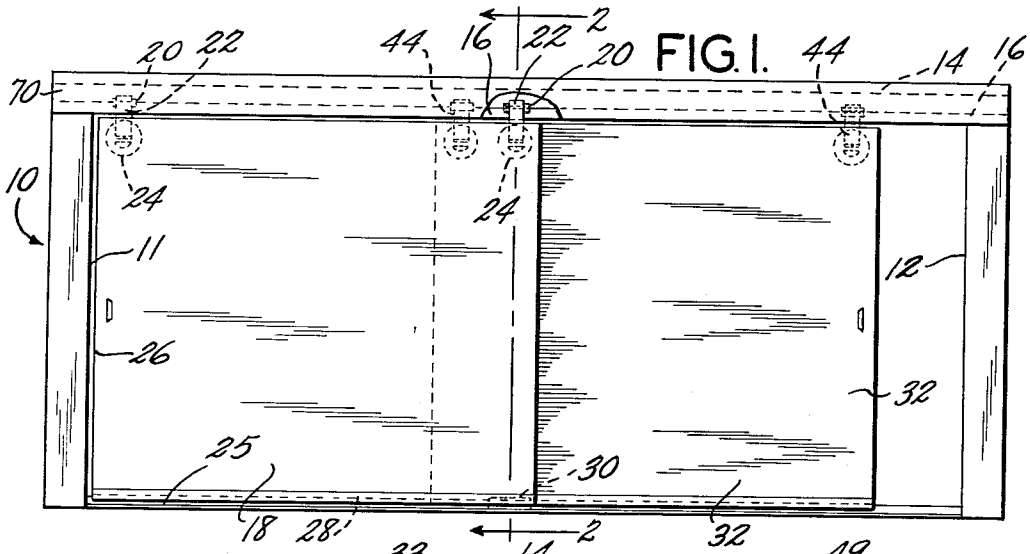
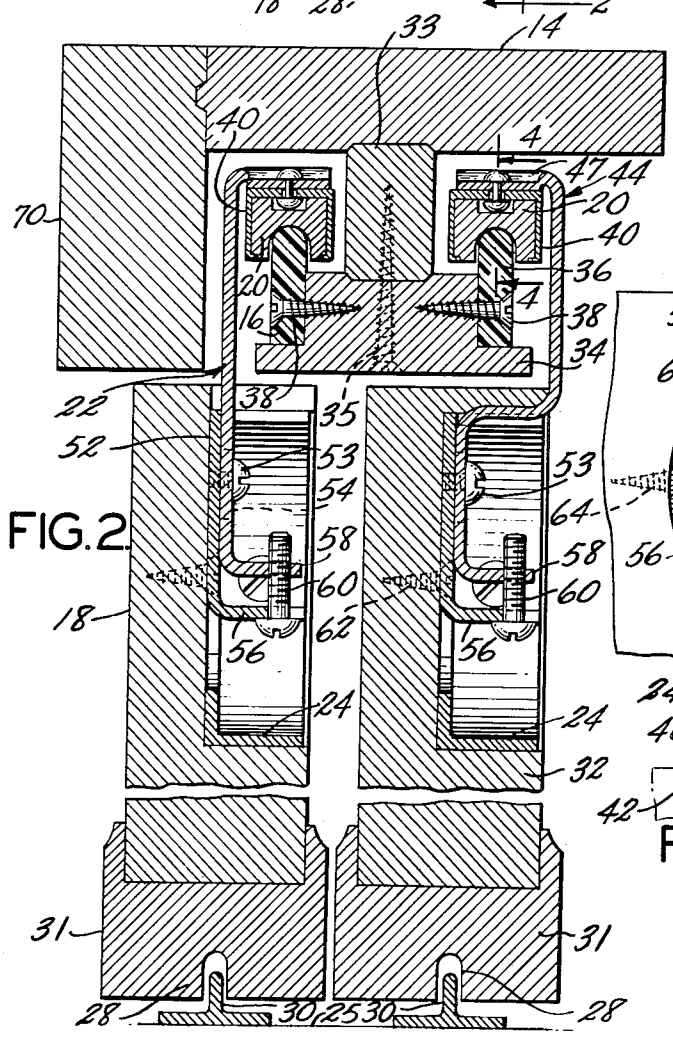
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SELF-ALIGNING ADJUSTABLE HANGER FOR SLIDING DOOR

