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(54) **ADAPTABLE SLIDING DOOR HANGING SYSTEM**

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(57) **ABSTRACT**

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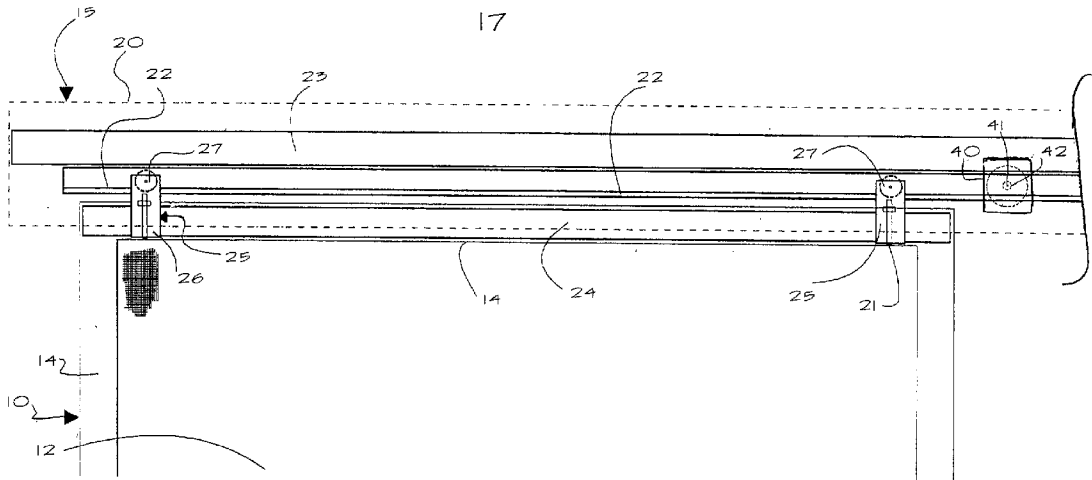
A door hanger assembly to be attached to a sliding door includes a first sub-assembly having a first support member to secure the hanger assembly in a position external to a frame containing the sliding door, and a glide track adjustably connected to the first support member to position the glide track above the sliding door and adjust the glide track in at least a first direction substantially perpendicular to a plane defined by the sliding door. The door hanger assembly including a second sub-assembly including a second support member to externally secure the door hanger assembly to the sliding door, and a first roller assembly coupled to the second support member to be rotatably received by the glide track to facilitate movement of the sliding door in a second longitudinal direction.

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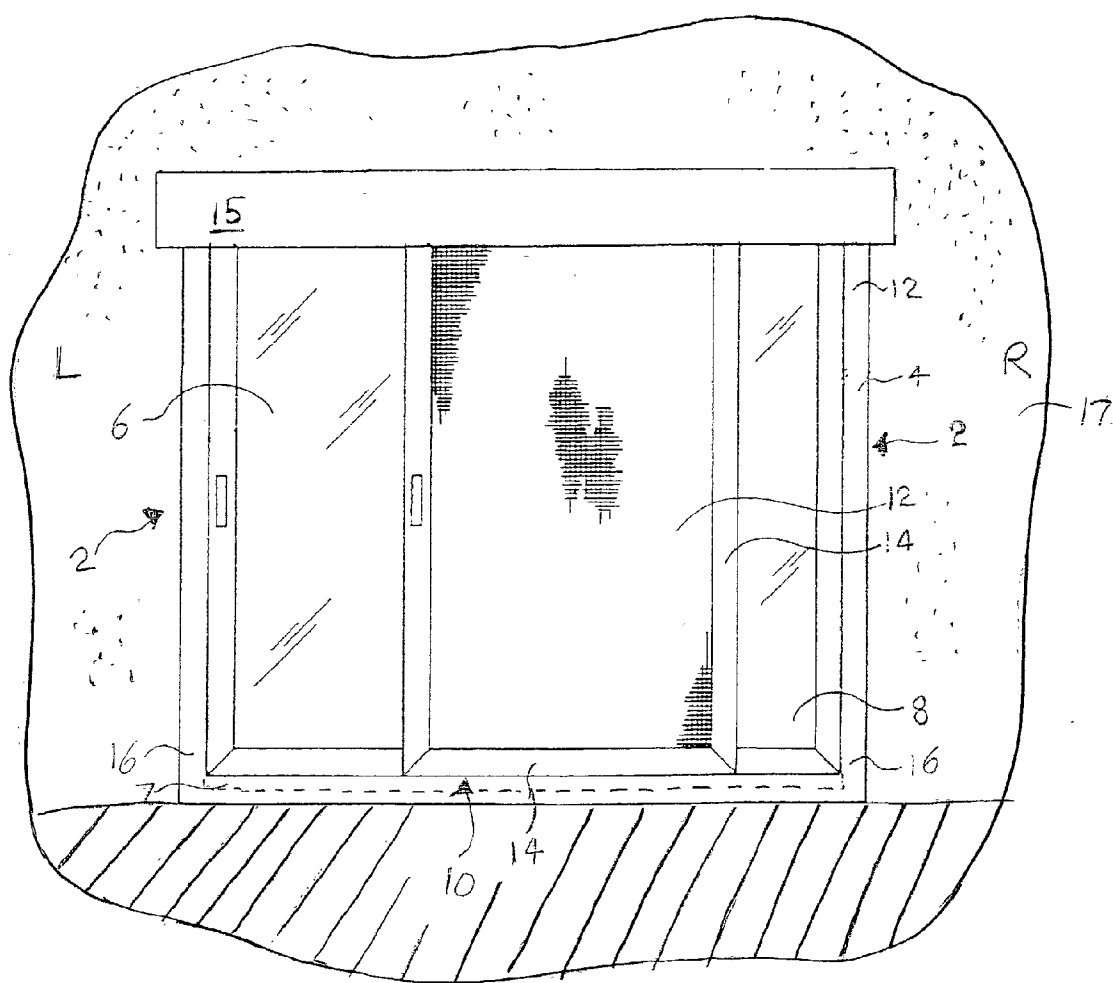


