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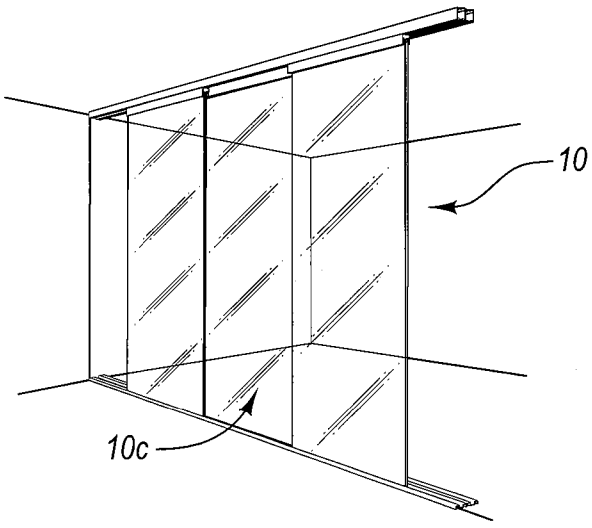
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(54) Title: SLIDING PANEL SYSTEM



(57) Abstract: A roller door system includes one or more sets of rollers configured to mount to a panel frame member on an upper end of a panel, and move through a complementary upper guide. A lower side of the panel frame can also be guided through one or more bottom tracks. These components, when coupled with the resin panel, can provide the ability to provide a smooth gliding motion for the resin panel door. In addition, the frame in which the panel is mounted can be configured with one or more components to accommodate the unique expansion and contraction properties of resin materials, and thus allow a stable, long term mounting solution. The upper guide and the lower track can also be configured with one or more components or mechanisms for pitch adjustment, as well as to adjust for uneven or irregular mounting surfaces.

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SLIDING PANEL SYSTEM

BACKGROUND OF THE INVENTION

1. The Field of the Invention

This invention relates to systems and methods related to mounting resin panels to a ceiling, wall, or floor structure as a door, wall or other form of movable divider.

2. Background and Relevant Art

Some recent architectural designs have implemented synthetic, polymeric resins, which can be used as partitions, walls, décor, etc., in offices and homes. Present polymeric resin materials generally used for creating these resin panels comprise polyvinyl chloride or "PVC"; polyacrylate materials such as acrylic, and poly (methylmethacrylate) or "PMMA"; polyester materials such as poly (ethylene-co-cyclohexane 1,4-dimethanol terephthalate), or "PET"; poly (ethylene-co-cyclohexane 1,4-dimethanol terephthalate glycol) or "PETG"; glycol modified polycyclohexylenedimethlene terephthalate; or "PCTG"; as well as polycarbonate materials.

In general, resin materials such as these are now popular compared with decorative cast or laminated glass materials, since resin materials can be manufactured to be more resilient and to have a similar transparent, translucent, or colored appearance as cast or laminated glass, but with less cost. Decorative resins can also provide more flexibility compared with glass at least in terms of color, degree of texture, gauge, and impact resistance. Furthermore, decorative resins have a fairly wide utility since they can be formed to include a large variety of artistic colors, images and shapes.

As mentioned above, one particular use of decorative resins can be in the panel form, where the panel might be used as a door, wall, or other form of space divider. In the case of a door, there are many conventional ways to mount the door to a ceiling or wall. In particular, a manufacturer or assembler can take a resin panel and attach the resin panel to a ceiling or wall using a sliding, hinged, or pivoting based hardware. Unfortunately, it can be fairly difficult to mount a resin panel in such a position using conventional mounting hardware, and in a way that allows the resin panel to also display its aesthetic properties adequately. For example, conventional

mounting hardware typically does not provide an appropriate attachment interface that can be readily hidden or blended with respect to the decorative resin panel.

In addition, conventional mounting hardware tends to be either too large in size, or too complex in configuration to be used with efficiency. For example, the size and configuration of conventional door attachment hardware does not often provide such functional features as height and pitch adjustment. Furthermore, the configuration of conventional mounting hardware tends to result in an attachment that can be fairly noisy when providing sliding or pivoting functions. In addition, the size and configuration of conventional mounting hardware makes such hardware difficult to mount to a given resin panel for use as a door without at least partially hindering the intended aesthetic of the resin panel.

Furthermore, there does not presently exist any sliding door hardware that fully frames and accommodates flexible resin panels generally, as well as some of the unique challenges associated with resin panels. For example, conventional sliding door hardware and frame/glazing systems are typically designed to accommodate glass. As glass is a fairly rigid material, the glass itself provides significant structural stability when used as a door or as a sliding partition. The rigidity of the glass also means that in a fully framed condition, the depths of the frame channels do not need to be substantial (e.g., in depth or width). When using a flexible resin, however, particularly PETG, the shallower depths and widths that might ordinarily be used for glass panels are generally inadequate to fully retain a resin panel (e.g., made of PETG, or even polycarbonate, acrylic, etc.) and accommodate the inherent expansion and contraction of the resin material.

Accordingly, an advantage can be realized with systems and components that provide for a relatively simple and smooth motion, and that preserves an intended aesthetic in a decorative architectural environment.

BRIEF SUMMARY OF THE INVENTION

Implementations of the present invention provide systems, components, and methods for mounting a panel (e.g., a resin panel) as a door or divider, so that the panel can move, glide, or slide in an efficient manner, while preserving an intended aesthetic for the panel. In particular, implementations of the present invention include the incorporation of one or more frame components to be mounted about a panel, and

further include one or more ceiling or face-mount apparatus that can be rollably or slidably coupled to the frame.

For example, in at least one implementation, a roller door system for mounting one or more resin panels in a retractable, slidable door or divider configuration, can include an upper guide, as well as a resin panel secured within a panel frame. The system can also include a roller assembly mounted to the panel frame on one end and positioned within the upper guide on an opposing end. In this case, the roller assembly is configured to roll through the upper guide. In addition, the system can include a lower track configured to guide the door panel along a support surface.

In an additional or alternative implementation, an adjustable door frame assembly configured to provide an efficient sliding motion for a panel along a support surface can include a resin panel having a gauge. The door frame assembly can also include a plurality of frame components mounted on at least two opposing edges of the resin panel, including an upper edge and a lower edge of the resin panel. In addition, the door frame assembly can include an adjustable roller assembly mounted directly to one of the plurality of frame components on one end, and inserted within an upper guide mounted to a ceiling substrate. Furthermore, the door frame assembly can include a brake assembly positioned within the upper guide, where the brake assembly is configured to reduce the speed of a resin panel, and to hold the resin panel in a stopped position.

Furthermore, a method of assembling a ceiling mounted roller door system can involve mounting a plurality of frame components about a panel, where the plurality includes at least an upper frame component. The method can also include mounting an upper guide to a ceiling or wall substrate. In addition, the method can include mounting at least one roller assembly directly to the upper frame component on one end of the at least one roller assembly, and positioning a rolling portion of the at least one roller assembly within the upper guide. Furthermore, the method can include adjusting the at least one roller assembly with respect to the upper component until a distance between a support surface and a lower portion of the panel exceeds a minimum distance.

Additional features and advantages of exemplary implementations of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by the practice of such exemplary

implementations. The features and advantages of such implementations may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims. These and other features will become more fully apparent from the following description and appended claims, or may be learned by the practice of such exemplary implementations as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to describe the manner in which the above-recited and other advantages and features of the invention can be obtained, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments thereof which are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

Figure 1A illustrates a schematic diagram of an internally-framed door configured using one or more components in accordance with one or more implementations of the present invention;

Figure 1B illustrates a schematic diagram of a wall mounted door configured using one or more components in accordance with one or more implementations of the present invention;

Figure 1C illustrates a schematic diagram of a ceiling mounted door configured using one or more components in accordance with one or more implementations of the present invention;

Figure 1D illustrates a multiple door configuration using one or more components in accordance with one or more implementations of the present invention;

Figure 2A illustrates a facing view of a framed panel in accordance with an implementation of the present invention;

Figure 2B illustrates an exploded view of a joint between frame components of the frame shown in Figure 2A;

Figure 3A illustrates a facing view of a roller assembly inserted in an upper guide in accordance with an implementation of the present invention;

Figure 3B illustrates an exploded view of the roller assembly shown in Figure 3A;

Figure 4A illustrates a facing view of a lower track assembly in accordance with an implementation of the present invention;

Figure 4B illustrates an exploded view of the lower track assembly of Figure 4A;

Figure 5A illustrates a side perspective view of an upper guide and roller assembly when engaged with a brake assembly in accordance with an implementation of the present invention;

Figure 5B illustrates an isolated perspective view of the brake assembly shown in Figure 5A;

Figure 6 illustrates an alternative configuration in accordance with an implementation of the present invention in which a panel is mounted to a roller assembly without the use of an upper frame component;

Figure 7A illustrates a perspective facing view of still another alternative configuration in accordance with an implementation of the present invention in which a panel is mounted in a face-mounted roller assembly; and

Figure 7B illustrates a side view of the panel and roller assembly configuration of Figure 7A.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention extends to systems, components, and methods for mounting a panel (e.g., a resin panel) as a door or divider, so that the panel can move, glide, or slide in an efficient manner, while preserving an intended aesthetic for the panel. In particular, implementations of the present invention include the incorporation of one or more frame components to be mounted about a panel, and further include one or more ceiling or face-mount apparatus that can be rollably or slidably coupled to the frame.

