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(54) SLIDING WINDOW OR SLIDING DOOR

(71) We, YOSHIDA KOGYO K.K. a Japanese body corporate, of 1 Kanda Izumi-cho Chiyoda-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a sliding window or sliding door comprising a fixed, main frame and at least one horizontally slidable sash frame.

Horizontally sliding sash frames of a window or door are often fastened together in their closed positions by means of sash fasteners provided on meeting stiles of the sash frames. However, the sash fasteners may fasten the sash frames together but fail to provide complete air seals between the sash frames and the main frame. Many attempts have been made to cope with this problem.

One of these prior art attempts involves utilizing respective tracks formed on an upper frame member or head, and a lower frame member or sill of the main frame to bias upper and lower "rails" of the sash frames towards the inside or outside of the window into sealing engagement with the main frame. However, the tracks do not act upon the stiles, intermediate portions of which are most likely to be subjected to significant deflection due to the wind pressure or the like.

Accordingly, since the stiles of sash frames are liable to deflection there can not be achieved desired air sealing between vertical frame members or side jambs of the main frame and the stiles of the sash frames. The incomplete air sealing between the side jambs of the main frame and the stiles of the sash frames allows the ingress of rain water or wind therethrough, as well as leakage of air from indoors to outdoors.

According to the present invention, there is provided a sliding window or sliding door comprising a fixed, main frame, at least one horizontally slidable sash frame mounted in said main frame and a selectively operable device for locking the sash frame in a closed position with a stile of the sash frame closely adjacent a side jamb of the main frame and for simultaneously biasing the stile towards the indoors or outdoors side of the window or door so as to bring the stile into sealing engagement with a part of the side jamb, said device comprising a vertically extending slide bar disposed within said stile, an operating lever for sliding the slide bar linearly in a vertical direction and at least one means arranged to act between the side jamb and the slide bar so as to bias the slide bar and hence the stile towards the indoors or outdoors side of the window or door in response to sliding movement of the slide bar.

The invention will be described by way of example with reference to the accompanying drawings which indicate embodiments of the invention and in which:

Figure 1 is an elevational view of a sliding window with locking and biasing devices embodying the present invention;

Figure 2 is a longitudinal cross-sectional view taken along the line 2—2 of Figure 3;

Figure 3 is a longitudinal cross-sectional view taken along the line 3—3 of Figure 1;

Figure 4A is an enlarged perspective view showing how a slide bar and a biasing means of the locking and biasing devices of Figure 1 are assembled on a stile of the window;

Figure 4B is an enlarged perspective view showing how a biasing member of the biasing means works on a vertical frame member of a fixed frame;

Figure 5 is a view similar to Figure 2, showing another locking and biasing device which is provided on a sash frame located on an outdoor side;

Figure 6 is a longitudinal cross-sectional view taken along the line 6—6 of Figure 1;

Figure 7A is a view similar to Figure 4A but showing the embodiment of Figure 5;

Figure 7B is a view similar to Figure 4B but showing the embodiment of Figure 5;

Figure 8 is a transverse cross-sectional view of a toggle joint mechanism shown in Figure 2; and

Figure 9 is a transverse cross-sectional view taken along the line 9—9 of Figure 1.

Referring to Figure 1, two locking and biasing devices 10, 10′ are secured to a pair of

horizontally sliding sashes 14, 14' located within a fixed, main frame 12 of a window or door.

The main frame 12 includes an upper frame member or head 16 and a lower frame member or sill 18, both of which are equipped with tracks for guiding the sashes 14, 14', and a pair of vertical frame members or side jambs 20, 20' located at a right angle to the upper and lower members 16, 18. The sashes 14, 14' are slidingly located within the main window or door frame 12 on the indoor and outdoor sides, respectively.

Meeting stiles of the respective sash frames are equipped with known sash fasteners 24 for fastening both sashes 14, 14' together in their closed positions.

The locking and biasing devices 10, 10' are built into stiles 26, 26' of the sash frames of sashes 14, 14', these stiles being positioned on the sides opposite to the meeting stiles 22, 22' of the sash frames and abutting vertical frame members or side jambs 20, 20' of the main frame 12 in the closed positions of the sashes 14, 14'. Thus, the locking and biasing devices 10, 10' maintain air seals between the sash frames and the main frame 12 in the closed positions of the sashes.