FIGURE 1

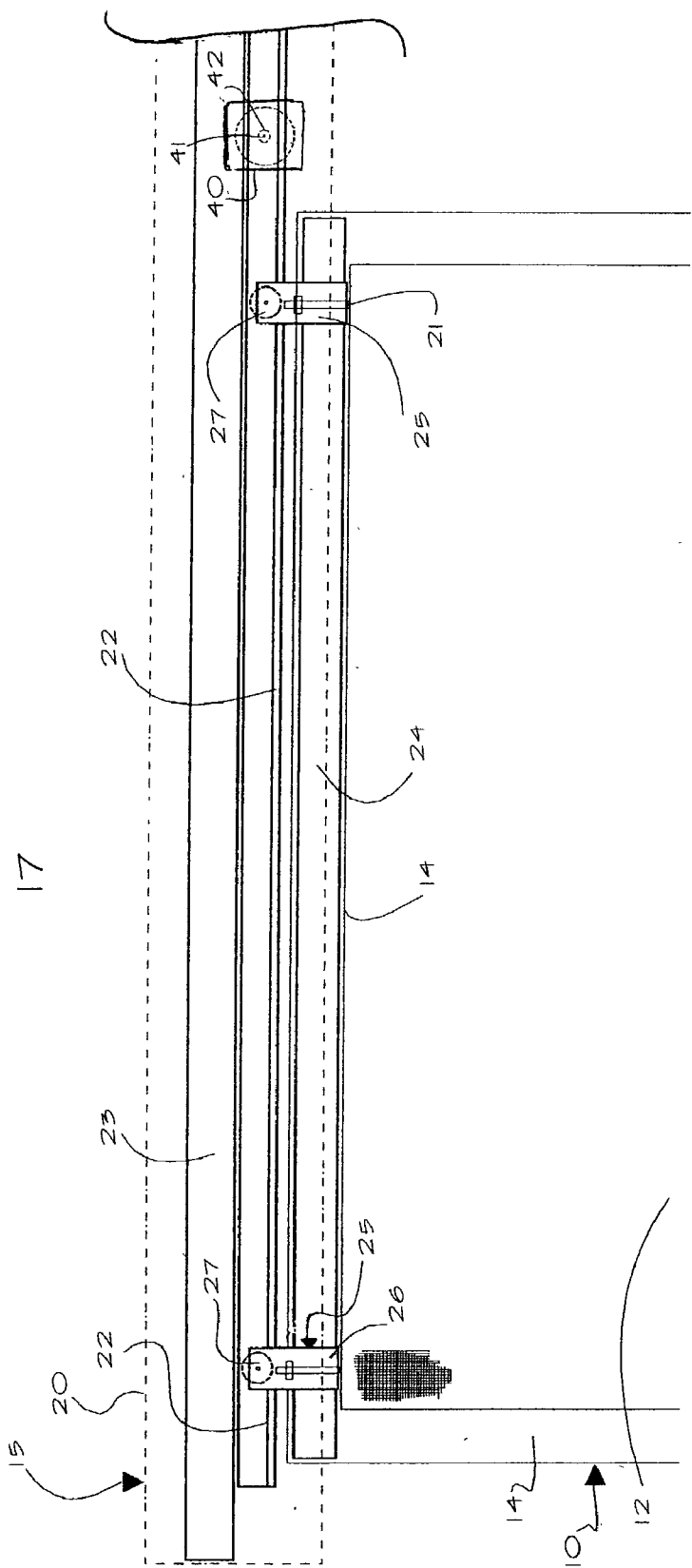


FIGURE 2A

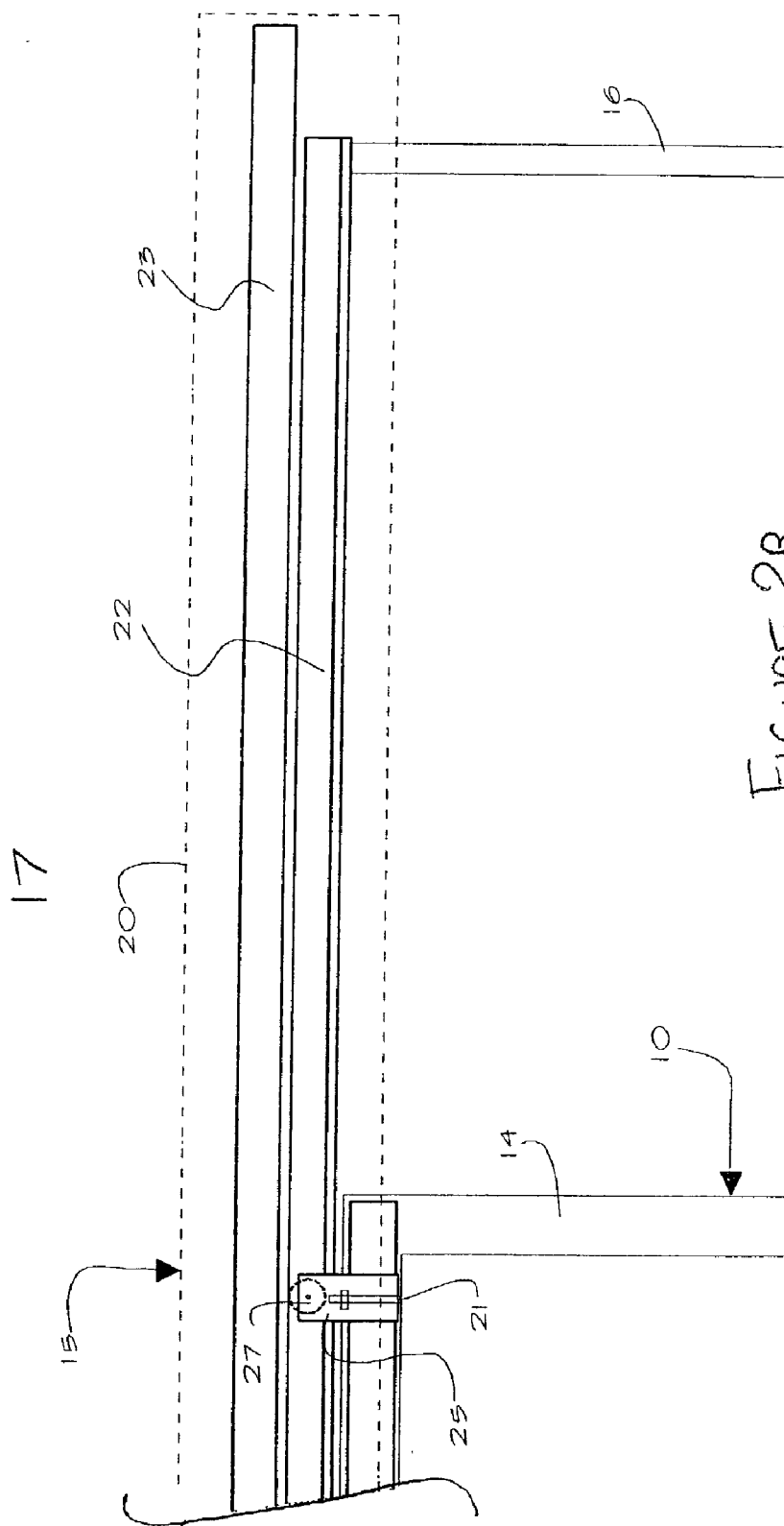