As will be appreciated more fully herein, these components, when coupled or mounted to the resin panel, can provide the ability to mount a panel as a door, divider, or other form of movable enclosure, and at the same time provide that panel with a smooth gliding motion. The smooth gliding motion provided by these components is aided not only by framing and roller assembly components, but also by the components used to stabilize the panel in a particular frame. In particular,

implementations of the present invention also include a number of components that can be used to frame virtually any gauge of a panel, and further to accommodate the given panel's unique expansion and contraction properties. Specifically, these mounting/framing components can be configured to ensure the given panel cannot easily wiggle or slip out of the frame over time.

As a preliminary matter, frequent reference herein is made to mounting of a panel, such as a resin panel. One will appreciate from the following specification and claims, however, that implementations of the present invention can be applied broadly not only to resin-based panels, such as polycarbonates, copolyesters, acrylics, or mixtures thereof, but also to non-resin based panels, such as those based partly or entirely from glass or glass composites. Accordingly, reference herein to resin panels, as such, is made primarily by way of convenience in description or illustration.

Referring now to the Figures, Figures 1A-1D illustrate various implementations in accordance with the present invention in which panels can be mounted in a door or divider system 10 using the system(s), component(s), and apparatus described herein. For example, Figure 1A illustrates an implementation of door system 10 that has been prepared or mounted as a "pocket door" 10a. In this implementation, the roller-based pocket door 10a comprises a resin panel with the frames and mounting apparatus mounted primarily inside a substrate of an internal wall opening (or internal door frame opening). In at least one implementation, for example, the pocket door 10a includes an upper guide and optional lower track) mounted on the inside of the wall substrate, as well as extending inside and outside the door frame. The mounting thus allows a user to slide the door into a partly or completely concealed (or open) position within the wall, or to slide the door into a completely or partially closed position.

Figure 1B illustrates a general "door" implementation 10b, in which the upper guide and optional lower track) is mounted on a wall substrate. In this implementation, the door system 10b is constructed so that the framed panel component of the door is always visible from at least one side of the wall on which the framed panel is mounted. The user can then slide the door 10b along the upper guide and optional lower track) in front of or away from a wall opening (e.g., door frame) as necessary.

In addition, Figure 1C illustrates another implementation of a roller-door 10, where the door is used as a multi-panel "divider" 10c using an upper guide mounted directly to an overhead/ceiling substrate. In at least one implementation, this configuration can allow for multiple bypassing doors. For example, a user can mount a plurality of framed panels within the upper guide and optional lower track) in any combination of fixed or slidable mountings. The user can then mount many or most of the panels in a fixed position to resemble a stationary wall, and then subsequently mount fewer than all of the framed panels in more mobile positions as one or more doors. In another implementation, the user can mount all of the panels as slidable panels, such that the user can move any or all of the panels in a door capacity. For multiple bypassing doors, the tracks may simply be placed directly next to one another (e.g., 1/4" of spacing therebetween) without fear of the framed panels interfering with one another.

Figure 1D illustrates still another implementation of the roller door system 10, in which the user has mounted the upper guide and optional lower track) within a door frame as a "bypassing door" 10d. In this implementation, the user has not mounted the upper and optional lower) track inside the wall, but mounted the track(s) primarily (or exclusively) within the visible part of the door frame. Thus, upon mounting the door panel in the appropriate tracks, the user can move any or both of the panels along the corresponding tracks as doors. In contrast with the pocket door 10a implementation, the user of the bypassing door 10d would not necessarily conceal the framed panel within a wall.

Figure 2A illustrates an example of a panel as it has been mounted to a frame in accordance with an implementation of the present invention. For example, Figure 2A shows that a panel 15 to be used as a divider or door can be mounted on one or more sides by a frame 20 having frame components 20a-d. In general, Figure 2A shows that frame 20 comprises upper frame component 20a, side frame components 20b and 20d, and lower frame component 20c. One will appreciate that each such component of the frame 20, however, is essentially the same construction, and is only differentially designated by its position on the resin panel 15. In general, one will appreciate that each frame component can be made from virtually any material that is sufficiently strong and aesthetically pleasing to accomplish the ends set forth herein. For purposes of illustration, however, at least one implementation of a material for

frame 20 can comprise anodized aluminum, which can complement the panel 15 material without detracting from the overall appearance of thereof.

In any event, Figure 2B illustrates an exploded view of a joint between frame components 20a and 20d shown in Figure 2A. For example, Figure 2B shows that panel 15 is mounted on a left side by side frame component 20d, and on a top or upper side by upper frame component 20a. Figure 2B also shows that upper frame component 20a comprises lower or receiving portion 23, as well as an upper or mounting portion 25. Thus, in this particular case, Figure 2B shows that the receiving portion 23 receives an extreme edge of panel 15, while the upper or mounting portion 25 is mounted directly or indirectly to a track, such as upper guide 35.

To facilitate mounting between frame components 20a and 20d, Figure 2B shows that a pair of angled (e.g., L-shaped) mounting bars 30 are mounted within and otherwise extend from frame component 20d. In one implementation, the manufacturer or assembler positions the receiving portion 23 of frame component 20d against an edge of panel 15. The manufacturer or assembler then inserts mounting bars 30 into corresponding receptacle(s) in receiving portion 23 of frame component 20a, and further mounts frame component 20a against the upper edge of panel 15.

The manufacturer or assembler then secures frame components 20a and 20d using the one or more fasteners 27 positioned through one or more tappings. In at least one implementation, the one or more fasteners 27 are threaded, and the manufacturer or assembler simply rotates fasteners 27 into a corresponding tapping or other form of receptacle in frame component 20a. In one implementation, the manufacturer or assembler can first tap the frame components 20a and 20d, as necessary, to receive fasteners 27. As discussed more fully in Figures 3A-B and 4A-B, the manufacturer or assembler may also position one or more gaskets 37 within receiving portion 23 of a given frame component. The mounting bars and threaded fasteners, therefore, particularly when applied at each end of each frame 20 component about the panel 15, can securely hold panel 15 in position within frame 20.

In contrast with the secure mounting between frame components 20a and 20d, Figure 2B also shows that the manufacturer or assembler can mount the upper frame component 20a to the upper guide 35 in a generally less-restricted fashion. In particular, and as shown in more detail with respect to Figure 3, a manufacturer or assembler can mount upper guide 35 to upper frame component 20a via one or more

adjustable hanger bolts 55 of a roller assembly (hidden in Figure 2B). Since the roller assembly is adjustable, a manufacturer or assembler can connect or mount the upper guide 35 and upper frame component 20a in a manner that is appropriate for a wide range of ceiling/floor and panel height dimensions.

For example, Figure 3A illustrates a facing view of an adjustable (e.g., at least vertically) roller assembly 40 that has been inserted in upper guide 35, and further mounted to upper frame component 20a. In particular, Figure 3A illustrates that adjustable roller assembly 40 (e.g., a vertically adjustable roller assembly) can comprise at least a set of rollers 50, such as rollers 50a and 50b, which are configured to fit or otherwise roll over a set of rails 43, such as rails 43a and 43b, respectively, positioned or formed in upper guide 35. As shown in the exploded adjacent view, Figure 3B further illustrates that adjustable roller assembly 40 comprises a central mounting member 47 through which both hanger bolt 55 and axle 53 are inserted.

In one implementation, central mounting member 47 comprises at least a first hollow portion through which hanger bolt 55 can be inserted. Figure 3B also shows that central mounting member 47 comprises at least a second hollow portion through which axle 53 can be inserted. In addition, Figure 3B shows that hanger bolt 55 can also comprise a hollow portion (not shown), such that axle 53 is seen extending from one side of hanger bolt 55 to an opposing side. Furthermore, the exploded view of Figure 3B shows that central mounting member 47 can be covered with a center clamp 45, which can help stabilize each of components 47, 53, and 55 during use.

Accordingly, at least one method of assembly includes a manufacturer or assembler mounting hanger bolt 55 within central mounting member 47. In at least one implementation, the upper end of hanger bolt 55 is threaded, and the central mounting member 47 is reciprocally-threaded for receiving hanger bolt 55, to thereby accomplish the mounting. In addition, the method of assembly can involve the manufacturer or assembler inserting axle 53 through central mounting member 47 and hanger bolt 55. Furthermore, the method can involve the user mounting rollers 50a-b on respective axle 53 ends, and positioning adjustable roller assembly 40 about rails 43a and 43b of upper guide 35.

