achieved by the provision of the wing actuator system of claim 1 in which a wing actuator system for a hinged wing is provided having

- a torsion member comprising an elongated torsion bar and a first torsion bar foot extending laterally from a first end of the torsion bar and a second torsion bar foot extending laterally from a second end of the torsion bar and
- a pair of first and second mounting means for securing the first torsion bar foot to a wing and the second torsion bar foot to a wing frame member adjacent the wing and thereby extending the torsion member between the two mounting means in a first direction, wherein

one of the first and second mounting means is provided with a first receiving means for receiving the first or second torsion bar feet and which receiving means is arranged to allow displacement of the torsion member relative to said mounting means in said first direction.

[0009] The fact that the receiving means of the mounting means allows displacement of the torsion member, facilitates the manipulation necessary for properly mounting and pre-tensioning the tension member. Once the other foot is mounted this possibility to displace the torsion member ends.

[0010] According to a further aspect of the invention the receiving means is on the first mounting means and the first mounting means is a bracket adapted to be mounted to a wing.

According to yet a further aspect of the invention the first bracket comprises a base having a top wall, a bottom wall, left wall and a right wall and the receiving means extend across the width of the base from the left wall to the right wall. According to yet a further aspect of the invention the receiving means is an indent in the rear surface of the first bracket and when the bracket is mounted to the wing, the rear surface and the indent are covered by the wing.

According to yet a further aspect of the invention the other of the first and second mounting means comprises a mounting part for fixing to one of the wing or wing frame member and an insert engageable to the other of the first and second torsion bar feet, and wherein the mounting part is adapted to hold the insert.

[0011] Further aspects of the invention will be apparent from the detailed description below of particular embodiments and the drawings thereof, in which:

- Figure 1 is a perspective view of a torsion member of the torsion member system of the invention;
- Figure 2A and 2B is a frontal and rear perspective view of a first or door mounting means for the torsion member of the torsion member system of the invention;
- Figure 3 is an exploded view of a second or door frame mounting means for the torsion member of the torsion member system of the invention;
- Figure 4A-4E is an illustration of the steps of installing the Wing actuator system of the invention to a screen door;

[0012] Figure 1 is a perspective view of a torsion member 1 for a wing actuator system. The torsion member 1 has a vertically extending, elongated bar 3 and a top and bottom ends or feet 5,7 extending lateral to the vertical torsion bar. The top and bottom feet 5,7 are also at right angles to each other. However other torsion members with the feet laterally extending from the bar and parallel to each other are also possible.

[0013] Figure 2A and 2B is a frontal and rear perspective view of a first mounting means or first bracket 9 for mounting one of the feet 5,7 of the torsion member 1 to a door.

The first bracket includes a base 11 with a front or outer surface 13, a top wall 15A, a bottom wall 15B and a left wall 15C and a right wall 15D, and a rear or inner surface 17. The front or outer surface 13 will be the surface directed away from the door when the first bracket is mounted thereon, the rear or inner surface 17 is the surface facing the door when the first bracket is mounted thereon.

[0014] As can be seen from the rear view in figure 2B, the inner surface 17 of the base 13 includes an indented portion 19 in the middle, which extends across the width of the base from the left wall 15C to right wall 15D. The indent 19 is arranged to accommodate one of the torsion member feet 5,7. The upper portion of the right wall 15D is provided with a vertical groove 21 for accommodating a portion of the torsion bar 3 of the torsion member 1.

[0015] The groove 21 extends along the upper part of the right wall of the bracket. The groove also extends inwardly from the right wall 15D towards the left wall 15C and has an entrance portion somewhat narrower than the thickness of the torsion bar and then widens into a holder portion a shape for encompassing the torsion bar cross-sectional shape and size. Thus after inserting the foot into the bore, the portion 3B of the torsion bar 3 adjacent the second foot 7 is pushed into the groove and snaps into the holder portion of the groove 21. This way the torsion bar 3 and the lower foot 7 are snugly held by the first bracket 9 while allowing a relative small vertical displacement of the torsion bar along the groove 21.

[0016] The bracket is further provided with the bar 23 to mate with a groove in a door side profile. The bar 23 extends from the top wall 15A to the bottom wall 15B over the rear surface of the bracket and spans across the indent 19. The first bracket 9 further includes a pair of mounting holes top and bottom 25A, 25B extending from front to back and through the groove mating bar 23.