FIGURE 2B

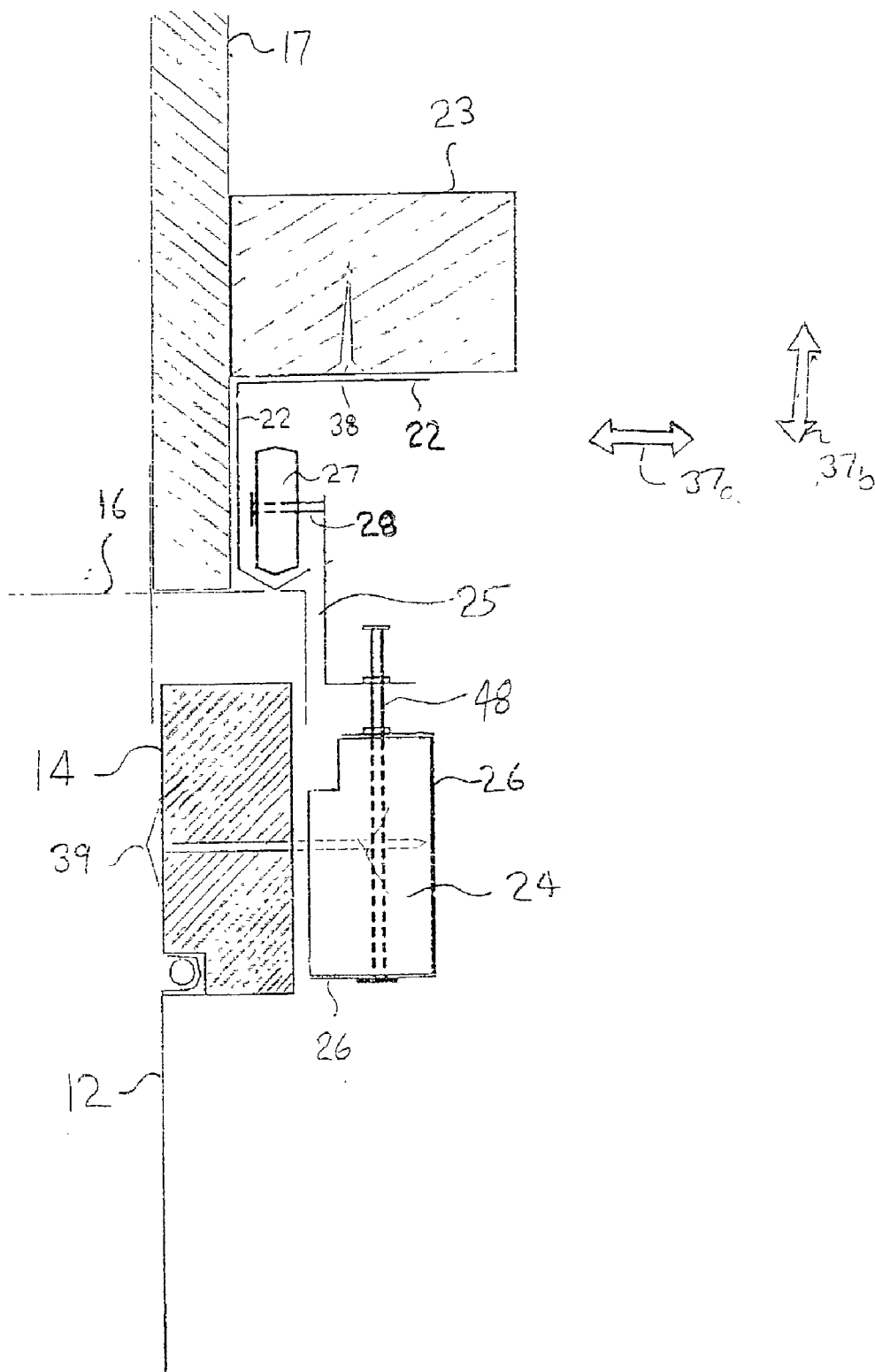
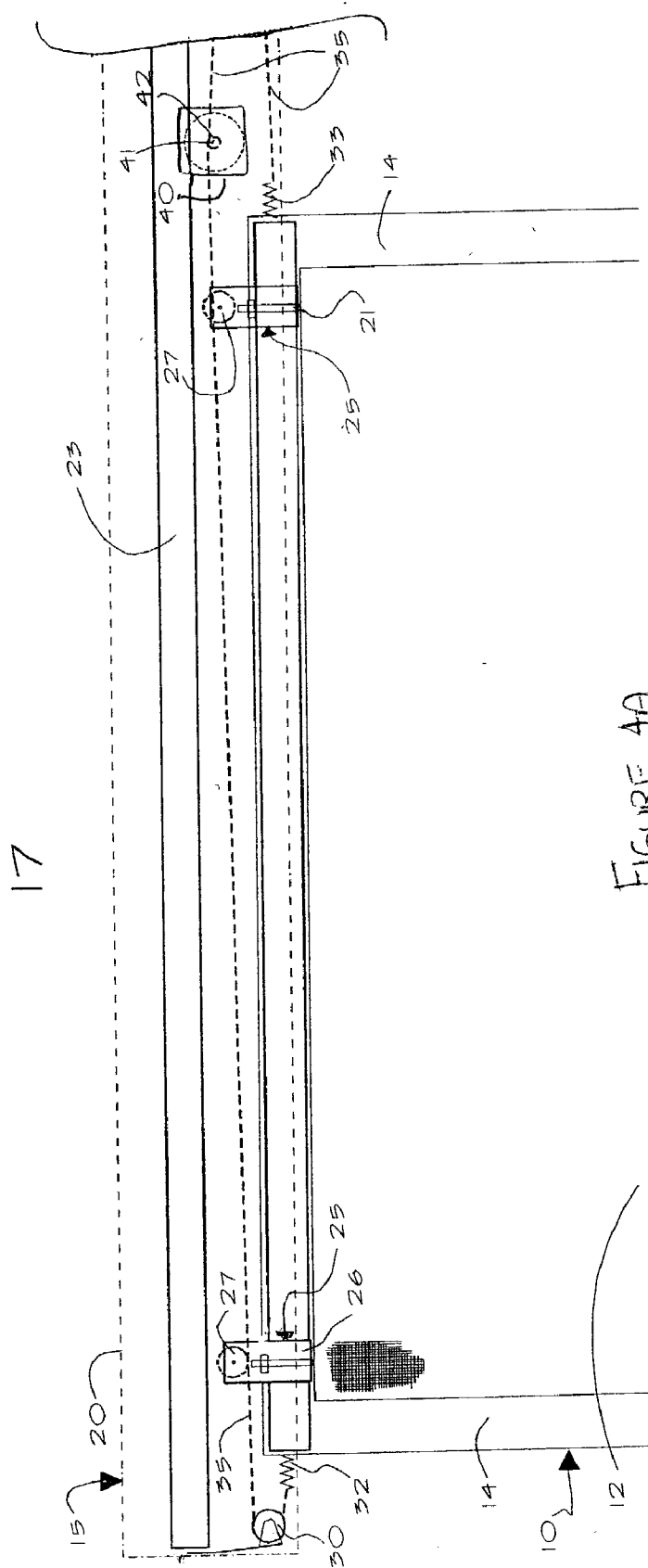