Upon assembling the adjustable roller assembly 40 within upper guide 35, the manufacturer or assembler can then mount hanger bolt 55 to frame component 20a to suspend frame component 20a (and panel 15) from upper guide 35. For example,

Figure 3A shows that hanger bolt 55 extends downward and is mounted directly into upper frame component 20a. As previously mentioned, hanger bolt 55 can be threaded at the mounting end. In such a case, the manufacturer or assembler can then screw the mounting end of hanger bolt 55 into a threaded tapping or other form of threaded receptacle in upper frame component 20a. In another implementation, hanger bolt 55 can be mounted to frame component 20a using other forms of mounting means, including any number or form of snap-fit means. For example, frame component 20a can comprise a receptacle with a set of horizontally-extending, vertically-spaced ridges or grooves (e.g., 56, Figure 6) therein. The ridges, in turn, are configured to receive a correspondingly ridged hanger bolt (not shown), which can interlock with the receptacle ridges or grooves at any number of vertical points.

In addition, hanger bolt 55 can be threaded in a variety of different ways as well. For example, hanger bolt 55 can comprise rotatable portions, so that a lower threaded portion can be rotated or screwed into frame component 20a, while an upper portion of adjustable roller assembly 40 remains relatively fixed within central mounting member 47. In additional or alternative implementations, hanger bolt 55 is a single threaded member, whereby a manufacturer or assembler screws hanger bolt 55 into upper frame component 20a before completing adjustable roller assembly 40. To make vertical adjustments, the upper guide 35 and rollers 50 can be configured in size and shape so that the manufacturer or assembler may simply lift the panel 15 off of rails 43. The manufacturer or assembler can then rotate the hanger bolt (and entire adjustable roller assembly 40 within guide 35) as appropriate, and lower panel 15 so that the rollers 50 rest again on rails 43.

In either case, the variability by which a manufacturer or assembler can mount hanger bolt 55 inside upper frame component 20a provides a great degree of flexibility for accommodating different ceiling/floor heights and/or panel heights. Beyond the adjustability of hanger bolt 55, however, Figures 3A-B and 4A-B further show still additional components that can be used not only to stabilize frame 20 about panel 15, but also to ensure a smooth sliding motion of door 10. For example, the facing view of Figure 3A shows that frame component 20a can further include a gasket 37, such as gasket 37a. In addition, Figures 4A-B illustrate additional mechanisms for providing an adjustable, smooth gliding surface.

Referring to gasket 37, Figure 3A illustrates that gasket 37a also 37b, Figure 4), can be inserted in receiving portion 23. In general, gasket 37 (e.g., 37a-b) can be configured to ensure a stabilized mounting interface for panel 15 within a given frame component, regardless of panel dimension. For example, resin panels are typically manufactured to vary in gauge from as thin as about 1/8" (one-eighth inch) or 1/4" (one quarter inch), or thinner, to as thick as about 1 1/2" (one and one-half inches) to about 2" (two inches), or thicker, depending on the end-user's designs. In general, thicker gauges tend to be sturdier and more expensive) than thinner gauges with respect to conventional panel frames or mounts. In accordance with the present invention, however, frame 20 and gasket 37 can be used with sufficient stability on thinner panel 15 gauges, such as anywhere from about 1/4" (one-quarter inch) to about 3/8" (three-eighths inch). In particular, implementations of the present invention allow use of a thinner, potentially more cost-effective, panel without sacrificing panel rigidity or deflection resistance.

To at least partly enable this sturdier, more stabilize mount, Figure 3A shows that gasket 37a comprises a set of opposing ridges 38 configured to grip opposing surfaces of panel 15. In general, a manufacturer or assembler can modify different gaskets to have different lengths of ridges 38 for different panel gauges. In at least one implementation, however, the manufacturer or assembler uses the same gasket 37 with the same ridges 38 for each gasket. Gasket 37 and corresponding ridges 38, in turn, are configured with at least partly flexible, yet sufficiently rigid, material configured to receive and hold virtually any size or gauge of panel 15 (or any contraction/expansion thereof). For example, gasket 37 can comprise any resiliently-deformable natural or synthetic materials, including rubber, latex, flexible plastics, or combinations thereof.

Figure 4A also shows inclusion of gasket 37 in receiving portion 23 of frame component 20c. In Figure 4A, however, frame component 20c is oriented in essentially the reverse or opposite position as that shown in Figure 3A, since frame component 20c is positioned in this case at the bottom (e.g., near the floor or support surface) of panel 15. As with the discussion with respect to Figure 3, however, gasket 37 serves essentially the same purpose for stabilizing panel 15 in the relevant frame component. Figures 4A-B also show that frame component 20c can be mounted to or positioned about a lower track or guide 70 via one or more resilient guiding means 60.

The one or more resilient guiding means 60, in turn, are configured to accommodate variations in panel or flooring dimension, as well as provide a smooth, even motion of a given door 10.

To this end, Figures 4A and 4B show that the one or more resilient guiding means 60 can comprise a housing 63 having one or more spring components 65 inserted therein. Guiding means 60 can also comprise a post 68 slidably inserted within housing 63, and directly adjacent spring 65. In addition, Figures 4A and 4B show that guiding means 60 can comprises one or more guides 69 configured for insertion and/or sliding within slot 73 of track 70.

Therefore, a manufacturer or assembler may first tap frame component 20c (if a tap/receptacle is not already present) to provide a receptacle within receiving portion 25. The manufacturer or assembler can then insert housing 63 into the tapping or receptacle of receiving portion 25, and further insert spring 65 (and post 68) within housing 63. The manufacturer or assembler can then fasten plate 67 directly to the surface of frame component 20c. In at least one implementation, the manufacturer or assembler can position several such guiding means 60 at any number of points along the surface of frame component 20c, as needed or appropriate for operation. The resulting spring-loaded guide and track system can ensure that a sliding panel is able to move efficiently, despite any variations in flooring, or support surface.

One will appreciate that additional other components (not shown) can also be used in accordance with lower or bottom track 70 to move or hold a panel. For example, in additional or alternative implementations, a manufacturer or assembler can also position a simple floor guide (rather than components 60 and 70) for limited travel applications, as well as a floor bolt option. The manufacturer or assembler can also use a keyed-lock to hold a door in a specific position, as well as use track end coverings to cover the extreme ends of track 70. When used with pocket door 10a, the manufacturer or assembler may also include a wall bumper.

Along these lines, implementations of the present invention further provide one or more components and mechanisms for efficiently holding or stopping a door using a brake assembly in upper guide 35. As shown in Figures 5A and 5B, for example, a brake assembly 75 for use in stopping adjustable roller assembly 40 within upper guide 35 comprises at least base 80, as well as arcuate stop 85 connected

thereto. Figures 5A and 5B further show that brake assembly 75 can include a decelerator arm 87 extending outwardly from arcuate stop 85.

In at least one implementation, a manufacturer or assembler of a roller door system 10 inserts brake assembly 75 at one or more extreme ends of upper guide 35, or wherever in guide 35 that braking is needed. The manufacturer or assembler can then secure base portion 80 therein against the upper inside surface of track 35, wherein the arcuate stop 85 and decelerator arm are positioned to receive adjustable roller assembly 40. In at least one implementation, brake assembly 75 is configured or formed so that decelerator arm 87 does not touch the upper inside surface on which base portion 80 is mounted. In at least some cases, for example, a resulting gap between the upper inside surface of track 35 allows decelerator arm 87 to flex upward a degree, as discussed more fully below.

In particular, Figure 5A shows that decelerator arm 87 extends in a sloping direction from one point with respect to arcuate stop 85 to another. In Figure 5A, for example, decelerator arm 87 extends above an "uppermost" point (e.g., arc point closest to the surface on which base 80 is mounted) of arcuate stop 85 to a position below the uppermost point of arcuate stop 85. One will appreciate, however, that the position of brake assembly 75 could be reversed in some configurations, such that reference herein to the "uppermost" point of arcuate stop 85 can be reversed to the "lowermost" point in other implementations. In any event, Figure 5A also shows that arcuate stop 85 can be configured in at least one implementation to conform at least partly to the shape of center clamp 45 on adjustable roller assembly 40. For example, the arcuate stop 85 can be configured in semi-circular form, and in a specific position, such that center clamp 45 of adjustable roller assembly 40 fits snugly within arcuate stop 85.

