May 6, 1969 W. O. JOHNSON ET AL 3,442,051

CONTROLLED POSITION SLIDING DOOR, WINDOW, PANEL OR THE LIKE

Filed Aug. 3, 1967 Sheet 1 of 3

FIG. 1

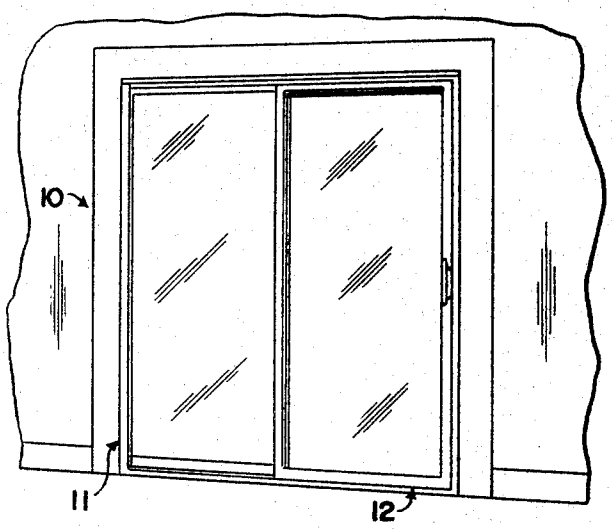
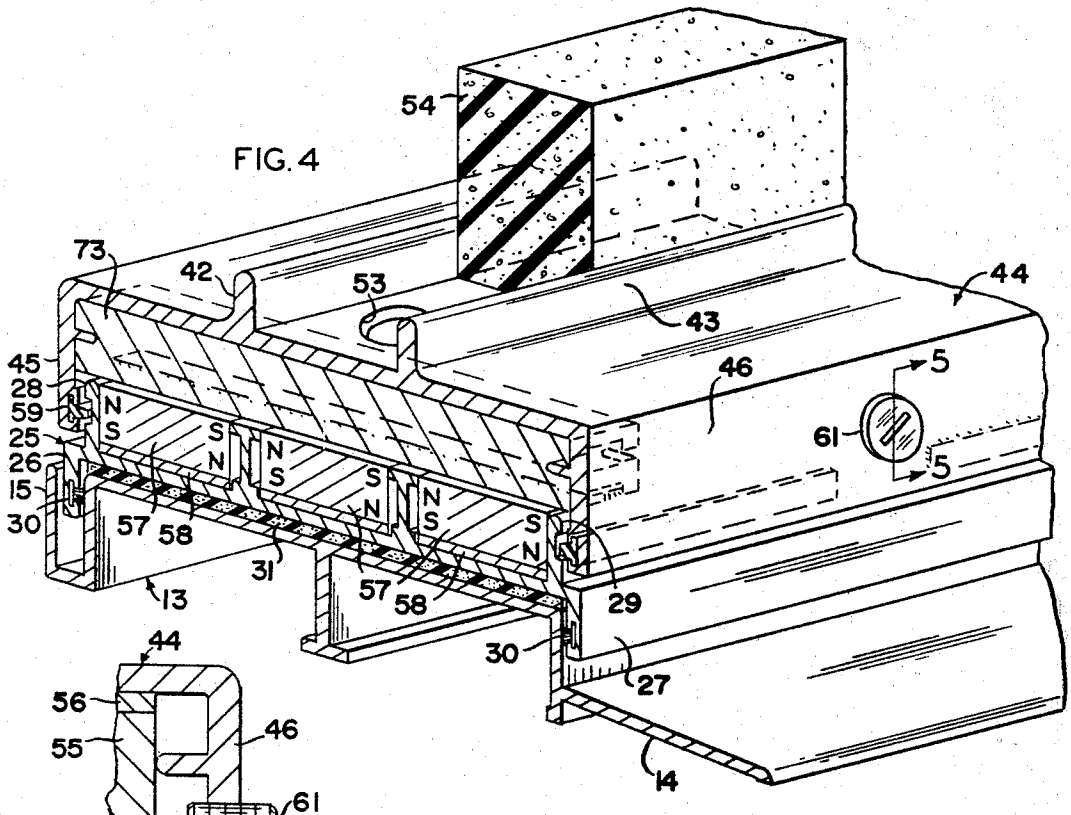


FIG. 4



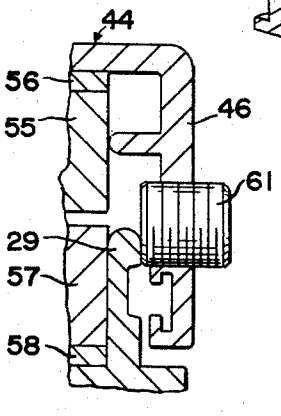


FIG. 5

INVENTORS
WALDO O. JOHNSON
JAMES E. SHACKLETTE
BY
Oldham & Oldham
ATTORNEYS.