The locking and biasing device 10 provided in the stile 26 of the sash frame of sash 14, positioned on the indoor side includes, as shown in Figures 2 and 3, a pair of vertically extending slide bars 28, 28 movable up and down along the stile 26 of the sash frame, a rotatable lever 32 linked to a toggle joint mechanism 30 for operating both slide bars 28, 28, and a respective biasing means 34 attached to each slide bar 28.

Both slide bars 28, 28 are coupled together through the medium of a coupling means 35. The coupling means 35 includes a casing 36 secured to the stile 26 and a connecting bar 38 which can slide relative to the casing 36. The opposite ends of the connecting bar 38 are coupled to the ends of the respective slide bars 28, 28 whilst the biasing means 34 is positioned in the neighbourhood of the other end of each slide bar 28. (In the drawing, only one biasing means is shown.) Elongate guide slots 40, 40 are provided in the upper and lower end portions or opposite end portions of the connecting bar 38, and fitted on guide pins 42, 42 which project from the casing 36. The connecting bar 38 is so loaded as to move upwards as viewed in the drawing, by means of a spring 38*a*, one end of which is connected to the casing 36, and the other end of which is connected to the connecting bar 38. As a result, the lower ends of the guide slots 40 provided in the connecting bar 38 normally abut the pins 42, as shown.

Furthermore, the aforesaid toggle joint mechanism 30 is provided between the connecting bar 38 and the casing 36.

As shown in Figures 2, 3 and 8, the toggle joint mechanism 30 comprises a crank 44 and a link member 44*a*. The crank 44 is rotatably supported on the casing 36 by means of a pivot which is integrally formed on one end portion of the crank 44, and also serves as a pivot for the lever 32. The link member 44*a* is pivoted at one end thereof to the other end of the crank 44 by means of a pin 45 whilst the member 44*a* is pivoted at its other end to the connecting bar 38 by means of a pin 45*a*.

Accordingly, the rotation of the rotatable lever 32 causes the pair of slide bars 28, 28 to slidingly move in the vertical direction or up and down along a straight line, the slide bars 28, 28 being coupled to the connecting bar 38 which in turn is connected to the toggle joint mechanism 30. In addition, the slide bars 28, 28 may be held in position, after the slide bars 28, 28 have been slidingly moved, by means of the toggle joint mechanism 30.

The connecting means 35 includes a safety locking means 46. The safety locking means 46 includes a locking lever 48 having a hook portion 48*a* at its tip, and a hole 50 provided in the connecting bar 38 and engageable with the hook portion 48*a*. The rear end (to the right in Fig. 2) of the locking lever 48 extends through the casing 36 and stile 26 and projects from the side surface of the stile 26, is opposed to the vertical frame member 20. The locking lever 48 is rotatably supported on its upper tip portion by the casing 36 through the medium of pin 42.

The locking lever 48 is biased rearwards by means of a spring 52, so that the locking lever 48 is in the position shown, relative to the stile 26, in any open position of the sash 14. As a result, the hook portion 48a is maintained in a condition to engage the hole 50, so that the connecting means, i.e., slide bars 28, 28 are prevented from moving downwards as viewed in the drawings.

When the sash 14 remains in its closed position, i.e., the stile 26 of the sash frame abuts the vertical frame member or side jamb 20 of the main frame 12, the locking lever 48 is subjected to a pressing force by the vertical frame member 20, so that the locking lever 48 is rotated about the pin 42, and hence the locking mechanism is maintained in a released condition. As a result, the slide bars 28, 28 are allowed to move downwards as viewed in the drawing.

The biasing means 34 includes; a grooved slide cam 56 secured to the slide bar 28 to move up and down therewith; a guide member 58 for guiding the slide cam 56 in the vertical direction, i.e., up and down, in response to the vertical movement of the slide bar 28; a biasing member 60 engaging said slide cam 56; and a guide member 62 (fixed in relation to the stile 26) for guiding the biasing member 60 for sliding movement in the transverse direction, i.e., in the indoor

and outdoor direction. The biasing means 34 is located on the stile 26 by means of an attaching plate 64 in a manner that part of the biasing member 60 can project from the side surface of the stile 26.