FIGURE 3



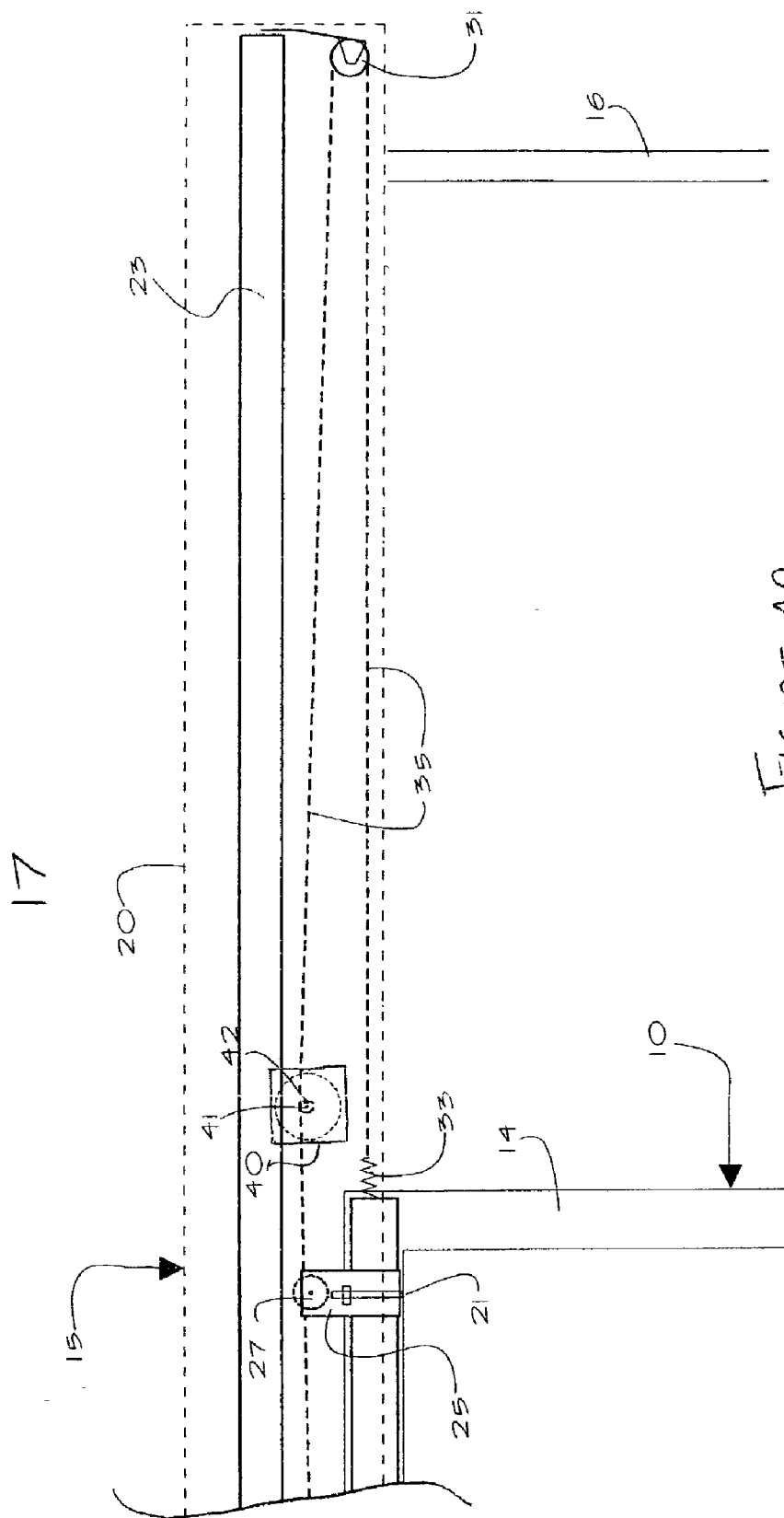


FIGURE 4B

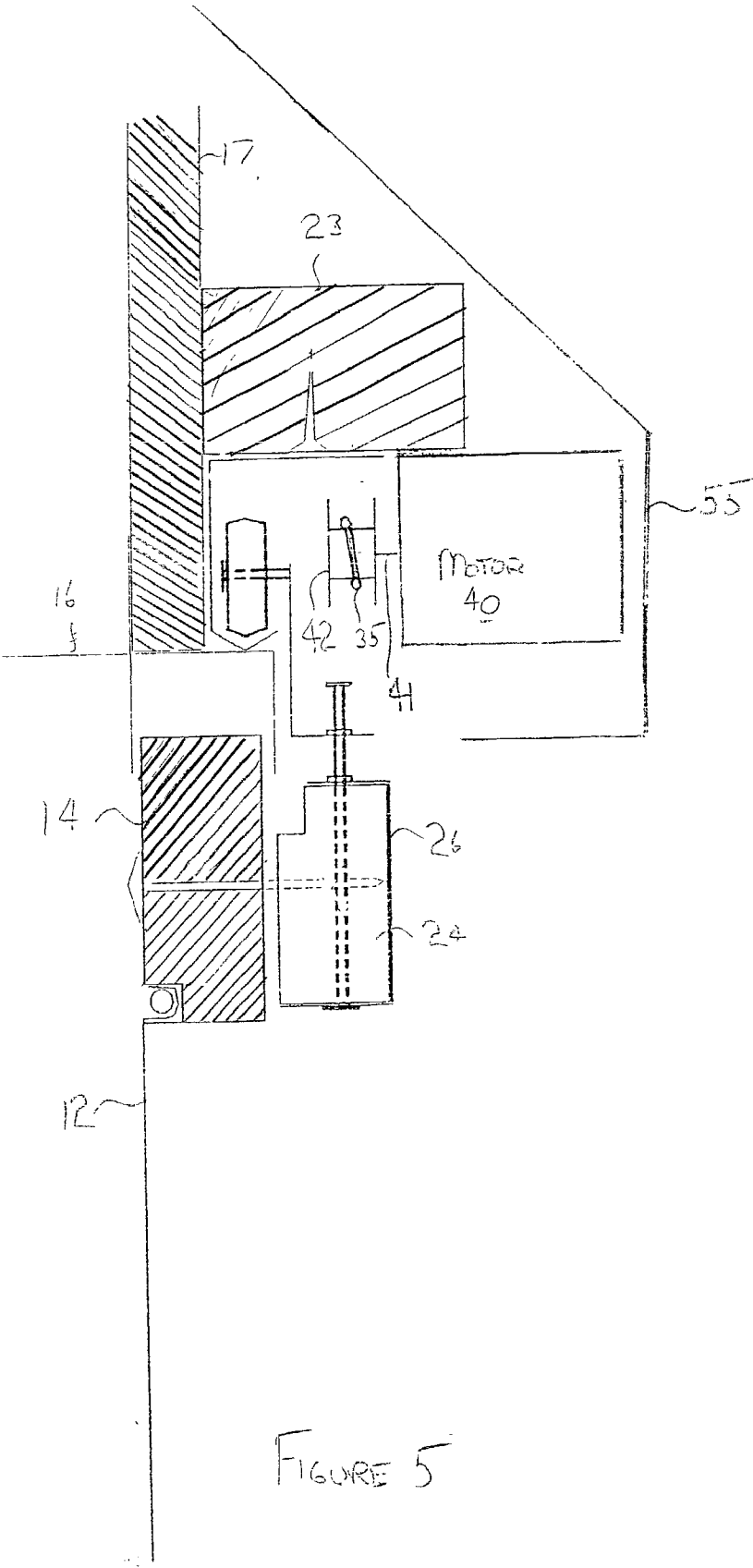


FIGURE 5



**ADAPTABLE SLIDING DOOR HANGING SYSTEM****BACKGROUND OF THE INVENTION****[0001] 1. Field of the Invention**

**[0002]** The present invention relates generally to a door hanging system. More specifically, the present invention relates to an externally mountable door hanging system that is mountable to the outside of a door frame and is adaptable to a wide variety of sliding doors and in particular, sliding screen doors.

**[0003] 2. Background Information**

**[0004]** Sliding screen doors, such as those often used in combination with common patio sliding glass doors, typically have associated with them a variety of operational problems due to their design wherein bottom-mounted rollers slide along a lower track. For example, due in part to dirt and debris that over time accumulates in the lower track, it is quite common for sliding screen doors to drag or skip along the track, or to become derailed entirely even with use by the most careful operators.

**[0005]** U.S. Pat. No. 6,336,247 issued to Schnoor describes a sliding screen door hanger assembly including a track horizontally mounted within a door frame, and a roller assembly including a roller for horizontal movement along the track. Although the Schnoor patent addresses many of the problems associated with bottom-mounted sliding screen door assemblies, Schnoor is nonetheless limited in its applicability. For example, the screen door hanger assembly of Schnoor includes a track that requires mounting within a door header assembly, while the screen door is required to be mounted directly below the hanger assembly. Accordingly, in order to fit, the hanger assembly of Schnoor requires a substantial amount of clearance space between the sliding screen door and the existing screen door track. Such spacing, however, is rarely provided for in the most common sliding door installations thereby decreasing the applicability of Schnoor. Moreover, Schnoor requires a complex track design that is not adaptive to a large number of door designs, and further does not provide for, or accommodate assistive door-opening facilities.