[0017] When the bracket is mounted to the door (which is shown in Figures 4A-4E), inner surface 17 and the indent 19 are covered by the door, thus creating a tunnel-like space 19 for the torsion member foot to be held captive. Also the indent 19 and if the torsion bar foot 7 to be held by it are generally perpendicular to the hinge axis of the door. And the torsion bar 3 will extend generally parallel to the hinge axis of the door. It is clear from the figures that the height of the indent 19 allows the torsion member 1 to move vertically up or down along the height. Also shown in figure 4A is how bar 23 mates with longitudinal groove G of the door side profile P of the door D.

[0018] Figure 3 is an exploded view of the second mounting means or second bracket for mounting of the torsion member to a stationary wing frame. The second bracket 31 has two parts, a mounting part 33 and an insert 35. The mounting part 33 for securing to the stationary frame or the like and the insert 35 for holding a foot of the torsion member 1, such that when the insert is inserted into the mounting part 33, the torsion member 1 is held to the stationary frame by the second mounting means.

[0019] The mounting part 33 of the second bracket 21 has a front or outer surface 37 defined as is the surface facing away from the stationary frame when the mounting part is fixed thereto, and the rear or inner surface 39 defined as facing towards the stationary frame F as shown in figure 4 when the mounting part is fixed thereto.

[0020] The mounting part 33 includes a recess or slot 41 arranged to accommodate the insert 35. The slot 41 is positioned generally in the middle of the mounting part 33 and thus divides the part 33 into a top wing 43 and a bottom wing 45. Each of the top and bottom wings 43,45 of the mounting part 33 include a top wall, 43A, 45A, a bottom wall 43B, 45B, a left wall 43C, 45C, and a right wall 43D, 45D. The entrance of the slot 41 D is situated between the right walls 43D, 45D of the top and bottom wings 43, 45 of the mounting part. The recess or slot 41 is further defined by a top recess wall 41 A coinciding with the bottom wall 43B of the top wing; a left recess wall 41 D parallel to the left wall of the mounting part, and a recess bottom wall 41B coinciding with the top wall 45A of the bottom wing.

[0021] The top and bottom walls 41 A, 41B of the slot 41 are profiled to slidingly cooperate with the insert which has grooved walls (as is explained further on). The profile of the top and bottom walls 41 A, 41 B is a tapered V-shape, which is wider at the slot opening 41 D and more narrow when nearing the left wall 41C.

[0022] The bottom wing right wall 45D of the mounting part 33 comprises a vertically extending groove 47 for accommodating a portion of the torsion bar 3 of the torsion member 1 when it is mounted to the second bracket 31. The vertical groove 47 also extends inwardly from the right wall 45D in the direction of the right wall 45C and has an entrance portion somewhat narrower than the thickness of the torsion bar and then widens into a holder portion a shape for encompassing the torsion bar cross-sectional shape and size.

[0023] The mounting part 33 is also provided with a top and bottom mounting opening 49A, 49B for fixing it to the door post or frame F.

[0024] The insert 35 of the second or frame bracket 31 is shaped to allow it to slide into the slot 41 of the mounting part 33 of the bracket 31.

The insert 35 is generally rectangular having a pair of grooved top and bottom walls 51A, 51 B, a left wall 51C , a right wall 51 D, a front or outer surface 53 and a rear or inner surface 55. The front or outer surface 55 of the

insert is the surface facing away from the stationary post or frame F when the mounting part 33 is fixed thereto and the insert 35 is present in slot 41 of the mounting part 33, and the rear or inner surface 55 of the insert 35 is facing the stationary frame when the mounting part is fixed thereto and the insert 35 is present in the slot 45 of the mounting part 33. A through bore 57 runs from the middle of the left wall 51C through the insert to the right wall 51 D, the bore 57 runs parallel to the top and bottom insert walls 51 A, 51B and is for accommodating the other foot 5,7 of the torsion member 1. The portion of the left wall 51C beneath entrance 57A of bore 57, comprises a longitudinal groove 59 destined to accommodate a portion of the torsion bar 3 of the torsion member 1 adjacent the foot to be held by the insert. The groove 59 is perpendicular to the bore 57 and the groove and bore connect at the bore entrance 57A. The groove 59 extends inwardly from the left wall 51C and has an entrance portion somewhat narrower than the thickness of the torsion bar and then widens into a holder portion a shape for encompassing the torsion bar cross-sectional shape and size. Thus after inserting the foot into the bore, the portion 3A of the torsion bar 3 adjacent the first foot 5 is pushed into the groove and snaps into the holder portion of the groove 59. This way the torsion bar 3 and the upper foot 5 are snugly held by the insert 35.