The front surface of the slide cam 56 is provided with an inclined guide groove 66 having an upward slope towards the outdoors as shown in Figure 4. A projecting portion 68 which can engage the guide groove 66 is formed on the biasing member 60. The biasing member 60 includes an abutting portion 70 extending along the indoor side-surface of a lip 68a formed on the vertical frame member or jamb 20, and positioned on the side opposite to the side of the projecting portion 68 of the biasing member 60.

Accordingly, when the slide bar 28 is lowered as viewed in the drawing, then the slide cam 56 is slidingly moved downwards in response thereto, so that the biasing member 60, having its projecting portion 68 in engagement with the inclined groove 66 in the slide cam, is moved in the transverse direction i.e., outdoors. As a result, the abutting portion 70 of the biasing member 60 presses the side surface of the lip 68a of the vertical frame member 20 in the outdoors direction.

Meanwhile, the locking and biasing device 10' of the stile 26' of the sash 14' on the outdoor side is of the same arrangement as that of the locking and biasing device 10, except for the biasing means 34A as shown in Figures 5 and 6. As shown in Figure 7, the biasing means 34A includes a slide cam 56A secured to a slide bar 28' (parts in Figures 5 and 6 identical or very similar to corresponding parts in Figures 2 to 4 have the same references but with a prime, e.g. 10 and 10'), a biasing member 60A engaging the slide cam 56A, and a guide member 62A adapted to guide the biasing member 60A in the transverse direction, i.e., indoors and outdoors. As in the preceding case, the biasing means 34A is secured to the stile 26' by means of an attaching plate 64A.

An inclined guide groove 66A having an upward gradient towards the outdoors is provided on the front end surface of the slide cam 56A. In addition, the biasing member 60A is formed with a projecting portion 68A engaging the guide groove 66A, thereby constituting a mechanism to change the direction of movement of the biasing member 60A in cooperation with the inclined guide groove 66A provided in the slide cam 56A. The biasing member 60A is formed with a pair of abutting portions 70A, 70A extending along the both side surfaces of a lip 68' formed on the vertical frame member or side jamb 20', on the side opposite to the side of a front portion of the biasing member 60A, i.e., on the side of the projecting portion 68A. The abutting portions 70A, 70A define a groove 72A therebetween so as to admit the lip 68' therein.

As in the case of the biasing means 34, when the slide bar 28' is moved downwards as viewed in the drawing, the slide cam 56A in slidingly moved downwards, so that the biasing member 60A engaging the slide cam presses the lip 68' in the transverse direction, i.e., towards outdoors by means of abutting portion 70A positioned on the indoor side.

As shown in Figure 9, using the locking and biasing devices 10, 10', after the sashes have been slidingly moved to their closed position and the sash fasteners 24 have fastened the sashes 14, 14' together, the levers 32, 32' are rotated downwards as shown by a phantom line in Figures 2 and 5.

The downward rotation of the rotatable lever 32 causes the slide bar 28 to slidingly move downwards. When the slide bar 28 is slidingly moved downwards, the slide cam 56 is moved, and then the biasing member 60 slides in the outdoor direction in cooperation and engagement with the slide cam 56, while being guided by the guide grove 66, thereby abutting the indoor side-surface of the lip 68. When the rotatable lever 32 is rotated further downwards, then the biasing member 60 presses the lip 68. In other words, a force acting on the lip 68 by means of the biasing member 60 causes the indoor fitting 14 to be biased in the indoor direction by means of the lip 68 serving as a reaction member. Accordingly, as shown in Figure 9, the inner surface of the flange 74 of the sash 14, which is provided on the indoor side, is forced against the lip 68 of the fixed frame 12. In this case, a seal member made of a foam resin may be positioned on the abutting surface of the lip 68 on the flange 74, thereby improving the air-tightness between the sash 14 and the fixed frame 12.