May 6, 1969 W. O. JOHNSON ET AL 3,442,051

CONTROLLED POSITION SLIDING DOOR, WINDOW, PANEL OR THE LIKE

Filed Aug. 3, 1967 Sheet 2 of 3

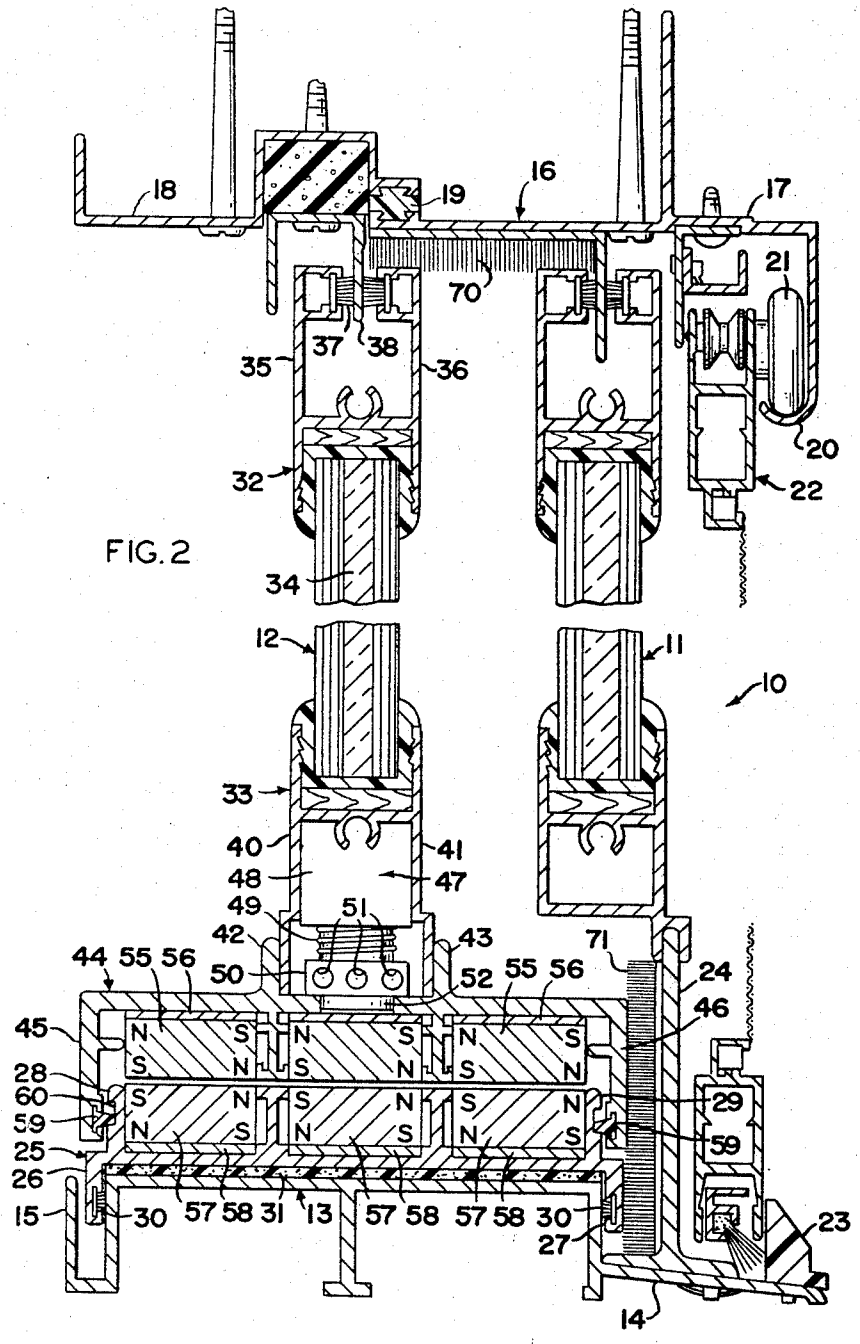


FIG. 2

INVENTORS
WALDO O. JOHNSON
JAMES E. SHACKLETTE

BY

Oldham & Oldham

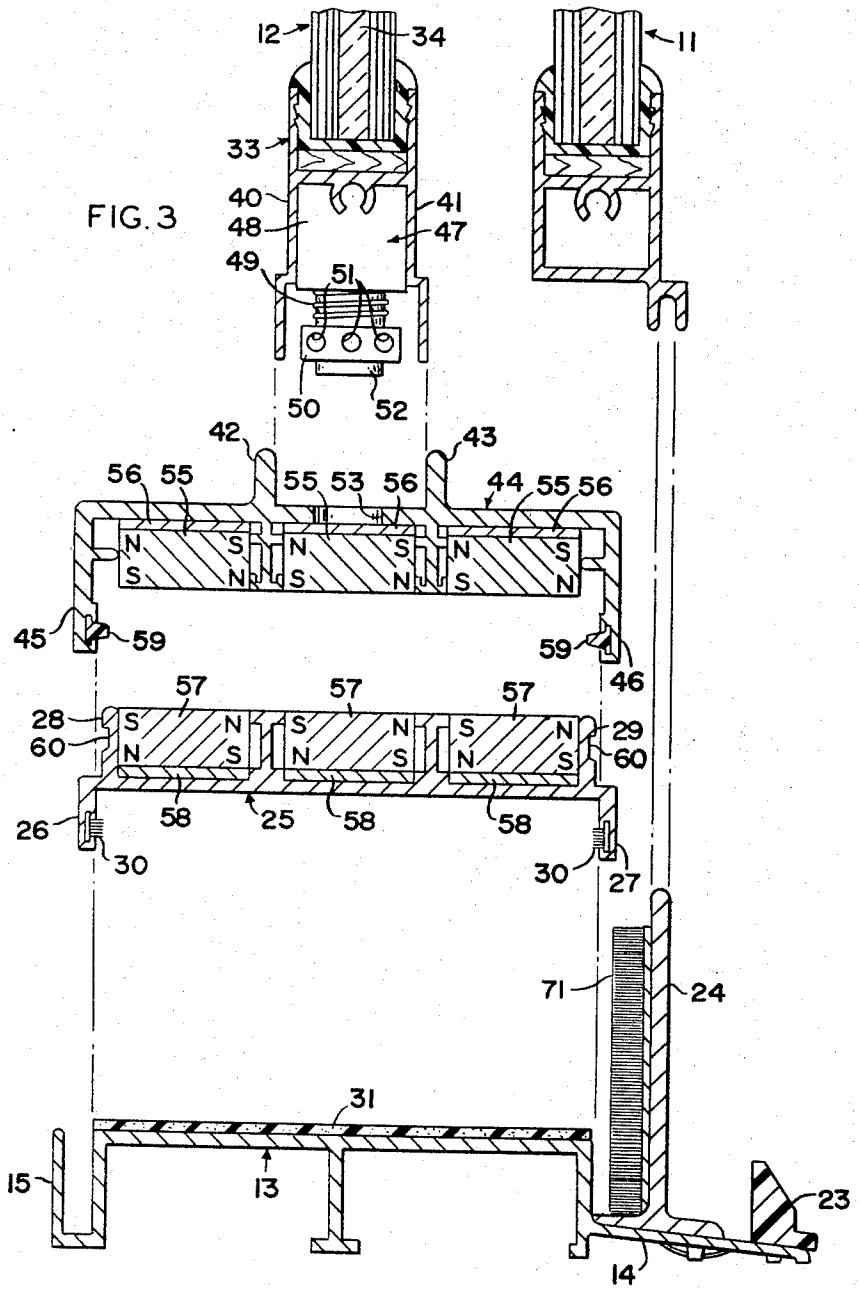
ATTORNEYS.

May 6, 1969 W. O. JOHNSON ET AL 3,442,051

CONTROLLED POSITION SLIDING DOOR, WINDOW, PANEL OR THE LIKE

Filed Aug. 3, 1967 Sheet 3 of 3

FIG. 3



INVENTORS
WALDO O. JOHNSON
JAMES E. SHACKLETTE

BY

Oldham & Oldham

ATTORNEYS.

United States Patent Office 3,442,051 Patented May 6, 1969

3,442,051

CONTROLLED POSITION SLIDING DOOR, WINDOW, PANEL OR THE LIKE

Waldo O. Johnson, Wooster, and James E. Shacklette, Barberton, Ohio, assignors to Weather-Seal, Inc., Barberton, Ohio

Filed Aug. 3, 1967, Ser. No. 658,211
Int. Cl. E05d 15/06, 13/00; E06b 7/10
U.S. Cl. 49—414 9 Claims

ABSTRACT OF THE DISCLOSURE

In this invention, a magnetically supported panel, door, etc. has adjustment positioning means associated therewith for maintaining a "floated" closure unit in a central position on its mounting means, and to square or adjust the door to its particular frame positioning means.

This invention relates to the adjustment in and control of the position of a magnetically supported door, window unit, panel, or the like, and wherein a support plate or sill is provided and it has a "floating" support sill carried thereby and means are provided for adjustment of the parts in the door and frame assembly with relationship to each other.