As such, decelerator arm 87 and arcuate stop 85 are formed so that, when adjustable roller assembly 40 approaches, decelerator arm 87 first comes into contact with center clamp 45. The downward bias force from decelerator arm 87 causes adjustable roller assembly 40 to gradually reduce speed. At the same time, the opposing force of center clamp 40 causes decelerator arm 87 to flex upwardly toward the upper inside surface of track 35. The upward flexing of decelerator arm 87 allows center clamp 45 to move into position directly against arcuate stop 85, at which point decelerator arm 87 settles back into the initial position. When decelerator arm 87

settles into the initial position, the decelerator arm 87 and arcuate stop 85 of brake assembly 75 can effectively hold adjustable roller assembly 40 until a user supplies sufficient force in the opposite direction to flex decelerator arm 87 upwardly again.

In operation, the components of brake assembly 75 provide a smooth and secure stopping motion for a given panel door, with minimal stress applied on the panel door. In particular, the components of brake assembly 75 are configured to slow and stop a panel door in motion without many of the "bounce back" effects sometimes seen with conventional door stops, which could potentially loosen the panel within a given frame 20. Furthermore, the design of the brake assembly 75 allows virtually any user to move the panel door in and out of the stopped position without much difficulty or required force.

In addition to the foregoing, Figure 6 illustrates yet another alternative configuration in accordance with an implementation of the present invention. In particular, Figure 6 illustrates a configuration in which panel 15a is mounted to roller assembly 40 directly, rather than via an upper frame component (e.g., 20a). To this end, Figure 6 shows that roller assembly 40 can comprise an alternate hanger bolt 55a, which is configured to interlock directly to frame 15a via embedded coupling member 95.

In the illustrated implementation, hanger bolt 55a comprises at least one set of grooves 56 that can be used for a snap fit into embedded coupling member 95, although this is not required. For example, hanger bolt 55a can comprise multiple sets of grooves 56 that can be used for vertical snap-fit adjustments within embedded coupling member 95. In such a case, a user could insert or adjust roller assembly 40 within panel 15a simply by pushing roller assembly 40 downward or pulling roller assembly 40 upward through panel taps 90 and 97 with sufficient force to engage or disengage the snap interlock. Furthermore, rather than being configured for a snap fit as illustrated, tap 97 of embedded coupling member 95 can alternatively be configured for receiving a threaded end of a hanger bolt (e.g., hanger bolt 55, Figures 3A-3B). In such a case, the manufacturer or assembler can simply rotate hanger bolt 55 and/or assembly 40, as previously described, in or out of taps 90 and 97 as desired for the necessary vertical adjustment.

Accordingly, at least one method of assembly involves a manufacturer or assembler preparing panel 15a by creating one or more taps 90 for receiving hanger

bolt 55a. The method also involves the manufacturer or assembler preparing panel 15a with one or more cavities 93 so that panel 15a can receive one or more corresponding coupling members 95. For example, the manufacturer or assembler can bevel, rout, or drill one or more cavities 93, which are configured in size and shape to reciprocally receive or embed coupling member 97. The manufacturer can then embed coupling member 95 into cavity 93, and further adjustably insert hanger bolt 55a (or hanger bolt 55, as appropriate) through tap 90 and into tap 97. The manufacturer or assembler can then make any vertical adjustments necessary (where allowable based on the configuration of the hanger bolt), and insert rollers 50a-50b within upper guide 35.

Figure 7A illustrates a perspective facing view of still another alternative configuration in accordance with an implementation of the present invention. In particular, Figures 7A-7B illustrate one or more components for mounting a given panel 15 in a face-mounted roller door configuration 10e, rather than necessarily in upper guide 35 for a ceiling mount configuration (e.g., 10a-10d). For example, Figure 7A illustrates an alternative upper guide 35a, which will generally be mounted to a wall, or ceiling support structure from a side or facing mount. In this case, upper guide 35a comprises opposing rails 43b and 43c, which are configured to guide roller 50b of roller assembly 40a. Accordingly, one will appreciate that upper guides 35 and 35a comprise alternative forms of upper guide means.

Figures 7A also shows that roller assembly 40a comprises a plurality of mounting points 100, such as a mounting point within an axle (not shown) of roller 50b, as well as mounting points directly within the side of panel 15. Each of these mountings 100, in turn, can be threaded (e.g., prior to mounting) within hanger bracket 55b to couple roller 50b and panel 15 together, and suspend the panel 15 from guide 35a. Accordingly, one will appreciate that hanger bolts 55, 55a, and hanger bracket 55b comprise different forms of suspension means that can be used to couple a given panel (15, 15a) to alternative forms of roller assembly means (40, 40a, etc.)

In general, there may be any number of reasons why a manufacturer will prefer to mount panel 15 in a face-mounted configuration rather than a ceiling-mounted configuration, and vice versa. For example, as with the configuration of Figure 6, the face-mounted configuration 10e can be prepared in some cases with or without frame 20 (and without any or all of frame components 20a-d). In addition,

ceiling mount structures may be limited or impractical (e.g., too high) in some environments, thus necessitating a face or wall-mount implementation.

Beyond these reasons, Figure 7B illustrates that at least one additional advantage of the face-mounted implementation includes the orientation of panel 15 with respect to the given roller assembly. In particular, Figure 7B shows that the configuration of bracket 55b, roller 50b and mountings 100 allow panel 15 to be mounted directly or substantially within the same vertical axis ("y") as roller 50b. In at least one implementation, this particular mounting along the same vertical axis can ensure that the panel 15 can be moved along upper guide 35a without necessarily requiring a corresponding lower track (or track type component). In particular, at least in part since panel 15 is mounted on the same vertical axis as roller 50b, there is less tendency for panel 15 to sway during motion.

Accordingly, Figures 1A-7B and the corresponding text, therefore, specifically show, describe or otherwise provide a number of systems, components, apparatus, and methods for efficiently mounting, moving, or holding a movable door system. In addition to these, however, one will appreciate that implementations of the present invention can further include additional components for other functionality of a given door 10 system. For example, implementations of the present invention also include mullion extrusions (e.g., as part of frame 20) that can be used to divide a panel 15 into segments. Implementations of the present invention can also include one or more edge locks for securing bypassing and pocket doors 10a to a side wall, and a catch set for hooking multiple panels 15 together (e.g., with doors 10c). In addition, implementations of the present invention can include one or more handle apparatus, including a handle pull for pocket doors 10a, and components to implement a simple finger pull.

One will appreciate, therefore, that the components described herein are simple to assemble, and can provide an elegant interface that can turn virtually any type of panel into a door that, in turn, can attach and slide relative to a wall with efficiency, lack of noise, and with excellent aesthetic characteristics. As such, the wide range of component configurability and general use ensures that a panel made of virtually any material, particularly one made of resin materials, can be easily used as part of a rolling or gliding door system, even in the presence of atypical ceiling/floor dimensions, or atypical panel gauges, etc. Furthermore, the versatility in size and

configuration of the framing and mounting apparatus ensure that a door can be mounted to a ceiling, or wall, or even concealed within a ceiling or wall, thus allowing the panel to be used as virtually any type of rolling/gliding door or divider (movable or stationary).

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. For example, the components described herein can also be modified so that the door panel is mounted on a ceiling track, rather than on a wall mounted track. Thus, the described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

CLAIMS

1. A roller door system for mounting one or more resin panels in a retractable, slidable door or divider configuration, comprising:

an upper guide;

a resin panel secured within a panel frame;

a vertically adjustable vertically adjustable roller assembly mounted to the panel frame on one end and positioned within the upper guide on an opposing end, wherein the vertically adjustable roller assembly is configured to roll through the upper guide; and

a lower track configured to guide the door panel along a support surface.

2. The roller door system as recited in claim 1, wherein the panel frame comprises a plurality of interconnected frame components, including an upper frame component and a lower frame component.

3. The roller door system as recited in claim 2, wherein the vertically adjustable roller assembly is connected to the upper frame component via a hanger bolt, wherein the hanger bolt is configured to adjust vertical spacing between the upper guide and the upper frame component.

4. The roller door system as recited in claim 2, further comprising an axle inserted through the hanger bolt, the axle bearing a plurality of wheels configured to roll on rails of the upper guide.

5. The roller door system as recited in claim 2, wherein the plurality of frame components are interconnected with a corresponding plurality of angled mounting bars inserted between adjacent frame components.

6. The roller door system as recited in claim 2, further comprising resilient guiding means mounted to the lower frame component on one end.

7. The roller door system as recited in claim 6, wherein the resilient guiding means are further configured to slidably interface with a reciprocal recess in the lower track.

8. The roller door system as recited in claim 6, wherein the resilient guiding means comprises:

a spring positioned within a housing, the housing being positioned within the lower frame component; and

a post connected to a guide, wherein the post pushes directly against the spring on one end, and, on an opposing end, interfaces with the reciprocal recess via a guide.

9. The roller door system as recited in claim 1, further comprising a brake assembly mounted within the upper guide.

10. The roller door system as recited in claim 1, wherein the brake assembly comprises an arcuate stop connected to a base, the arcuate stop having a decelerator arm extending therefrom.