On the other hand, when the rotatable lever 32' provided on the outdoor sash 14' is rotated, and hence the slide bar 28' is slidingly moved downwards, then the biasing member 60A is slidingly moved in the outdoor direction to abut and press the inner surface of the lip 68'. When the rotatable lever 32' is rotated further downwards, then a force acting on the lip 68' by means of the biasing member 60A causes the outdoor sash 14' to be biased in the indoor direction by means of the lip 68' which serves as a reaction member. As a result, the indoor side surface of the flange 74' provided on the sash 14' on the indoor side is forced against the lip 68'. In this case, as well, a seal member 76' should preferably be provided between the flange 74' and the lip 68' for improving the air seal therebetween.

The biasing means 34, 34A are different in construction. However, either biasing means 34 or 34A may be used for the indoor and

outdoor sashes 14, 14'. In this case, the attaching positions of the seal member 76 or 76' may be changed.

In addition, the biasing means 34, 34A are so designed as to change primary linear movements of the slide bars 28, 28' into secondary linear movements at right angles to the primary linear movements with the aid of the guide grooves 66, 66A in the slide cams 56, 56A. Alternatively, there may be used an eccentric cam which effects a circular movement or other rack pinion.

As is apparent from the foregoing description of the locking and biasing devices, when the slide bar is slidingly moved in the vertical direction, the biasing member acts on the stile of the sash by means of a lip provided on the abutting surface of the stile and serving as a reaction member, so that the sash is biased against a fixed frame member or side jamb, or a seal member attached to the stile. This can seal a clearance between the sash and the fixed frame completely, thereby maintaining a desired air-seal therebetween.

In addition, the force to bias the sash acts on the stile of the sash, so that the vertically intermediate portion of the sash which is most likely to be deflected, may be reinforced by the aforesaid force, thereby increasing the strength of the sash against the pressure of wind.

Furthermore, the locking and biasing device may be used for sashes having varying heights, without changing the length of the slide bar. Still furthermore, by selecting the length of the slide bar suitably, the biasing means may be positioned in a suitable position to reinforce the portion of the sash which is most likely to be deflected under the pressure of wind. Thus, the strength and airtightness of sashes may be further improved.

WHAT WE CLAIM IS:—

1. A sliding window or sliding door comprising a fixed, main frame, at least one horizontally slidable sash frame mounted in said main frame and a selectively operable device for locking the sash frame in a closed position with a stile of the sash frame closely adjacent a side jamb of the main frame and for simultaneously biasing the stile towards the indoors or outdoors side of the window or door so as to bring the stile into sealing engagement with a part of the side jamb, said device comprising a vertically extending slide bar disposed within said stile, an operating lever for sliding the slide bar linearly in a vertical direction and at least one means arranged to act between the side jamb and the slide bar so as to to bias the slide bar and hence the stile towards the indoors or outdoors side of the window or door in response to sliding movement of the slide bar.

2. A window or door as claimed in claim 1 wherein the or each said means comprises a camming device having a camming surface sloping upwardly towards the indoors or outdoors side of the window or door.

3. A window or door as claimed in claim 1 wherein the or each said means comprises a pair of members mounted respectively on the stile and on the side jamb, a rib of one member being engageable in a groove in the other member, the rib and the groove both sloping upwardly towards the indoors or outdoors side of the window or door.

4. A window or door as claimed in claim 1, 2 or 3 wherein the or each said means is disposed intermediate the levels of the operating lever and the top or bottom of the sash frame.

5. A window or door as claimed in claim 1, 2, or 3 wherein two said means are disposed one intermediate the levels of the operating lever and the top of the sash frame and the other intermediate the levels of the operating lever and the bottom of the sash frame.

6. A window or door as claimed in any preceding claim wherein said part of the side jamb is a vertically extending lip.

7. A window or door as claimed in any preceding claim wherein said lever is a rotatable lever having a pivot and there is provided a toggle joint mechanism for converting rotational movement of said lever into the linear movement of said slide bar.

8. A window or door as claimed in claim 7 wherein said toggle joint mechanism comprises a crank and a link member.

9. A window or door as claimed in any preceding claim wherein said lever can be locked by means of safety means.

10. A window or door as claimed in any preceding claim wherein a sealing member is provided on a side surface of said part of the side jamb.

11. A sliding window or sliding door substantially as described with reference to and as illustrated in the accompanying drawings.