**BRIEF DESCRIPTION OF DRAWINGS**

**[0006]** The present invention will be described by way of exemplary embodiments, but not limitations, illustrated in the accompanying drawings in which like references denote similar elements, and in which:

**[0007] FIG. 1** illustrates a sliding door assembly including one embodiment of a self-contained, adaptable sliding door hanging system of the present invention;

**[0008] FIG. 2** illustrates a more detailed view of one embodiment of the external hanging system of the present invention;

**[0009] FIG. 3** illustrates a profile view of one embodiment of the external hanging system of the present invention;

**[0010] FIG. 4** illustrates a detailed view of the external hanging system of the present invention including a pulley assembly in accordance with one embodiment; and

**[0011] FIG. 5** illustrates a profile view of the external hanging system of the present invention including a motorized pulley assembly in accordance with one embodiment.

**DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION**

**[0012]** The present invention describes an adaptable sliding door hanger system. In the description to follow, various aspects of the present invention will be described, and specific configurations will be set forth. However, the present invention may be practiced with only some or all aspects, and/or without some of these specific details. In other instances, well-known features are omitted or simplified in order not to obscure the present invention. The description repeatedly uses the phrase "in one embodiment", which ordinarily does not refer to the same embodiment, although it may. The terms "comprising", "including", "having", and the like, as used in the present application, are synonymous.

**[0013] FIG. 1** illustrates a sliding door assembly including one embodiment of a self-contained, adaptable sliding door hanging system of the present invention. As shown, structure **17** includes sliding door enclosure **2**, and self-contained, adaptable, sliding door hanging system (hereinafter "external hanging system") **15** of the present invention. Sliding door enclosure **2** includes fixed glass pane **8**, and sliding glass pane **6** supported by conventional door assembly frame **16** and equipped to roll longitudinally (i.e. from side to side) on rollers engaged with lower track **7**. As shown, hanging system **15** is attached to structure **17** at a location above sliding door assembly **2** and external to door assembly frame **16**. Although depicted to be an outside wall, structure **17** may nonetheless represent a wide variety of interior and exterior walls or partitions. In accordance with the teachings of the present invention, external hanging system **15** is equipped to adjustably adapt to a wide variety of sliding door enclosures to facilitate improved longitudinal movement of a sliding door such as sliding screen door **10**, or an interior closet door. More specifically, in accordance with one embodiment of the invention, screen door **10**, including screen **12** and screen door frame **14**, are suspended and thereby supported by external hanging system **15** reducing the dependency for screen door **10** to be supported by lower track **7** as with conventional sliding door configurations. Accordingly, the problems associated with conventional lower track sliding door configurations such as the accumulation of dirt and debris may be avoided. Additionally, in accordance with one embodiment of the invention external hanging system **15** is equipped to easily adjust to fit a wide variety of sliding door assemblies such as sliding door assembly **2**. In one embodiment, external hanging system **15** includes height, width and depth adjustment facilities to accommodate a variety of sliding door installations.

**[0014] FIG. 2** illustrates a more detailed view of one embodiment of the hanging system of the present invention. Hanging system **15** includes upper support member **23**, horizontally secured to structure **17** above screen door **10**, with glide track **22** adjustably connected thereto. Hanging system **15** further includes lower support member **24** attached to screen door frame **14** at the top of screen door **10**, and one or more roller assemblies connected to screen door **10** at lower support member **24** to roll along glide track **22**. In one embodiment each of the components of hanging system **15** are at least partially covered by shroud **20**.

**[0015]** In the illustrated embodiment, upper support member **23** represents a single support member extending the

length of glide track 22. In other embodiments, however, upper support member 23 can be two or more support members each having a length shorter than that of glide track 22. Likewise lower support member 24 represents a single support member extending the length of screen door 10. In other embodiments, however, lower support member 24 can be two or more support members each having a length shorter than that of screen door 10. Upper support member 23 and lower support member 24 may each take a number of forms and may constitute a number of materials including but not limited to wood such as cedar and redwood due to their naturally weatherproofing abilities, metal such as aluminum or steel, or a plastic/composite. In one embodiment, glide track 22 represents a slotted J-track that is adjustably attached to upper support member 23 to adapt to a variety of sliding door assemblies such that roller assembly 25 and glide track 22 are aligned.

[0016] In the illustrated embodiment, hanging system 15 includes two roller assemblies 25 to facilitate smooth operation of screen door 10 from one side of door assembly frame 16 to the other. However, more or less roller assemblies could be used. Each roller assembly 25 includes a roller 27 and an adjustable holding bracket 26 attached to lower support member 24. Rollers 27 represent any of a large number of rollers known in the art such as, but not limited to v-groove rollers, closet door rollers, and window rollers manufactured from a variety of materials including plastic and metal. Holding brackets 26 are attached to screen door frame 14 via lower support member 24. In one embodiment of the invention, each holding bracket 26 represents an adjustable C-channel bracket disposed on lower support member 24 in such a manner that adjustment of holding bracket 26 will cause screen door 10 to move up or down with respect to structure 17 and external hanging system 15. Although in the illustrated embodiment roller assembly 25 includes two components, roller assembly 25 could nonetheless contain a fewer or greater number of components without departing from the spirit and scope of the invention.

[0017] FIG. 3 illustrates a profile view of one embodiment of hanging system 15. As shown, lower support member 24 is attached to screen door frame 14, while upper support member 23 is attached to structure 17. Both lower support member 24 and upper support member 23 may respectively be attached to screen door frame 14 and structure 17 in any of a variety of joining methods known in the art. For example, lower support member 24 can be attached to screen door frame 14 using screw 39, or one or more nails, bolts, brackets, clamps, fabric fasteners such as VELCRO, adhesives and so forth. In one embodiment, at least one of upper support member 23 and lower support member 24 includes a self-sealing adhesive disposed between the respective support member and structure 17 and/or screen door frame 14 to waterproof any holes that may be created in structure 17 and/or screen door frame 14 as the support members are attached.