11. The roller door system as recited in claim 10, wherein the decelerator arm is configured in size and shape to flex from an initial position to a subsequent position upon contact from the vertically adjustable roller assembly, and return to the initial position when the brake assembly is positioned against the arcuate stop.

12. The roller door system as recited in claim 10, wherein the decelerator arm is configured in size and shape to at least temporarily hold the vertically adjustable roller assembly against the arcuate stop.

13. An adjustable door frame assembly configured to provide an efficient sliding motion for a panel along a support surface, comprising:

a resin panel;

a plurality of frame components mounted on at least two opposing edges of the resin panel, including an upper edge and a lower edge of the resin panel;

an adjustable roller assembly mounted directly to one of the plurality of frame components on one end, and inserted within an upper guide mounted to a ceiling substrate; and

a brake assembly positioned within the upper guide, the brake assembly being configured to reduce the speed of a resin panel, and to hold the resin panel in a stopped position.

14. The adjustable door frame assembly as recited in claim 13, wherein the plurality of frame components are configured to mount together with each other about the resin panel in an interlocking manner.

15. The adjustable door frame assembly as recited in claim 14, wherein each frame component of the plurality of frame components comprises a plurality of angled mounting bars configured for insertion into an adjacent frame component, and one or more taps for receiving one or more corresponding fasteners via the adjacent frame component.

16. The adjustable door frame assembly as recited in claim 13, further comprising a gasket having one or more resiliently deformable opposing ribs configured to grip two opposing surfaces of the resin panel.

17. The adjustable door frame assembly as recited in claim 13, further comprising resilient guiding means mounted to the lower edge frame component, wherein the resilient guiding means includes a spring-loaded guide configured to fit within a lower track recess.

18. An roller door assembly configured to provide an efficient sliding motion for a panel along a support surface, comprising:

a resin panel; and

roller assembly means mounted directly into the resin panel via suspension means on at least one end, and rollably inserted within an upper guide on an opposing end;

wherein one or more rails of the upper guide direct the resin panel along a path defined by the upper guide via one or more rollers of the roller assembly means.

19. The roller door as recited in claim 18, wherein the suspension means comprises a hanger bolt extending from the roller assembly means, and mounted through a top of the resin panel; wherein the hanger bolt is configured to mount directly to the resin panel via an adjustable threaded or snap-fit connection.

20. The roller door as recited in claim 18, wherein the suspension means comprises a hanger bracket extending from the roller assembly means, and mounted to a side of the resin panel; wherein the resin panel and the at least one roller are aligned along the same vertical axis.