MARKS & CLERK.

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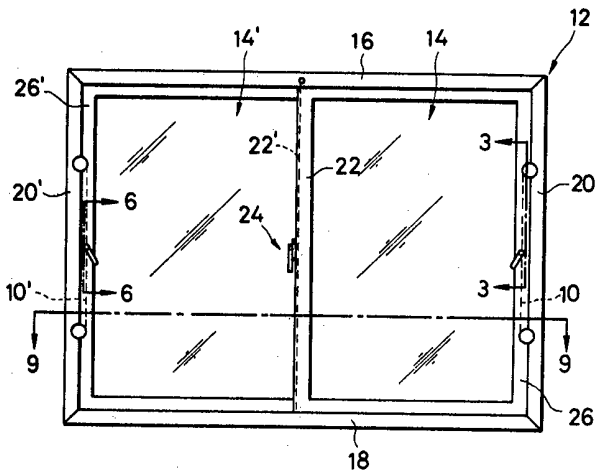
F I G. 1



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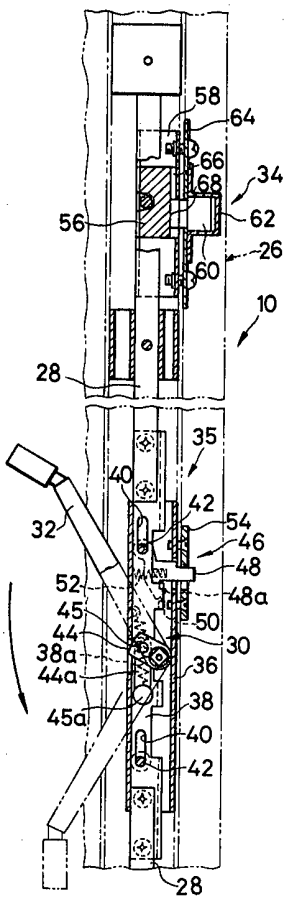

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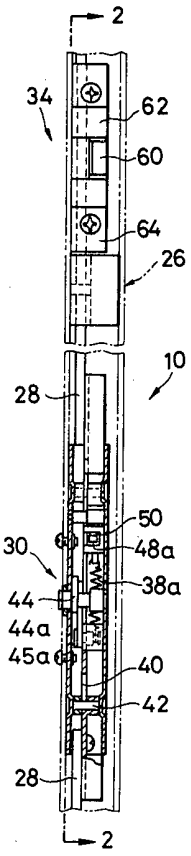

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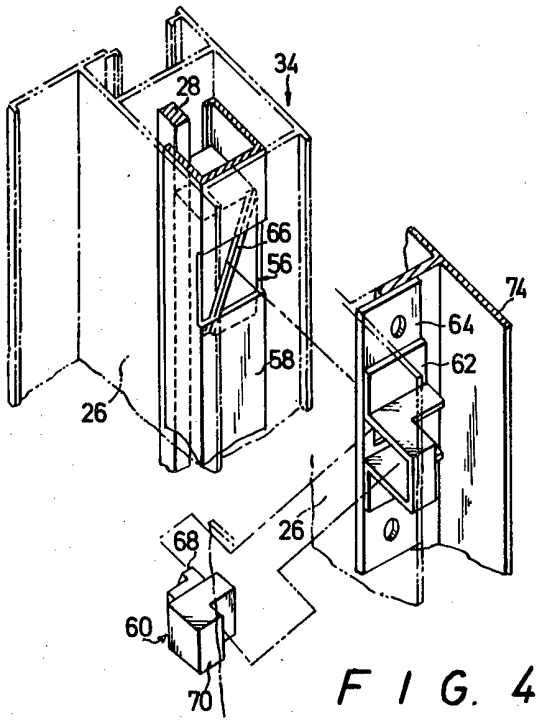

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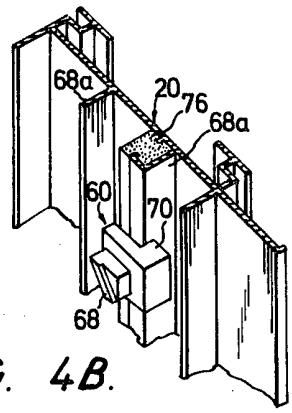

F I G. 4B.