[0025] When one of the torsion bar feet 5,7 is held by the insert 35 and the insert 35 is accommodated in the mounting part 33, the groove 59 of left insert wall 49C, is in line with the groove 47 of bottom wing right wall 45D. Since the groove 47 of the bottom wing right wall 45D is shaped similar to the groove 59 of the insert 35, the portion of the torsion bar held by this groove is also snapped into the groove to be snugly held.

[0026] In order to provide for a good grip between the mounting part 33 and the insert 35 of the second bracket a bead 61 can be provided on one of the legs of the V-shaped top and bottom grooves adjacent the right insert wall 49D. A complementary snap groove (not shown in the drawings) can be provided in the adjacent V-leg of the top and bottom insert walls adjacent the left wall of the slot. Preferably such snap beads and snap grooves are located on the rear or inner side of the mounting part and insert.

[0027] Figures 4A-4E illustrate how the torsion member 1 and the first and second brackets 9,31 are installed to a screen door D and one of the door posts or frame members F to form the wing actuator system. 31.

Figure 4A is in a schematic representation of a partial view of a screen door D with side profile P with mounted thereon the first bracket 9 and a stationary door post or door frame member F with mounted thereon the second bracket 33 without the insert.

[0028] As can be seen the first bracket 9 is mounted with bar 23 in groove G of the door side profile P of the screen door. The door side profile P is the one that is being hingedly mounted to the door post. The hinges are not shown in the drawings, but the hinge axis runs parallel to the door side profile P and the door frame member F. In the embodiment shown in the figures 4A-4E the door D is mounted to hinge open in clockwise direction.

[0029] Of the mounted first bracket 9, the entrance to the indent 19 is visible as well as the groove 21 in the portion of the right wall 15D over the indent 19. Of the second bracket 31 the slot 41 is visible as well as the groove 47 in bottom wing right wall 45D.

[0030] In figures 4B-4E the screen door D is in the closed position and only the right walls 15, 43D, 45D of the first and bottom brackets 9, 31 are visible. Further are visible parts of the first bracket such as the indent 19 and its indent entrance 19A, and the upper groove 21 of the first bracket 9 and parts of the mounting element 33 of the second bracket 31 such as the slot entrance 41 D of the recess 41, and the bottom wing groove 47. The brackets are mounted in the plane to which the hinges would be mounted in the 'in the day' mount of the door, which is within the door post.

[0031] Figure 4B further shows, in front of the screen door D, the torsion member 1 and to the right thereof the insert 35 of the second bracket 31. The insert 35 is shown with its bore opening 57A directed towards the top foot 5 of the torsion member 1. Thus the left side wall 51C and the groove 59 are also directed to the top foot of the torsion member. The outer surface 53 of the insert 35 is facing away from the door D.

Figure 4C shows the insert mounted to the top foot 5 of the torsion bar 3 the top foot 5 having been inserted into the opening 57 in the left side wall 51. The portion of the torsion bar 3 adjacent top foot 5, is accommodated in the groove 59 below entrance 57A to bore 57 and does not stick out of the left side wall 51C of the insert 35.

In figure 4C the next step of the mounting sequence is shown by arrow A adjacent the bottom foot 7 of the torsion member. The bottom foot 7 of the torsion member 1 is inserted into the detent 19 of the first bracket 9, and the adjacent portion of the torsion bar is pushed into the groove 21 in the upper part of the left side wall 15D of the first bracket. In this step already the benefit of the invention to provide room for the tension member to move relative to the bracket is clear. The indent 19 allows the bottom foot 7 of the tension member and its bar 3 to move in vertical manner relative to the bracket along the groove 21, while the foot 7 is inserted into the indent 19.

Figure 4D shows the next step of rotating the insert 35 counter-clockwise in the direction of arrow B, thus preparing insertion into recess 41 of second bracket 33. Again by the indent allowing some movement of the direction of the groove 21, manipulation of the insert 35 becomes easier.

Figure 4E shows how after the rotation of the insert 35 is completed the left wall 51 D will be aligned with the entrance 41A of the recess 41 and a simple push in the direction of the arrow C will insert the insert and complete the process of mounting the torsion bar to the door. The left wall 51C now is aligned with the right bottom wing wall 45D and its groove 47. Thus the grooves 59 of the

insert and the groove 47 of the mounting part 33 of the second bracket 31 are aligned and a portion of the torsion bar 3 beneath the top foot 5 is held by these grooves. This step is also easier because of the manipulation room provided by the indent. Also the insert 35 being an element that is more easily held than a bare torsion bar foot, the manipulation is further facilitated.