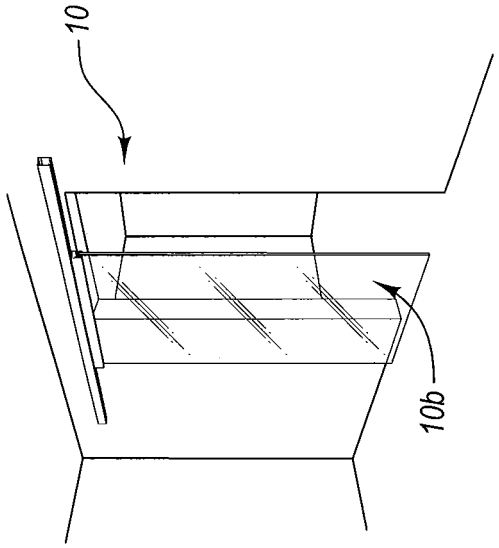


FIG. 1B

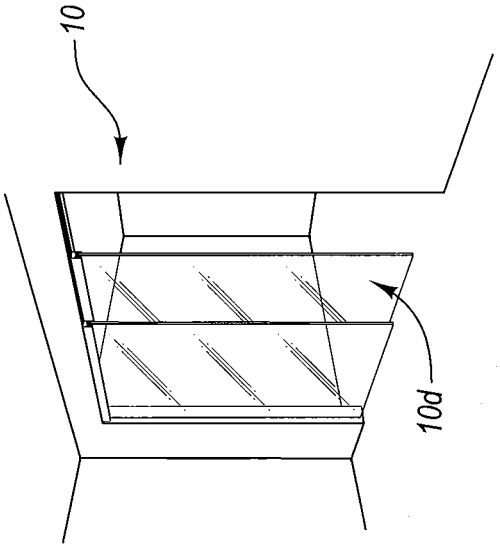


FIG. 1D

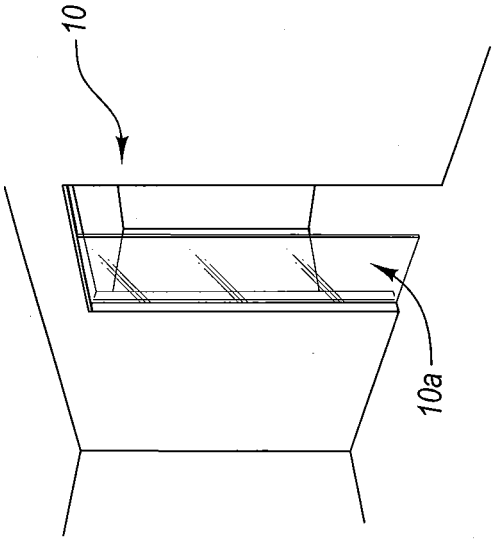


FIG. 1A

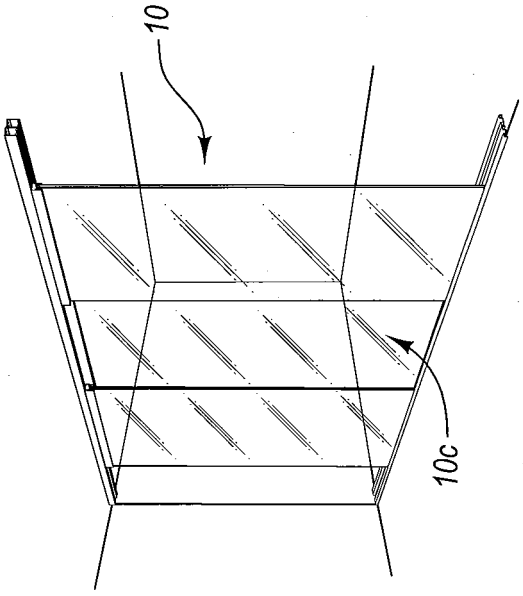


FIG. 1C

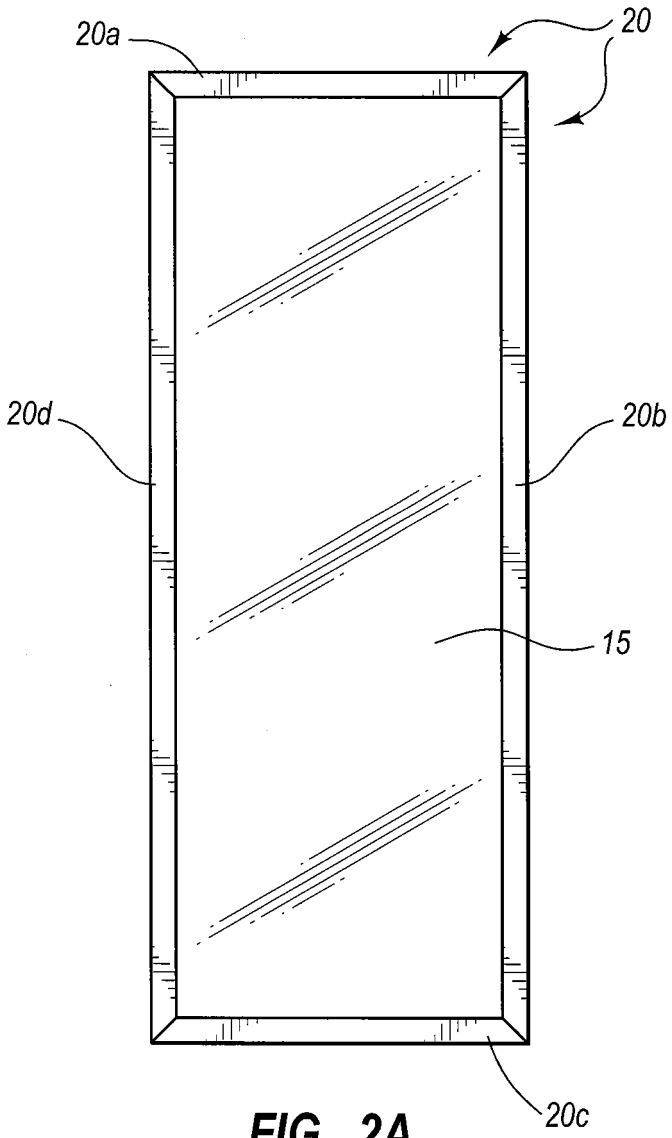


FIG. 2A

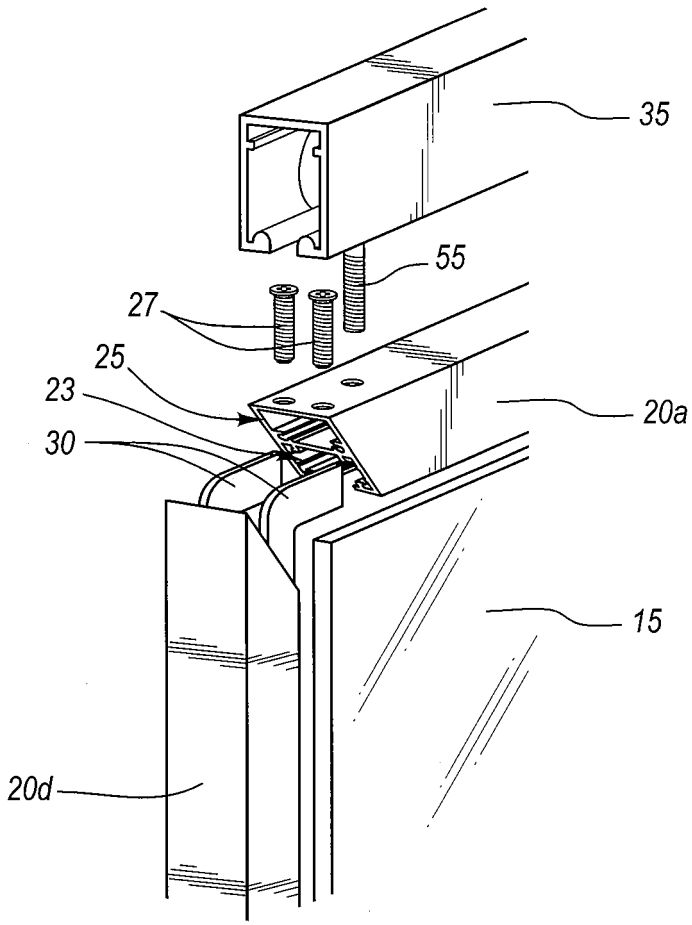


FIG. 2B

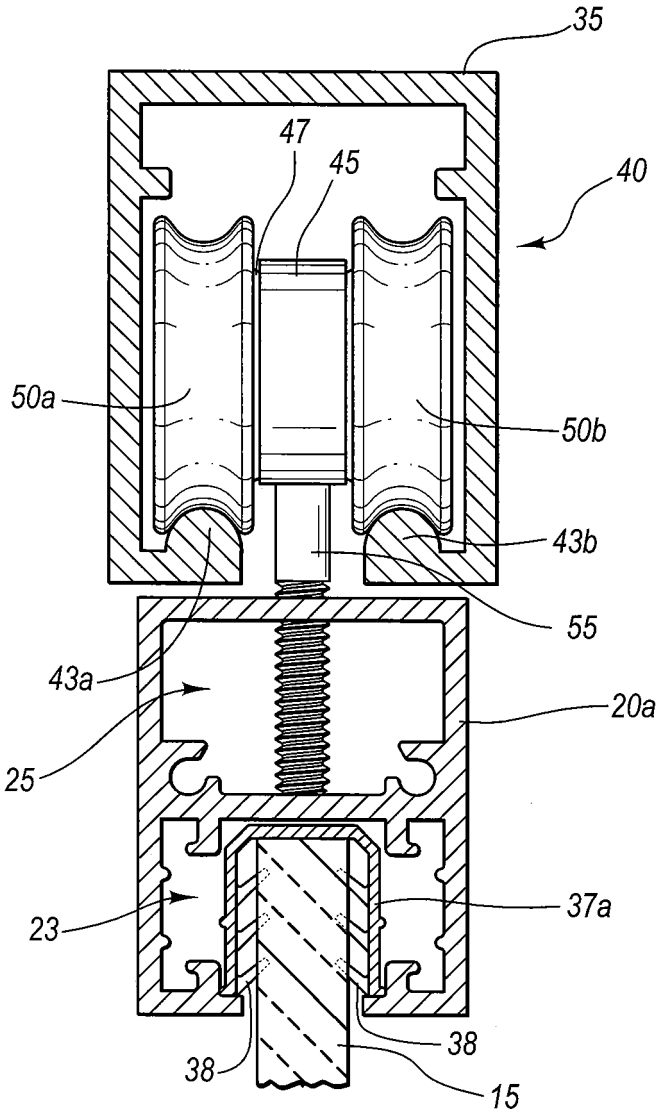

35
47
45
40
50a
50b
43b
55
43a
20a
25
23
37a
38
38
15