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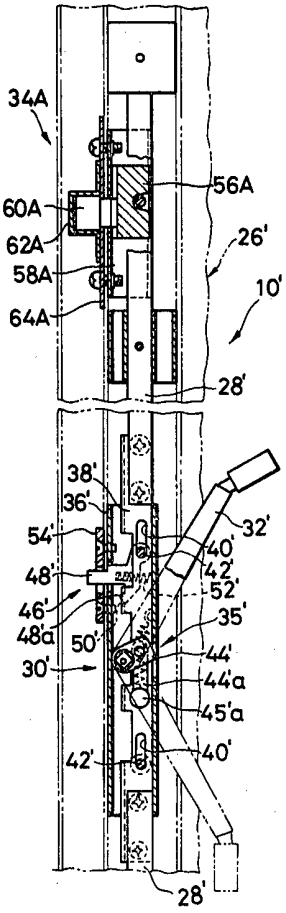
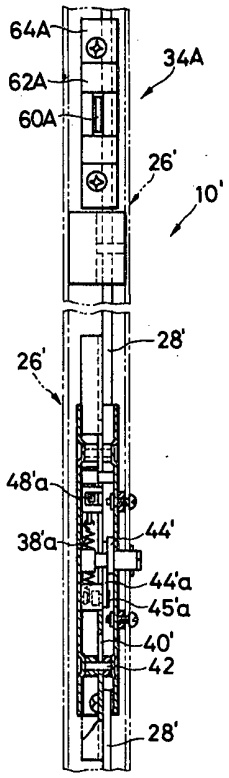
F I G. 5



F I G. 6



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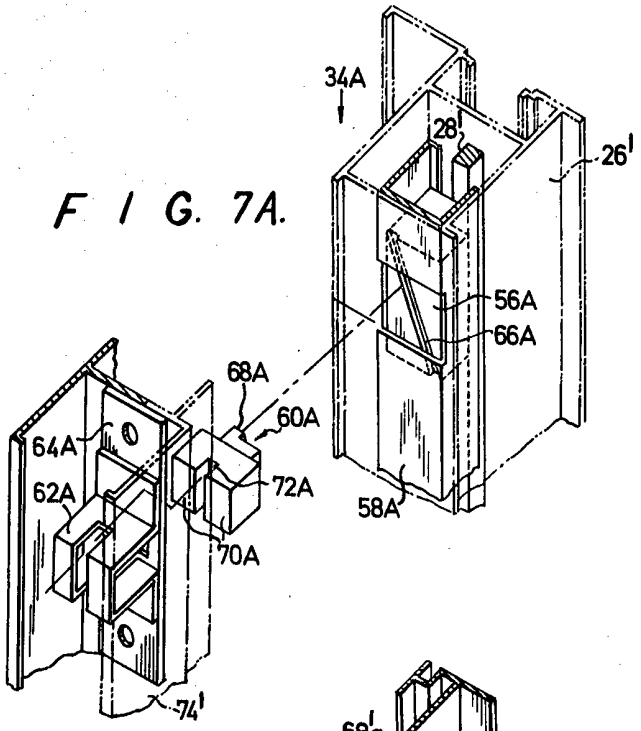

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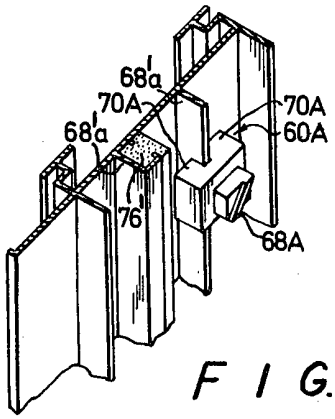

F I G. 7B.

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FIG. 8

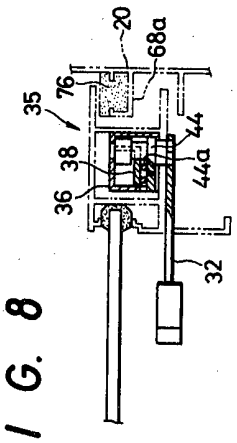

FIG. 9