Heretofore it has been proposed in Waldo Johnson's co-pending United States patent application Ser. No. 551,005 to float or support a window, door, panel, or the like in a frame means by magnetic repulsion action. It has been found that doors can be positioned in frame means by a magnetic "floating" principle, but it is difficult to keep such doors in the best positions for very low friction movement in the frame means provided.

The general object of the present invention is to provide novel and improved means for adjustably or controllably positioning a door, window, or the like in an associated frame means for smooth, effective support action thereby.

Yet another object of the invention is to provide members in a door or panel unit wherein the support shoe, or member by which the door is supported can be adjusted with relation to the door, and wherein the shoe can be adjusted in relation to a floating sill, or equivalent member, on which the door is positioned.

Further objects of the invention are to provide a relatively heavy sliding door, panel, window or the like assembly wherein the glass means in the unit is removably engaged with a support shoe; to provide a panel unit which has a resilient load transfer means provided intermediate the bottom edge of the glass and its bottom rail; to provide low friction guide means to aid in providing sliding engagement between a panel support means and a floating sill or other bottom frame support member in the panel assembly; to provide positively controlled vertical adjustment means positioning a panel on its support shoe and wherein a pair of such support means are provided adjacent the bottom corners of the panel and are accessible in the door or panel unit as operatively positioned for convenient adjustment in position of the panel on its support shoe; and to provide convenient means by which a panel unit can be properly and tightly assembled in an existing door frame or other means even though such frame is slightly out of square.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

Attention now is particularly directed to the details of the unit shown in the drawings, and wherein:

FIG. 1 is a perspective view of a typical sliding door or panel unit embodying the principles of the invention;

FIG. 2 is an enlarged, fragmentary, vertical section of

the window or door assembly of FIG. 1 taken when the movable door is laterally overlapped with the fixedly positioned door in the assembly;

FIG. 3 is an exploded view of the bottom portions of the panel assembly of FIG. 2 and showing such members as provided ready for assembly;

FIG. 4 is an enlarged, fragmentary perspective shown in vertical section at one portion thereof, of one end of a support shoe for the panel and its operative engagement with the bottom support means in the door assembly; and

FIG. 5 is an enlarged, fragmentary vertical section taken on line 5—5 of FIG. 4.

When referring to corresponding members shown in the drawings and referred to in the specification, corresponding numerals are used to facilitate comparison therebetween.

With reference to the details of the structure shown in FIG. 1, a sliding door or panel assembly is indicated as a whole by the numeral **10**. The present invention relates to any desired assembly of a door, window, panel, or the like, where it is positioned in some type of a frame means and wherein usually one fixed panel is provided and one panel is slidably positioned. The term "panel" is used in the specification and claims as referring to any suitable member positioned for sliding action in a control frame, or other equivalent means. Specifically, in the drawings, a fixed panel **11** is provided and a slidable panel **12** is shown.

FIG. 2 of the drawings best shows that the frame means in this instance comprises a fixed or bottom sill **13** that may have an outwardly extending flange **14** formed on the portion thereof to be placed on the outside of the building unit in which the assembly **10** is positioned. The sill **13** can be engaged with any conventional frame or support means, as desired. On the inner edge or margin of the fixed sill **13**, usually an upwardly open channel **15** is provided and which can have a carpet or other means abutted against the innermost margin thereof, as desired.

In order to position the slidable panel **12** for movement in the frame means, we prefer to use a magnetically supported means or action for the panel **12** so that such panel is "floated" in the assembly on the same general type of a construction as shown in the co-pending United States patent application in the name of Waldo O. Johnson under Ser. No. 551,005. Thus, we now provide a floating sill **25** that has a pair of longitudinally extending dependent flanges **26** and **27** thereon and a pair of upwardly extending flanges **28** and **29** extending longitudinally thereof.

The upper portion of the frame means in which the panels are positioned may comprise a top member which includes an outermost section and an inner section and wherein the top members, indicated as a whole by the number **16**, and the outer section is represented by the number **17**, and the inner section is **18**. In order to prevent the conduction of heat and cold from the outer section **17** to the inner section **18**, a pair of dovetail shaped recesses are provided in vertically opposed portions of these frame means and a suitably contoured plastic insulating strip or runner **19** is engaged with these opposed dovetail shaped recesses to secure the top section components together but to prevent heat or cold transfer therebetween. The outer section **17** has a dependent J-shaped flange **20** thereon for engaging a roller **21** suitably attached to a screen **22** whereby the screen **22** is positioned for sliding movement in the frame means to close the opening formed when the movable panel **12** is moved to expose some of the opening which the door or panel assembly **10** provides. A guide strip **23** is normally secured to the sill flange **14** to aid in guiding movement of the screen **22** and retain it in proper position in the assembly while an inner vertically extending flange **24** or upright is suitably secured to the sill **13** to prevent un-

desired inward movement of the screen 22 and to provide a support for the lower margin of the fixed panel 11 in the panel assembly 10.