FIG. 3A

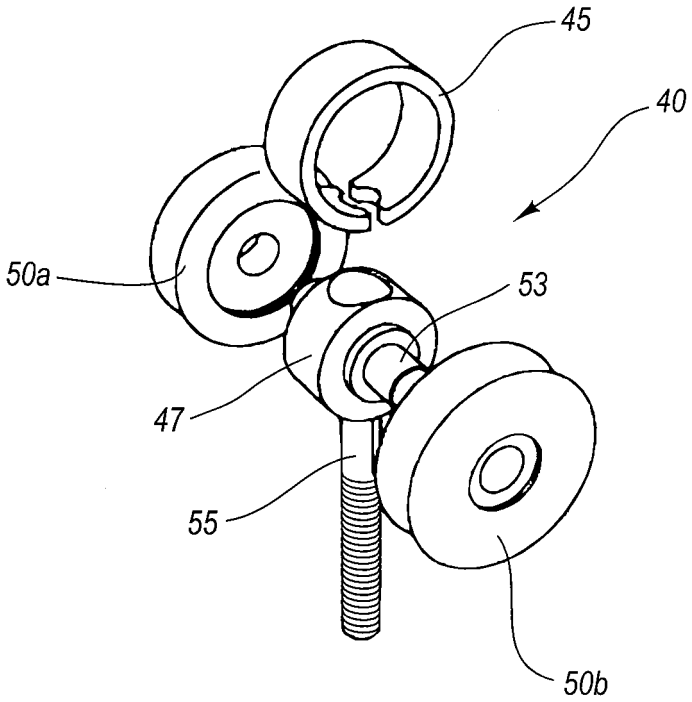

45
40
50a
53
47
55
50b

FIG. 3B

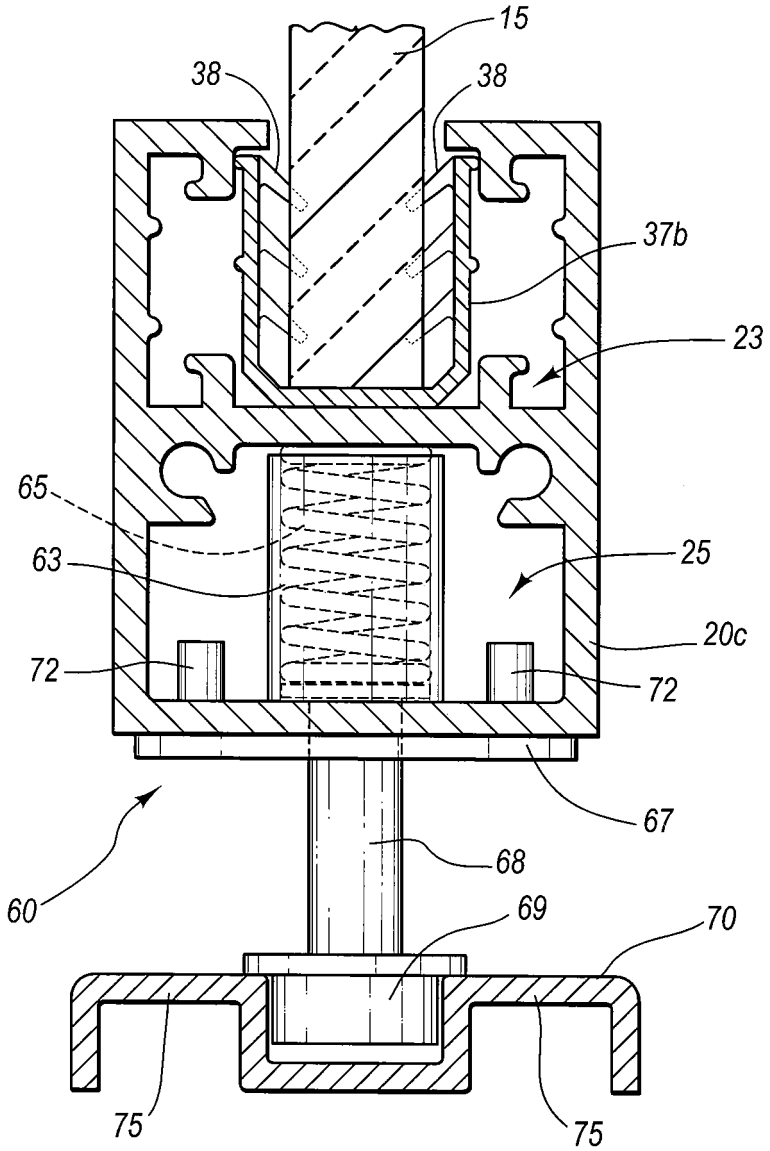

15
38
38
37b
23
65
63
25
20c
72
72
67
60
68
69
70
75
75

FIG. 4A

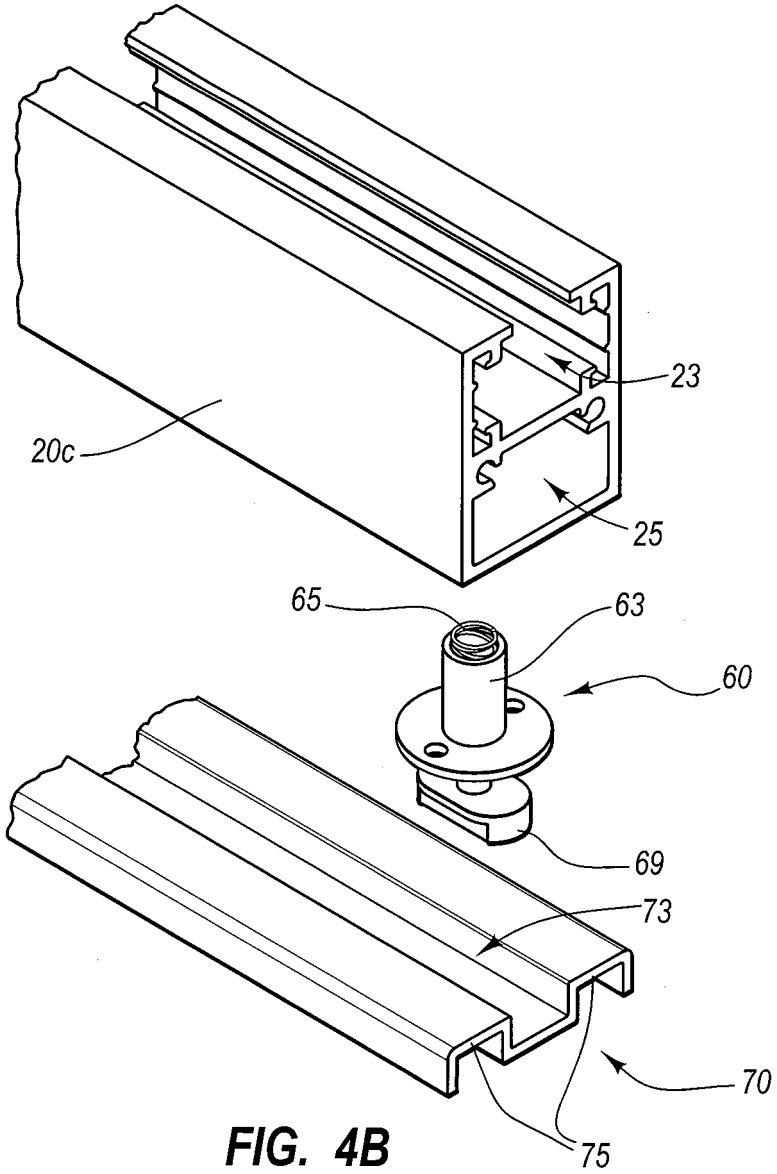

23
20c
25
65
63
60
69
73
70
75

FIG. 4B

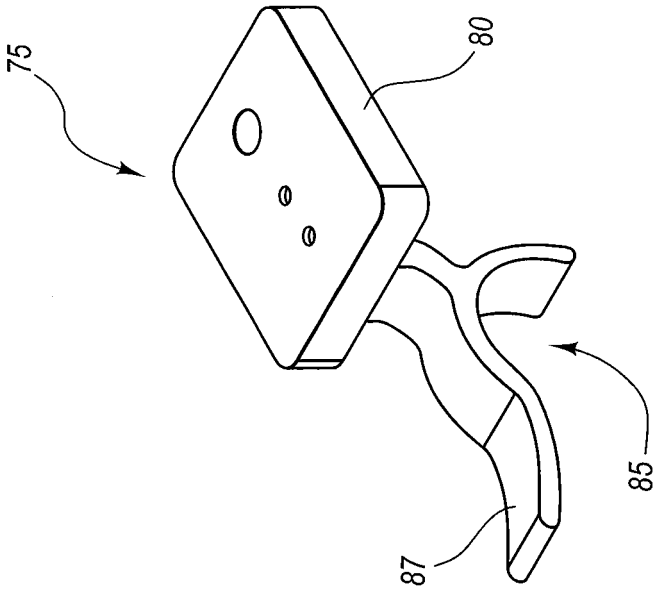


FIG. 5B

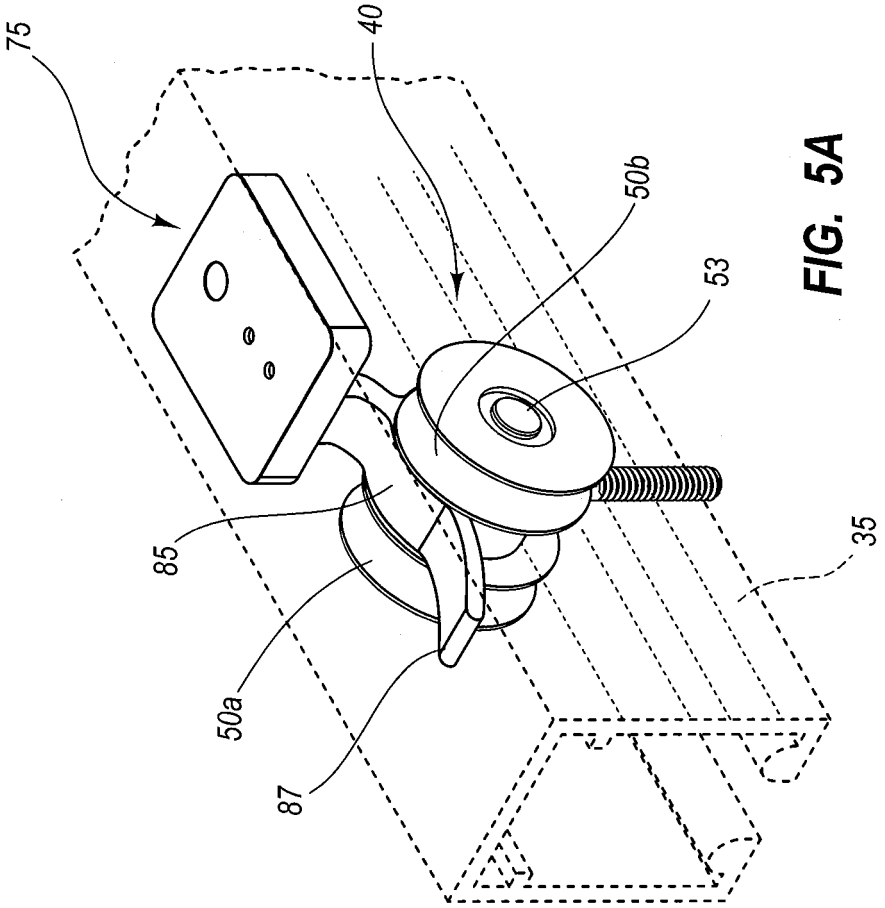
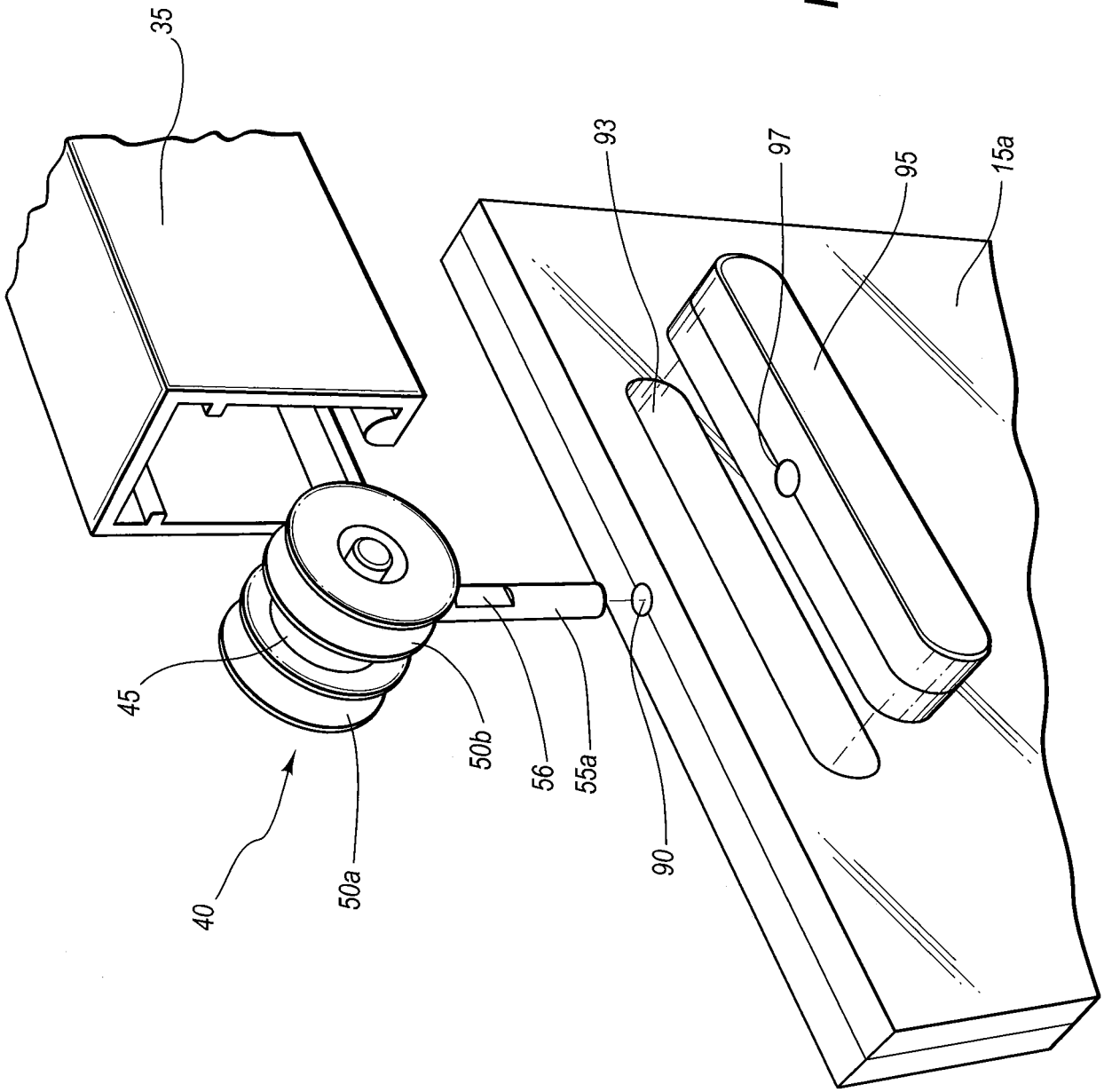