[0032] The torsion member 1 is pre-tensioned by this manner of mounting. Subsequent clockwise rotation of the door D to open it, will cause clockwise rotation of the first bracket 9 and the torsion bar 3 relative to the second bracket 31. This will further tension the torsion member, such that when the door is released the force stored in the torsion member will act on the first bracket to rotate clockwise and thus to close the door and return the tension member to its previous state of pre-tension.

[0033] This invention is, of course, not limited to the above-described embodiment which may be modified without departing from the scope of the invention or sacrificing all of its advantages. In this regard, the terms in the foregoing description , such as "inner", "outer", "upper", "lower", "up", "down", "right", "left", "front", "rear", "top", "bottom", "outer", "inner", "above" or "below" have been used only as relative terms to describe the relationships of the various elements of the mounting profile of the invention as shown in the Figures.

[0034] For example the indent 19 can be a closed off channel like space which extends from the right wall 15C to the left wall 15D through the body of the bracket 9. Or when brackets are not used but holes as in GB ... the hole in either the door or the door frame can be an vertically positioned oblong hole.

[0035] Also different types of wings will require different shapes of the brackets. E.g. the first bracket 9 is provided with a bar 23 which specifically designed to mate to a groove in a screen door side profile. Different doors profiles, or different wing side will either require not bar at all or maybe a differently styled bar.

Also for mounting a door 'on-the-day' as opposed to 'in-the-day' in this example will change the bracket for the door post or door frame member F.

Claims

1. A wing actuator system for a hinged wing is provided having:

   - a torsion member (1) comprising an elongated torsion bar (3) and a first torsion bar foot (5) extending laterally from a first end of the torsion bar and a second torsion bar foot (7) extending laterally from a second end of the torsion bar; and
   - a pair of first and second mounting means (9,31) for securing the first torsion bar foot (5) to a. wing and the second torsion bar foot (7) to a wing frame member adjacent the wing and thereby extending the torsion member (1) between the two mounting means (9,31) in a first direction; and
   - wherein one of the first and second mounting means (9) is provided with a first receiving means (19) for receiving the first or second torsion bar feet (7) and which receiving means is arranged to allow displacement of the torsion member (1) relative to said mounting means (9) in said first direction.

2. The torsion bar wing closer system of claim 1 wherein the receiving means (19) is on the first mounting means (9) and the first mounting means is a first bracket (9) adapted to be mounted to a wing.

3. The torsion bar wing closer system of claim 2 wherein the first bracket comprises a base 11 having a top wall 15a, a bottom wall 15b, left wall 15c and a right wall 15d, and the receiving means (19) extends across the width of the base 11 from the left wall to the right wall.

4. The system of claim 3 wherein the receiving means is an indent 19 in a rear surface 17 of the bracket 9 and when the bracket is mounted to the wing, the rear surface 17 and the indent 19 are covered by the wing.

5. The system of claim 3 wherein the receiving means is a bore through the first bracket.

6. The system of any of the preceeding claims wherein the other of the first and second mounting means (31) comprises a mounting part (33) for fixing to one of the wing or wing frame member and an insert (35) engageable to the other of the first and second torsion bar feet (5), and wherein the mounting part (33) is adapted to hold the insert (35).

Fig.1.

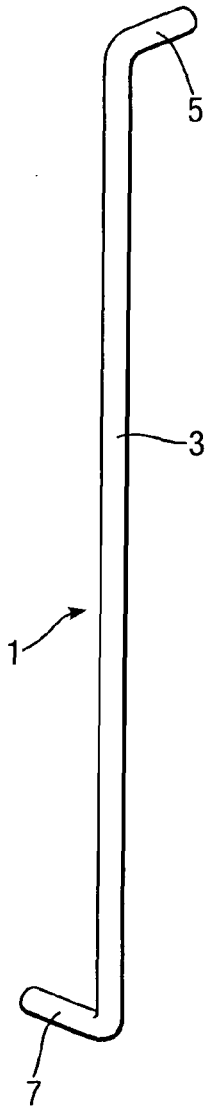


Fig.2A.

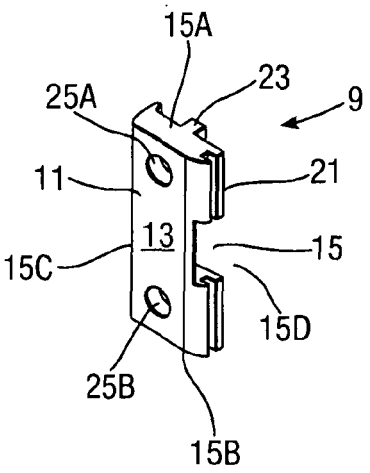


Fig.2B.