In general, the panel assembly 10 as described hereinbefore is substantially of conventional construction and the novel portion of the present invention particularly relates to the slidable or movable panel 12 and to the details of support and positioning thereof.

Such sill means, or "floating" sill 25 is carried by and positioned on the bottom sill 13, as by having the dependent lateral flanges 26 and 27 telescope into engagement with associated portions of the bottom sill. Normally conventional weather stripping means 30 are carried by each of the flanges 26 and 27 on their inner surfaces for contact with the adjacent surfaces on the bottom sill to make the assembly of the slidable panel 12 with the frame substantially airtight at this connection. Usually, it is desired to provide some means, such as a thin resilient pad or layer 31, intermediate the upper surface of the bottom sill 13 and the effective lower surface of the floating sill 25 for supporting such sill 25 in a slightly adjustable resilient, vertical position with relation to the bottom sill 13 and this resilient support of the floating sill 25 aids in permitting the sill 25 to take a substantially horizontal position at all times even though the bottom sill may be slightly out of a horizontal position or plane on its upper support surface.

The slidable panel 12 is shown in the drawings with an upper rail 32 and a bottom rail 33. Some suitable member, usually glass or an insulated glass sheet or pane 34 is provided and is suitably attached to the upper and bottom or lower rails 32 and 33 for positioning the slidable sash in the panel assembly 10. Any suitable vertical extending edge members or rails are usually provided for the slidable panel 12 normally to complete a frame means thereabout. The upper rail 32 normally engages some means operably carried by the frame for the assembly 10 and in this instance, the upper sash rail 32 is shown as having a pair of laterally spaced vertically upwardly extending legs 35 and 36 which may carry suitable weather stripping means 37 thereon to engage a dependent flange 38 which normally is resiliently and operably carried by the top portion of the frame of the assembly 10 whereby the slidable panel 12 is engaged with such flange 39 and its associated member for controlled or guided sliding movement only in a horizontal plane but with some limited vertical movement being permitted usually between the slidable panel 12 and the frame means provided therefor. The lower or bottom rail 33 has a pair of laterally spaced vertically downwardly directed edge flanges 40 and 41 which are snugly received and usually have some slight frictional engagement with a pair of vertically upwardly extending flanges 42 and 43 provided on a shoe 44. This shoe or bottom support rail 44, when the components of the assembly 10 are operatively engaged, is then adapted to provide a supporting action for the slidable panel 12 in association with other means to be described hereinafter in more detail. It should be noted that the sills and the shoe 44 normally are made from a non-magnetic metallic material, such as wood or aluminum, and such shoe has a pair of downwardly extending edge flanges 45 and 46 which are designed so as to overlap laterally and vertically the upper portions of the upwardly extending flanges 28 and 29 provided on the floating sill 25, all for a purpose to be described hereinafter in more detail.

FIG. 3 best shows that the bottom rail 33 removably engages the shoe 44, and a pair of vertically adjustable support means 47 are provided at or adjacent the lateral margins of the slidable panel 12, and particularly adjacent the ends of the bottom rail 33. Each of these vertically adjustable support means may comprise a support 48 that is suitably fixedly secured between the edge flanges 40 and 41 and which receive in a tapped vertically extending bore therein a threaded stud 49. Such threaded stud 49 carries a suitable control nut or ring 50 in a fixed vertical position thereon, which nut 50 is provided with a plurality of radially inwardly extending, circumferentially spaced holes or bores 51 for receiving a suitable tool by which the nut 50 can be engaged for turning the stud 49 in relation to the block 48. Hence, the vertical position of the lower end of the stud 49, which normally is of a reduced diameter as indicated at 52, and which is adapted to seat in a suitable recess or hole 53 provided in the upper surface of the shoe 44 can be varied to change the angular relation of the panel 12 to the shoe. Thus, the vertically adjustable means 47 aid in maintaining the shoe 44 and bottom rail 33 in fixed association with each other and prevent any relative movement therebetween as the vertically adjustable support means 47 hence transmit most of the load carried by the bottom rail 33 onto the shoe 44 for supporting the slidable panel 12 in the window assembly 10. FIG. 3 indicates that these control nuts 50 are exposed at the lateral margins of the slidable panel 12 to adjust the vertical positioning thereof and hence controlling the vertical or angular relationship of the glass panel 34 and means carried thereby with relation to the position of the shoe 44 on the floating sill 25, as described hereinafter in some further detail. In order to prevent the shoe 44 from being bent out of its normal flat or straight shape by the application of load only to the end portions thereof by the support means 47, preferably there is provided a block or pad 54 of resilient material that is positioned intermediate the edge flanges 42 and 43 of the shoe and engages the bottom rail 33 intermediate the ends thereof for load transfer to the shoe 44 at a central area thereof. Such block 54 can be made of any suitable height and length and from any suitable material such as foamed polyurethane, cellular rubber, or the like, so that the vertical positioning of the bottom rail 33 and means carried thereby can still be varied with relation to the shoe 44 by the end supports 47 but with some load transfer to the shoe being effected intermediate such support means 47, as well. FIG. 4 shows such block positioned adjacent an end of the shoe 44 but normally the block would be spaced appreciably from the panel and shoe ends. For example, a block of neoprene sponge about 12 to 14 inches long would be placed centered on a shoe, for example, about 48 inches long.