FIG. 5A

FIG. 6



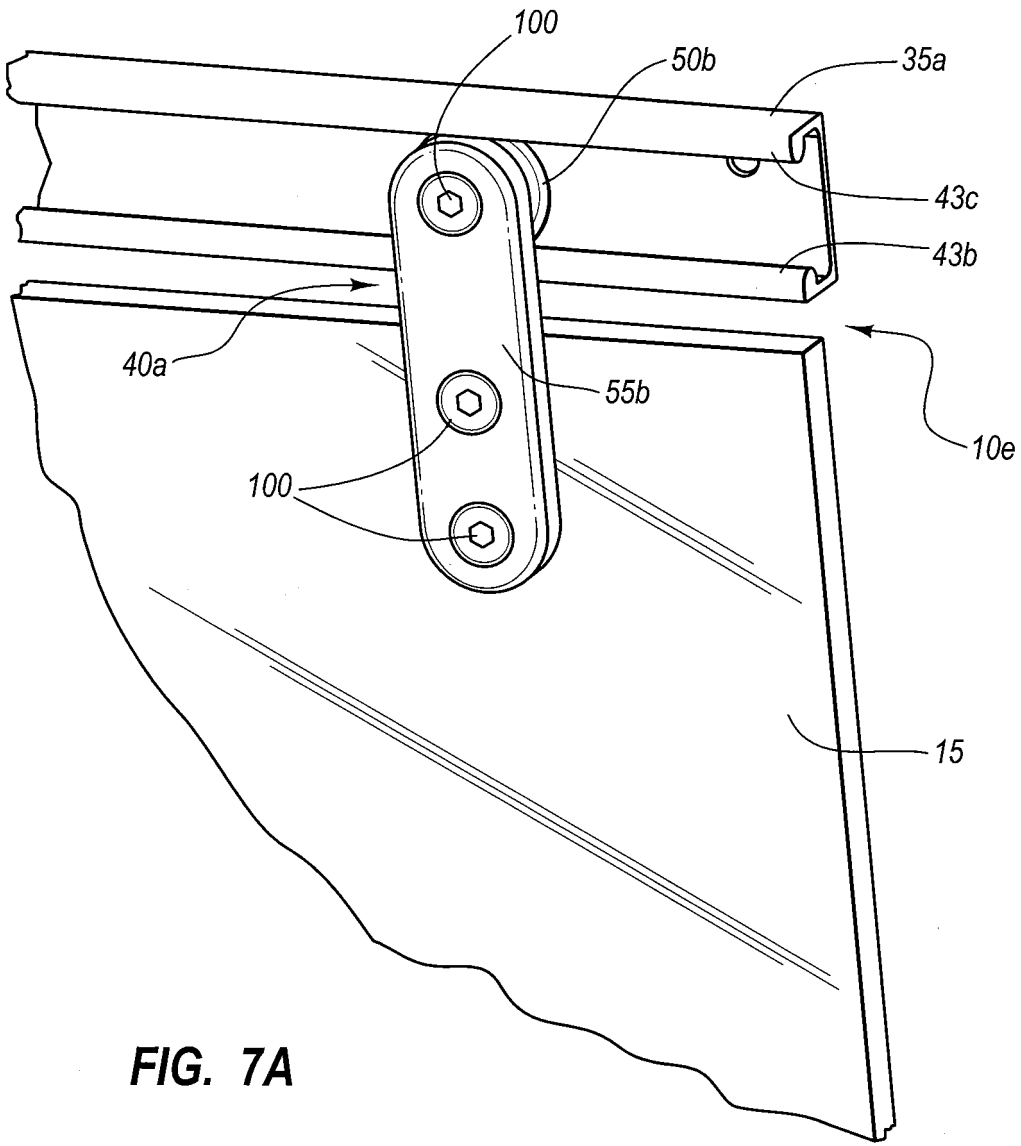

100
50b
35a
43c
43b
40a
55b
10e
100
15

FIG. 7A

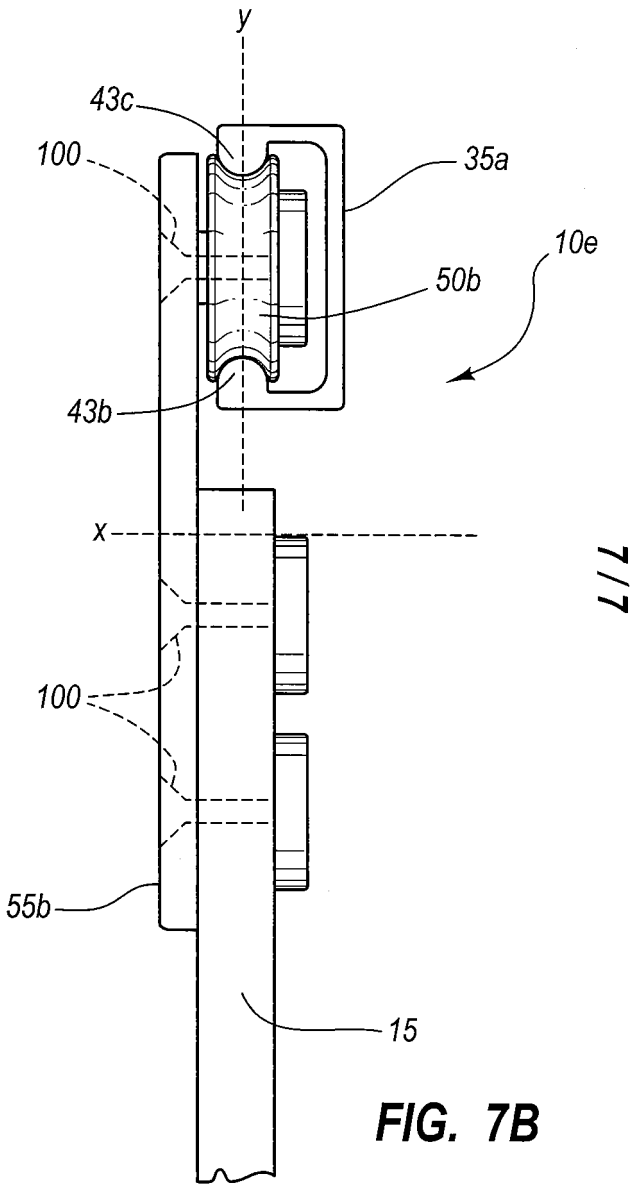

y
43c
100
35a
10e
50b
43b
x
100
55b
15

FIG. 7B