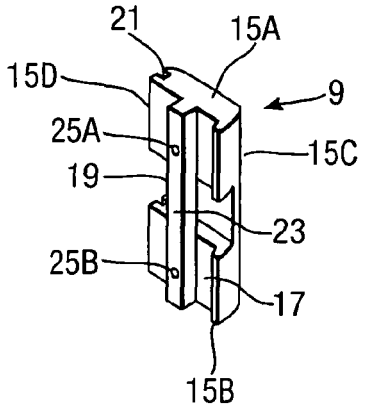


Fig.3.

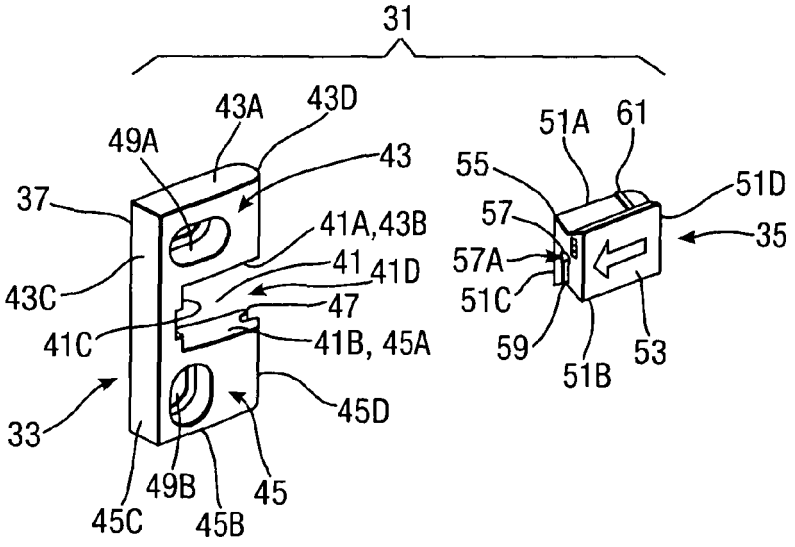


Fig.4A.