As has been previously indicated, the shoe 44 and slidable panel 12 of which such shoe is a part is adapted to be magnetically floated in the assembly 10. Hence, a plurality of elongate permanent magnets 55, FIG. 3, are shown suitably secured to and carried by the shoe 44 on the lower surface thereof. Preferably these magnets 55 each have a pair of elongate north and south poles provided therein and extending the length thereof. These magnets 55 can be made from conventional materials by known processes and usually each magnet strip 55 is flexible and has a metal backing strip 56. If desired, these magnets 55 can extend the effective length of the shoe 44, or if desired, a number of parallel elongate magnets of the same general construction can be used but one continuous flexible magnetic strip may be used, dependent upon the load to be supported. Other permanent magnets can be used in place of the magnets 55, as desired, but preferably some type of a permanent magnet means is provided and is suitably secured to the shoe 44 to be positioned on an exposed lower surface area thereof. The companion magnetic action for supporting the shoe 44 and means carried thereby is provided by a plurality of elongate permanent magnetic strips 57 that are suitably secured to and extend longitudinally of the floating sill 25 at the upper portion thereof. These magnets 55 also have metal backing strips or plates 58 on their lower surfaces so that again permanent elongate poles are provided which normally extend the effective length of the magnets 57 which normally would be the exposed length of the floating sill 25. It will be realized that the magnets 55 and 57 should be of equal strength and be provided in equal numbers on the shoe 44 and floating sill 25 whereby they can be positioned in

immediately adjacent relationship and have like poles positioned immediately adjacent each other. By predetermined calculations, the weight supported by the shoe **44** can be determined and the number of and length of the magnets **55** and **57** required to "float" the shoe **44** and means supported thereby can be determined. Hence, a plurality of the magnet strips can be positioned in adjacent parallel relationship as shown in the drawings, or when lighter windows, panels, doors or the like are provided in the assembly, then possibly only one or two of the magnet strips would be required on each component.

The strength of the magnets **55** and **57** can be varied by varying the mass of magnetic material carried thereby, and the thickness and/or width of the magnet strips can be changed, while the strength of the strips can be further controlled by the processing to which they are subjected in permanently magnetizing the strips and any suitable metallic or other particles embedded therein to provide the desired permanent magnetization action in the magnet strips.

It will be realized that even though extreme care is taken in the production of the magnet strips **55** and **57**, in some instances, the magnetic poles provided therein may not be exactly equal in strength. Hence, in some instances, there may be some lateral deflective forces provided in the panel assembly as shown and some lateral rubbing may occur between the dependent edge flanges **45** and **46** of the shoe **44** and the associated upwardly extending flanges **28** and **29** of the floating sill **25**. Thus, we partially control such lateral forces by the provision of a plurality of low friction, plastic guide strips **59** that are carried by the lower ends of the flanges **45** and **46** to provide a guide action by engaging an associated groove **60** formed in each of the laterally outer surfaces of the upwardly extending flanges **28** and **29**. Several of the strips **59** each about 4 inches long may be carried at spaced portions of the flanges **45** and **46**.

As a further feature of the present invention, and to provide a positively controlled relationship between the shoe **44** (and means carried thereby) and the floating sill **25**, a plurality of low friction plastic guide means, such as set screws **61**, FIGS. 4 and 5, are operatively engaged with threaded recesses provided in the dependent shoe flanges **45** and **46** adjacent but usually slightly spaced from the end of the flange. These low friction studs or set screws, or equivalent means, are adapted to extend through the flanges **45** and **46** and they have flat inner ends that slidably engage the upper edge portions of the floating sill flanges **28** and **29**. Thus, a positive laterally locating or centering action can be obtained to prevent any sizable lateral frictional engagement between the associated sets of flanges **45** and **46** and **28** and **29** by sliding movement of the panel **12** in the assembly.

The shoe **44** may be considered a separate member in relation to the panel means **12**.