[0018] FIG. 3 also illustrates glide track 22, which is adjustably connected to upper support member 23. In one embodiment, glide track 22 represents a slotted J-track that is slidably attached to upper support member 23 to facilitate positional adjustment of glide track 22 to/from structure 17 in the direction of arrows 37a (i.e. orthogonal to screen door 10). In one embodiment, at least a portion of glide track 22 rests on door assembly frame 16, and may be adjusted e.g.

via an adjustment mechanism such as adjustment screw 38 on a per-door installation basis to be aligned with roller assembly 25. Roller assembly 25 includes at least one roller 27 oriented so as to rotate about axle 28 when roller assembly 25 is moved longitudinally along glide track 22.

[0019] Further illustrated in FIG. 3 is holding bracket 26, which is attached to lower support member 24 via height adjuster 48 as shown. In one embodiment height adjuster 48 represents an adjustable screw, however other adjusting mechanisms such as bolts, fabric fasteners, adjustable mounting brackets may instead be used. By adjusting height adjuster 48 holding bracket 26 and lower support member 24 together cause screen door 10 to move in a vertical direction illustrated by arrows 37b. For example, the turning of height adjuster 48 in a clockwise direction may cause screen door 10 to move vertically up, whereas the turning of height adjuster 48 in a counterclockwise direction may cause screen door 10 to move vertically down.

[0020] FIG. 4 illustrates a detailed view of the external hanging system of the present invention including a pulley assembly in accordance with one embodiment. The pulley assembly includes left distal pulley wheel 30, right distal pulley wheel 31, and cable 35 engaged with each of the pulley wheels and coupled to screen door frame 14 as shown. In the illustrated embodiment, a biasing mechanism such as spring 33 is interposed between cable 35 and the left side of screen door frame 14, and a biasing mechanism such as spring 32 is interposed between cable 35 and the right side of screen door frame 14. Left and right distal pulley wheels 30-31 may each represent a tensioning roller that also includes a biasing element. Left and right distal pulley wheels 30-31 can be attached to upper support member 23 as shown, or may also be attached to shroud 20, for example. In one embodiment, motor assembly 40 is provided to facilitate assisted movement of the sliding door in the longitudinal direction. In one embodiment, motor assembly 40 represents a 12-volt motor that is disposed between left and right distal pulley wheels 30-31 and includes rotatable shaft 41 and wheel 42, which is engaged by cable 35. Motor assembly 40 may be mounted horizontally such that wheel 42 rotates within a plane parallel to the plane containing screen door 10 or motor assembly 40 may be mounted vertically such that wheel 42 rotates within a plane perpendicular to the plane containing screen door 10. Furthermore, motor assembly 40 may be disposed in alignment with left and right distal pulley wheels 30-31, or motor assembly 40 may be vertically and/or horizontally offset from left and right distal pulley wheels 30-31 as shown.

[0021] FIG. 5 illustrates a profile view of the external hanging system of the present invention including a motorized pulley assembly in accordance with one embodiment. In the illustrated embodiment motor 40, including rotatable shaft 41 and wheel 42, is disposed below upper support member 23 as shown, such that cable 35 can at the same time engage wheel 42 and left and right distal pulley wheels 30-31. In one embodiment, cable 35 represents a 30-pound test nylon line and is wrapped around wheel 42 once to act as a friction clutch mechanism. The friction clutch mechanism is used to cause cable 35 to slip on wheel 42 in the event screen door 10 encounters an obstacle such as a person's hand or arm during longitudinal movement. Accordingly, screen door 10 will temporarily stop movement until the obstacle is removed thereby reducing any

chance of injury. Operation of motor **40** can be controlled by a mechanical and/or electronic switch mounted inside and/or outside of structure **17**. For example, motor **40** may optionally be connected to a motion sensor via a wired or wireless connection to further automate operation of the sliding screen door **10**. Moreover, additional electrical, mechanical and/or physical means such as sensors, magnets air, and fluid(s) may be used to facilitate and/or limit the travel of screen door **10** within door assembly frame **16**.

### Epilog

**[0022]** While the present invention has been described in terms of the above-illustrated embodiments, those skilled in the art will recognize that the invention is not limited to the embodiments described. The present invention can be practiced with modification and alteration within the spirit and scope of the appended claims. Thus, the description is to be regarded as illustrative instead of restrictive on the present invention.

What is claimed is:

**1.** A door hanger assembly to be attached to a sliding door, the hanger assembly comprising:

a first sub-assembly including a first support member to secure the hanger assembly in a position external to a frame containing the sliding door, and a glide track adjustably connected to the first support member to position the glide track above the sliding door, the glide track adjustable in at least a first direction substantially perpendicular to a plane defined by the sliding door; and

a second sub-assembly including a second support member to externally secure the door hanger assembly to the sliding door, and a first roller assembly coupled to the second support member to be rotatably received by the glide track to facilitate movement of the sliding door in a second longitudinal direction.

**2.** The door hanger assembly of claim 1, wherein the guide track is slidably connected to the support member.

**3.** The door hanger assembly of claim 2, wherein the guide track comprises a slotted J-track extending longitudinally above the sliding door.

**4.** The door hanger assembly of claim 1, wherein the first support member is horizontally secured to a fixed location above the sliding door.

**5.** The door hanger assembly of claim 4, wherein the glide track is positioned such that when the glide track is engaged with the first roller assembly, the glide track is at least partially supported by a door frame associated with the sliding door.

**6.** The door hanger assembly of claim 1, wherein the second support member is horizontally secured to the sliding door.

**7.** The door hanger assembly of claim 1, further comprising height adjustment means coupled to the first roller assembly and the second support member to facilitate positional adjustment of the sliding door in a vertical direction substantially parallel to the plane containing the sliding door and orthogonal to the first and second directions.

**8.** The door hanger assembly of claim 7, wherein the height adjustment means comprises an adjustable C-channel bracket.

**9.** The door hanger assembly of claim 1, further comprising pulley means to facilitate movement of the sliding door in the second longitudinal direction.