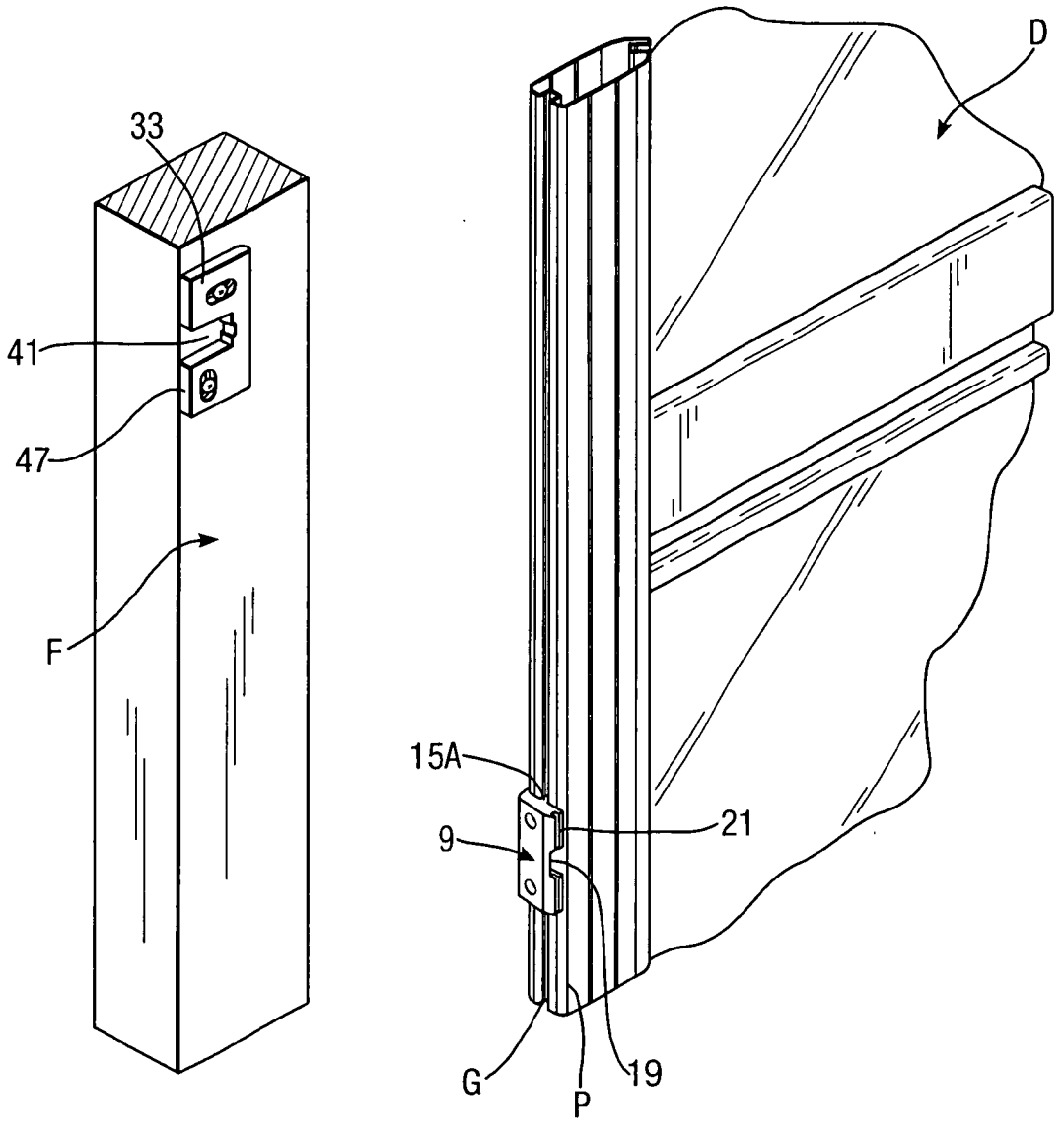


Fig.4B.

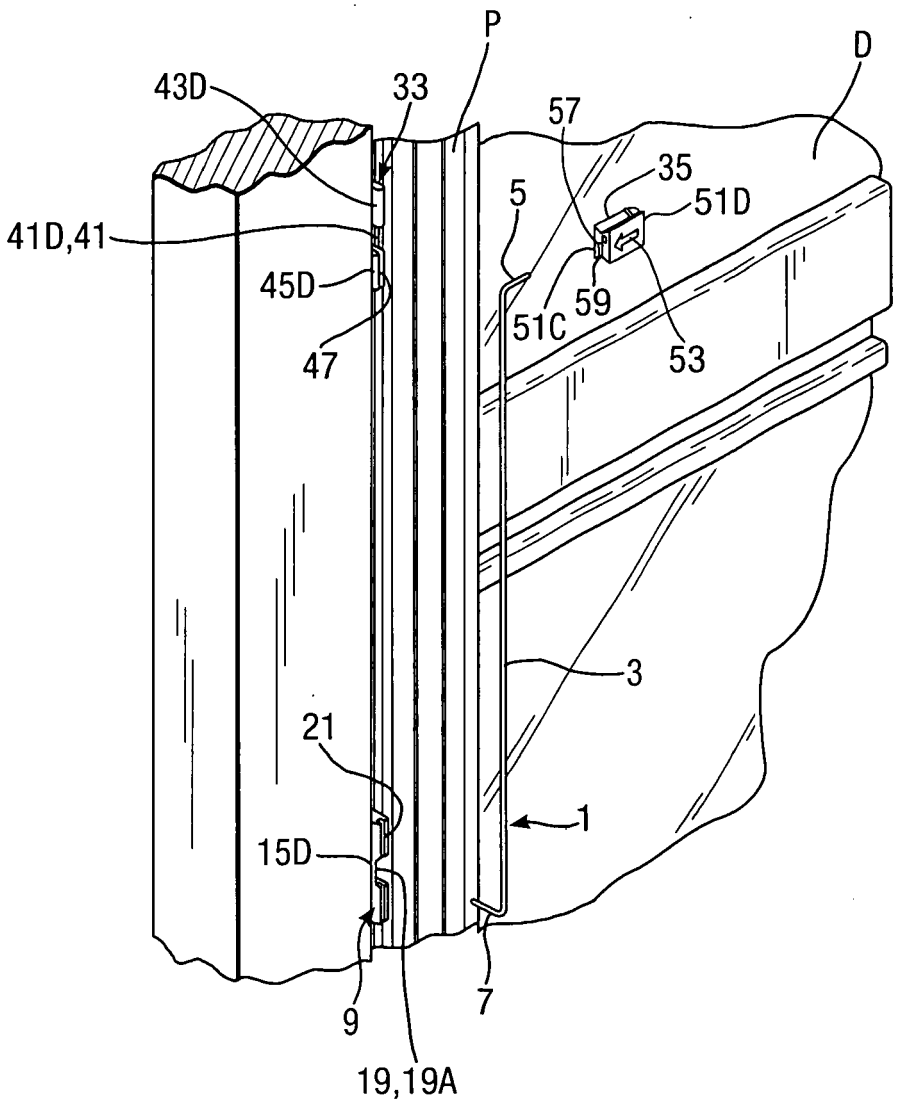


Fig.4C.