Usually the low friction guides **59**, and the set screws **61**, are made from a relatively hard, durable, machinable but low friction plastic material such as "Delrin" which is an acetal resin manufactured by The Cadillac Plastic Co. of Kalamazoo, Mich. The material is commercially available and can be readily worked and/or shaped or molded to a desired form.

It will be realized that any other suitable types of weather stripping means or other associated sealing members can be provided for resilient or flexible engagement with various movable components of the window assembly. Hence, patricularly weather strips **70** and **71** are shown in FIG. 2 to aid in providing a seal between the various components of the door or panel assembly **10** of the invention.

By adjustment of the members **47** provided for supporting the movable panel **12** in the assembly **10**, if any of the vertically extending frame means are slightly out of square with the position for the bottom frame means, such as the bottom sill **13**, the movable panel **12** can be positioned so as to extend at a slight angle of other than 90° with relation to the positioning of the shoe **44** so that a tight, closed assembly can be provided for the door **12** even under these adverse operative conditions.

It also should be noted that the floating sill **25** can adjust its position slightly on the bottom sill **13** in case such sill is not exactly horizontally positioned. Also, the movable door **12** can readily be provided with a self-closing action. This is because the weight of the movable panel **12**, being expressed through magnetic action onto the floating sill **25**, tends to push it downwardly and hence increase the normal "floating" air gap which normally exists between the movable panel **12** and its support means. Such air cushion provided for the movable panel usually is in the order of .050 to about .060 inch. The movable door has a tendency to move towards its closed position at all times, particularly if a very slight angle such as only about one to three degrees is provided in the positioning of the bottom sill **13** to incline such sill at a slight angle towards one side of the frame means to urge the movable panel **12** in a closing direction.

In some instances, a sealing end member **73** is provided at each of the ends of the shoe **44** to cover the magnet means carried thereby.

From the foregoing, it is seen that a novel and improved readily adjustable door assembly is provided and that the components thereof can be readily assembled in place. In order to assemble the panels or doors **11** and **12** in the frame means provided, usually the upper ends thereof are telescoped into engagement with the associated frame means at the top portion of the frame and then the doors or panels are swung into proper vertical position and permitted to drop down onto the adjacent support means, or to be "floated" on the magnetic support means, as described hereinbefore. Hence, it is believed that the objects of the invention have been achieved.

While one complete embodiment of the invention has been disclosed herein, it will be appreciated that modification of this particular embodiment of the invention may be resorted to without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. In a slidable door, window, or panel assembly or the like,

a bottom sill means having upwardly extending lateral edge flanges,

a shoe having downwardly extending lateral edge flanges vertically overlapping said sill means flanges,

a panel member removably engaged with said shoe for support thereby and being adapted for engagement with a top frame means,

individual elongate permanent magnets operatively secured to each of said sill means and said shoe for adjacent vertically opposed positioning thereof with the magnets on said shoe being above the magnets on said sill means, said magnets having longitudinally extending poles extending the lengths thereof to provide a repelling action therebetween to thereby provide a lifting action on said panel member to float said panel member with relation to said sill means when assembled, and

a pair of support means for said panel member and operatively attached thereto at lower corner areas thereof intermediate said panel member and shoe, said support means being individually adjustable vertically to position said panel member in adjustable relation to said shoe.

2. In the assembly of claim **1**, a plurality of longitudinally extending low friction, elongate guide members carried by said shoe on the inner walls of said dependent flanges and extending laterally thereform, said guide members being adapted to engage with side portions of said sill means to aid in centering and guiding said shoe for sliding engagement with said sill means.

3. In the assembly of claim **1**, said panel member hav-

ing a longitudinally extending bottom slot at each end thereof, each of said support means including a support having a vertically extending tapped hole extending thereinto from its bottom surface attached to said panel member and positioned in a said bottom slot, said shoe having a centering means thereon on its upper surface adjacent each end thereof, a vertically extending threaded stud engaging said hole and engaging and being positioned by said centering means at its lower end, and means on said stud and exposed at the end of said slot to turn said stud.

4. In the assembly of a vertically positioned, horizontally sliding door, window, panel or the like including frame means defining a vertical plane and having an opening therein, a panel means slidably engaging said frame means for horizontal movement, a base sill means forming a part of said frame means, a non-magnetic metal shoe carried by said panel means and having a pair of dependent flanges laterally adjacent the sill means, elongate permanent magnet means operatively secured to said sill means and said shoe at adjacent vertically opposed portions thereof with the magnet means on said shoe being above the magnet means on said floating sill, said magnet means having longitudinally extending like poles opposed and extending the lengths thereof to provide a repelling action therebetween and a lifting action on said panel means to float said panel means with relation to said frame means along its full length of slidable relation therewith, the combination therewith of low friction means carried by said shoe flanges and engageable with portions of said sill means for controlling the lateral position on said shoe in relation to said sill means, vertically adjustable means connecting lower edge portions of said panel means to said shoe, and a resilient block positioned intermediate the ends of said panel means and being compressed between said panel means and said shoe to aid in distributing the load of said panel means uniformly over said shoe intermediate said adjustable means which engage end portions of said panel means.