**10.** The door hanger assembly of claim 9, wherein said pulley means comprises:

at least a left distal pulley wheel and a right distal pulley wheel in rotatable communication with one another, each of said left and right pulley wheels coupled to at least one of the first and second support members; and

a cable engaged with the left and right distal pulley wheels and having a first end positioned around the left distal pulley wheel and coupled to a left side of the sliding door and a second end positioned around the right distal pulley wheel and coupled to an opposing right side of the sliding door.

**11.** The door hanger assembly of claim 10, wherein said left distal and right distal pulley wheels are spring-biased.

**12.** The door hanger assembly of claim 10, wherein said pulley means further comprises:

first biasing means interposed between the left side of the door and the first end of the cable; and

second biasing means interposed between the right side of the door and the second end of the cable.

**13.** The door hanger assembly of claim 10, further comprising a motor assembly disposed between the left and right distal rollers and including a rotatable shaft to be engaged by the cable to facilitate automatic movement of the sliding door in the longitudinal direction.

**14.** The door hanger assembly of claim 13, wherein the cable is disposed as a single loop around the rotatable shaft.

**15.** The door hanger assembly of claim 14, wherein the cable comprises nylon line.

**16.** A door hanging system for attaching a sliding screen door to a structure, the system comprising:

first support means for securing the hanging system to the structure external to the door frame;

second support means for securing the hanging system to the sliding screen door; and

rotational support means adjustably attached to the first support means for rotationally supporting at least a first roller assembly coupled to the second support means to facilitate movement of the sliding screen door in a longitudinal direction, the rotational support means being adjustable in at least a direction substantially perpendicular to a plane containing the sliding screen door.

**17.** The door hanging system of claim 16, wherein the rotational support means comprises a slotted J-track extending longitudinally above the sliding screen door.

**18.** The door hanging system of claim 16, wherein the first support means is horizontally secured to a fixed location on the structure above the sliding screen door.

**19.** The door hanging system of claim 18, wherein the rotational support means is positioned such that when engaged with the first roller assembly, the rotational support means is at least partially supported by a door frame associated with the sliding screen door.

**20.** The door hanging system of claim 16, wherein the second support means is horizontally secured to the sliding screen door.

**21.** The door hanging system of claim 16, further comprising height adjustment means coupled to the first roller assembly and the second support means to facilitate positional adjustment of the sliding screen door in a vertical direction substantially parallel to the plane containing the sliding screen door and orthogonal to the first and second directions.

**22.** The door hanging system of claim 21, wherein the height adjustment means comprises an adjustable C-channel bracket.

**23.** The door hanging system of claim 18, further comprising pulley means to facilitate movement of the sliding screen door in the second longitudinal direction.

**24.** The door hanging system of claim 23, wherein said pulley means comprises:

at least a left distal pulley wheel and a right distal pulley wheel in rotatable communication with one another, each of said left and right pulley wheels coupled to at least one of the first and second support members; and

a cable engaged with the left and right distal pulley wheels and having a first end positioned around the left distal pulley wheel and coupled to a left side of the sliding screen door, and a second end positioned around the right distal pulley wheel and coupled to an opposing right side of the sliding screen door.

**25.** The door hanging system of claim 24, wherein said left distal and right distal pulley wheels are spring-biased.

**26.** The door hanging system of claim 24, wherein said pulley means further comprises:

first biasing means interposed between the left side of the screen door and the first end of the cable; and

second biasing means interposed between the right side of the screen door and the second end of the cable.

**27.** The door hanging system of claim 24, further comprising a motor assembly disposed between the left and right distal rollers and having a rotatable shaft to be engaged by the cable to facilitate automatic movement of the sliding screen door in the longitudinal direction.

**28.** The door hanging system of claim 27, wherein the cable is disposed as a single loop around the rotatable shaft.

**29.** The door hanging system of claim 28, wherein the cable comprises nylon line.

**30.** A door hanging system for hanging a sliding door within a door frame contained by a structure, the system comprising:

a first support member to be attached to the structure at a point above the sliding door;

a guide track adjustably connected to the first support member to facilitate positioning of the guide track in at least a direction substantially perpendicular to a plane containing the sliding door;

a second support member to be secured to the sliding door; and

a roller assembly coupled to the second support member and rotatably supported by the guide track to facilitate movement of the sliding door in a longitudinal direction.

**31.** The door hanging system of claim 30, wherein the guide track comprises a slotted J-track extending longitudinally above the sliding door.

**32.** The door hanging system of claim 30, wherein the glide track is positioned such that when the glide track is engaged with the roller assembly, the glide track is at least partially supported by the door frame associated with the sliding door.

**33.** The door hanging system of claim 30, further comprising height adjustment means coupled to the roller assembly and the second support member to facilitate positional adjustment of the sliding door in a vertical direction substantially parallel to the plane containing the sliding door.

**34.** The door hanging system of claim 33, wherein the height adjustment means comprises an adjustable C-channel bracket.

**35.** The door hanging system of claim 30, further comprising pulley means to facilitate movement of the sliding door in the longitudinal direction.

**36.** The door hanging system of claim 35, wherein said pulley means comprises:

at least a left distal pulley wheel and a right distal pulley wheel in rotatable communication with one another, each of said left and right pulley wheels coupled to at least one of the first and second support members; and

a cable engaged with the left and right distal pulley wheels and having a first end positioned around the left distal pulley wheel and coupled to a left side of the sliding door and a second end positioned around the right distal pulley wheel and coupled to an opposing right side of the sliding door.

**37.** The door hanging system of claim 36, wherein said left distal and right distal pulley wheels are spring-biased.

**38.** The door hanging system of claim 36, wherein said pulley means further comprises:

first biasing means interposed between the left side of the sliding door and the first end of the cable; and

second biasing means interposed between the right side of the sliding door and the second end of the cable.

**39.** The door hanging system of claim 36, further comprising a motor assembly disposed between the left and right distal rollers and including a rotatable shaft to be engaged by the cable to facilitate automatic movement of the sliding door in the longitudinal direction.

**40.** The door hanging system of claim 39, wherein the cable is disposed in a single loop around the rotatable shaft to operate as a friction clutch.

**41.** The door hanging system of claim 40, wherein the cable is comprises nylon line.

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