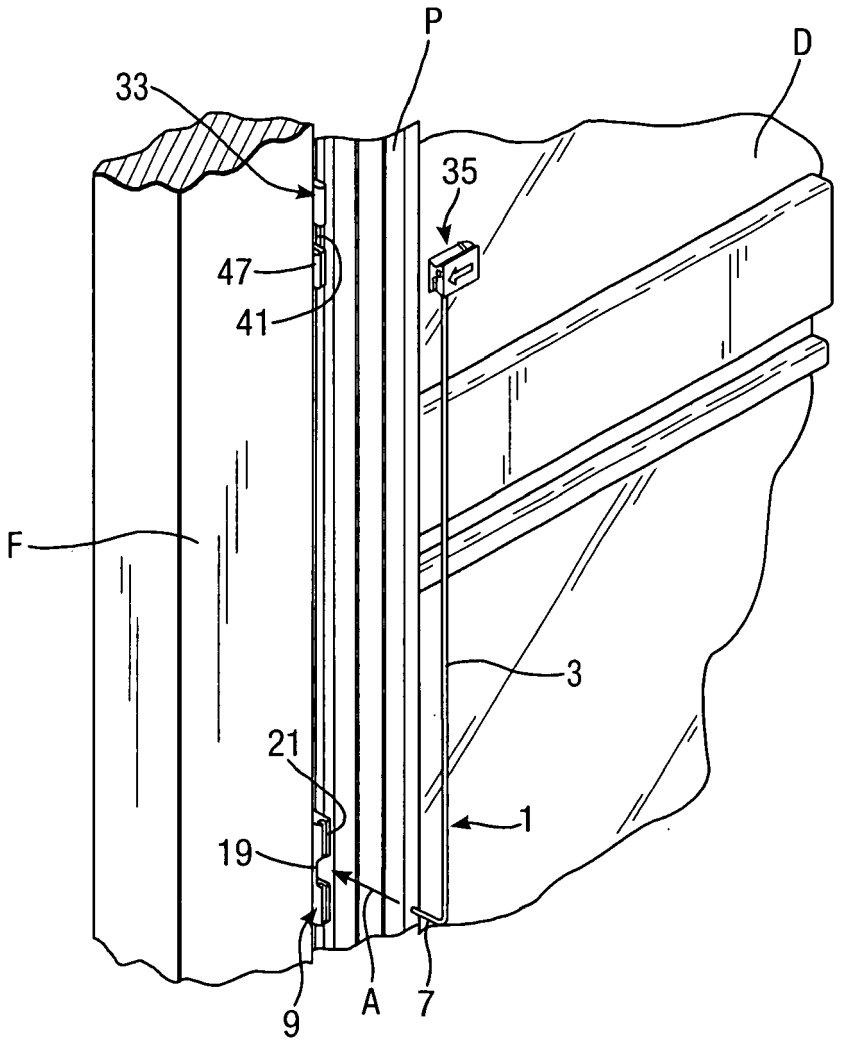


Fig.4D.