5. In the assembly of a vertically positioned, horizontally sliding door, window, panel or the like including frame means defining a vertical plane and having an opening therein, and a panel means slidably engaging said frame means for horizontal movement, the combination of a base sill means forming a part of said frame, a shoe for said panel means having a pair of dependent flanges positioned laterally adjacent the sill means, elongate permanent magnet means operatively secured to said sill means and to said shoe at adjacent vertically opposed portions thereof with the magnet means on said shoe being above the magnet means on said sill means, said magnet means being immediately adjacent in superimposed relation and having longitudinally extending opposed like poles extending the lengths thereof to provide a repelling action therebetween for a lifting action on said panel means to float said panel means with relation to said frame means along its full length of slidable relation therewith, means between said shoe and panel means to adjust the vertical position of said panel means on said shoe to vary the position of said panel means in relation to said frame means, said adjustable means being adjacent each end of said shoe, and a resilent block being positioned intermediate the ends of said panel means and being compressed between said panel means and said shoe to aid in distributing the load of said panel means over said shoe intermediate said adjustable means.

6. In the assembly of a vertically positioned, horizontally sliding door, window, panel or the like including frame means defining a vertical plane and having an opening therein, a panel means slidably engaging said frame means for horizontal movement, a base sill means forming a part of said frame means, a non-magnetic metal shoe carried by said panel means and having a pair of dependent flanges laterally adjacent the sill means, elongate permanent magnet means operatively secured to said sill means and said shoe at adjacent vertically opposed portions thereof with the magnet means on said shoe being above the magnet means on said sill means, said magnet means having longitudinally extending like poles opposed and extending the lengths thereof to provide a repelling action therebetween and a lifting action on said panel means to float said panel means with relation to said frame means along its full length of slidable relation therewith, the combination therewith of elongate low friction plastic means carried by said shoe flanges on the inner surfaces thereof and engageable with portions of said sill means, said plastic means extending longitudinally of and protruding from said shoe flanges at longitudinally spaced portions thereof.

7. An assembly as in claim 6, which is characterized by said plastic means having a pair of base flanges extending longitudinally thereof and protruding therefrom in opposite directions, and

said shoe flanges each having an undercut groove therein which receives said plastic means and engages the flanges thereof to position said plastic means.

8. In the assembly of claim 6, the improvement comprising a plurality of low friction plastic set screws adjustably engage said shoe flanges at longitudinally spaced portions thereof to protrude inwardly therefrom to engage said sill means for control of the lateral relationship of said shoe to said sill means.

9. In the assembly of a vertically positioned, horizontally sliding door, window, panel or the like including frame means defining a vertical plane and having an opening therein, a panel means slidably engaging said frame means for horizontal movement and coacting guide means at the adjacent upper margins of the frame means and panel means, the combination of a base sill means forming a part of said frame, a shoe for said panel means having a pair of dependent flanges positioned laterally adjacent the sill means, elongate permanent magnet means operatively secured to said sill means and to said shoe at adjacent vertically opposed portions thereof with the magnet means on said shoe being above the magnet means on said sill means, said magnet means being immediately adjacent and having longitudinally extending poles extending the lengths thereof, said magnet means on said sill means extending at least substantially the length of said opening and said magnet means on said shoe extending substantially the length thereof, said magnet means all having like poles thereof in adjacent spaced vertical positions to provide a repelling action therebetween to thereby provide a lifting action on said panel means to float said panel means with relation to said frame means along its full length of slidable relation therewith, and characterized by

means on said shoe for adjusting the lateral position on said shoe in relation to said sill means,

a pair of adjustable support means between said shoe and panel means adjacent the ends thereof to adjust the vertical position of said panel means on said shoe, and

elongate resilient means positioned between said shoe and panel means and centered intermediate said support means to distribute the weight of said panel means along a center area of said shoe.

References Cited

UNITED STATES PATENTS

3,114,944	12/1963	Horgan	49—425 XR
3,158,765	11/1964	Polgreen.	
3,334,442	8/1967	Boettcher	49—404 XR
3,346,992	10/1967	Johnson	49—419 XR

FOREIGN PATENTS

804,258	11/1958	Great Britain.

KENNETH DOWNEY, *Primary Examiner.*

U.S. Cl. X.R.

49—423