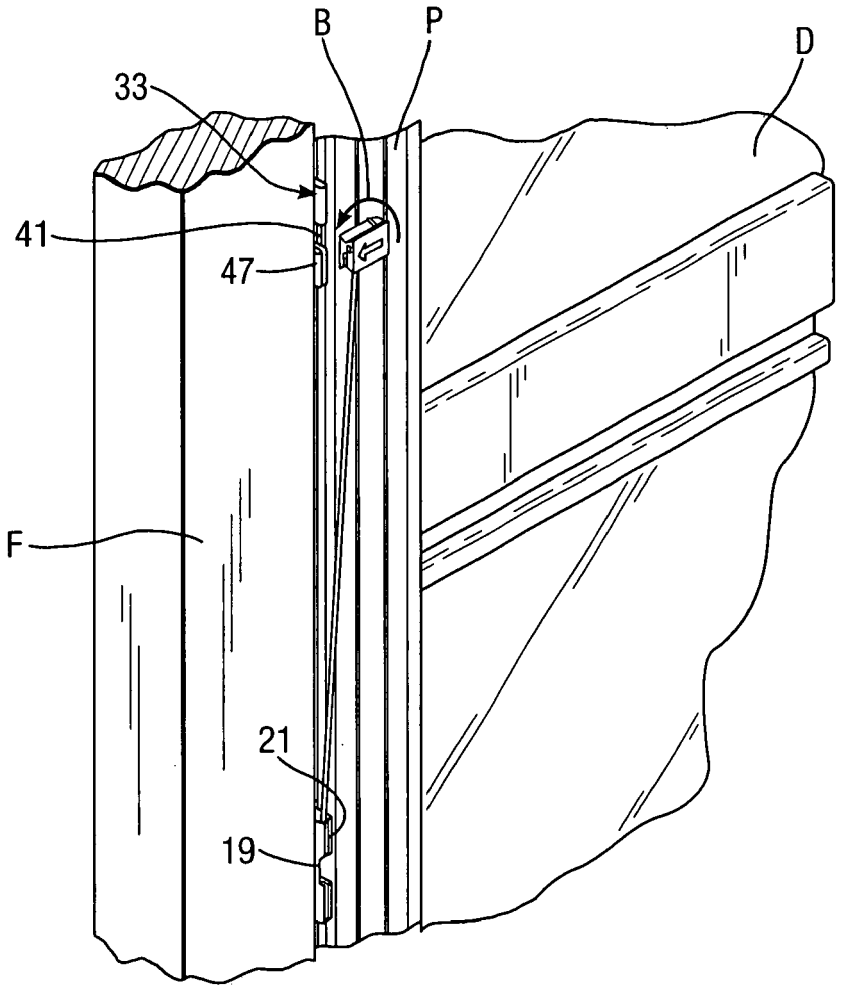
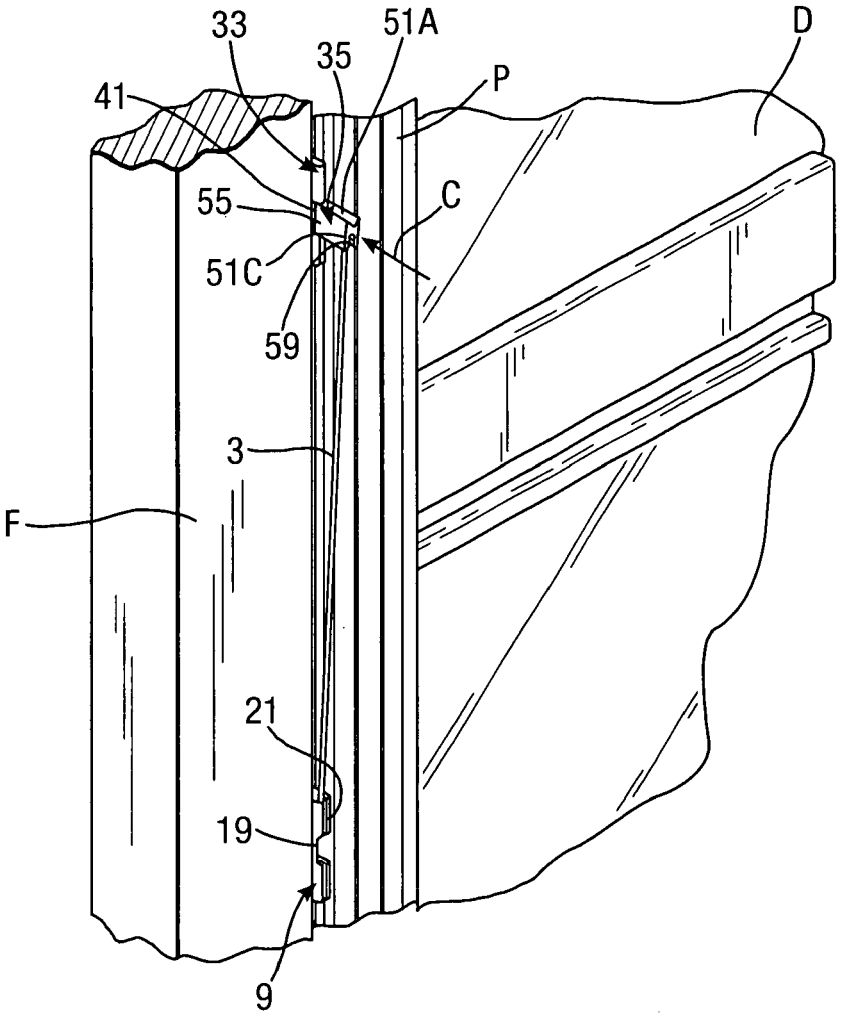


Fig.4E.



REFERENCES CITED IN THE DESCRIPTION

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