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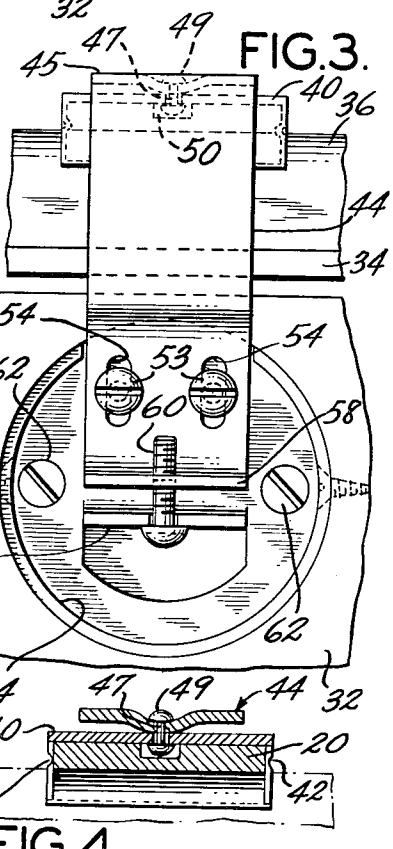


FIG. 4.

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SELF-ALIGNING ADJUSTABLE HANGER FOR SLIDING DOOR

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7 Claims. (Cl. 16—93)

This invention relates to hangers for supporting sliding doors and to a novel assembly of the hanger and door with the supporting structure of the building.

One of the features included in some modern houses is the provision of very wide closets with two sliding doors at the front of the closet which can be operated to completely open the front of either half of the closet. It is an object of this inveniton to provide an improved door hanger and sliding door construction which is particularly suitable for use with such closets.

One feature of the invention relates to a door supporting means which compries sliding blocks constructed and arranged to obtain self alignment so that the door will operate quietly and easily without observing close tolerances when installing it, and regardless of minor misalignment that may result from the settling of a new building.

Another object of the invention is to provide sliding doors with hanger supports that are more conveniently adjusted for obtaining alignment of the edge of the door with the side of the fixed frame against which the edge of the door contacts when the door is closed. The invention has blocks which slide along a rail to obtain quiet operation and extremely low friction. The construction is more economical, more compact, and more easily installed than the roller supports of the prior art. It is specially intended for closet doors but can also be used with doors between rooms, or in other locations where sliding doors are desirable. It is suitable for either wooden or composition doors, and some features of the invention can be used with tin metal doors even though these latter doors are not of sufficient thickness to provide recesses for receiving the receptacle of the door hangers of this invention.

Other objects, features and advantages of the invention will appear or be pointed out as the specification proceeds.

In the drawing, forming a part hereof, in which like reference characters indicate corresponding parts in all the views,

Figure 1 is a front elevation showing a door frame with two sliding doors made in accordance with this invention,

Figure 2 is a greatly enlarged sectional view taken on the line 2—2 of Fig. 1, but with one of the doors moved to bring its hanger into the plane of section,

Figure 3 is a front view of a portion of the structure shown in Fig. 2, and

Figure 4 is a detail sectional view taken on the line 4—4 of Figure 2.

Figure 1 shows a fixed door frame **10** in a building. This frame includes vertical frame members **11** and **12** at opposite sides of the opening through the frame. There is a top frame member **14** and there is a rail **16** supported from the top frame member, by structure which will be described more fully in connection with Fig. 2. This rail **16** extends for the full width of the opening through the door frame. A sliding door **18** is supported from

the rail **16** by slide blocks **20** at the upper ends of brackets **22** from which the door hangs.

The connection between the bracket **22** and the door **18** includes a receptacle **24** fitted into a recess in the rearward face of the door, and there is a vertically adjusted connector in the receptacle **24** by which the door **18** can be raised or lowered with respect to the overhead rail **16**. The construction of this connector will be described in connection with Figs. 2 and 3; and for the present, it is sufficient to understand that the forward door **18** is supported by brackets **22** at opposite ends of the door; and that the connectors at the lower ends of these brackets are independently adjustable selectively to raise and lower either end of the door to control the clearance between the door and the floor **25** immediately beneath it, and also to control the hang of the door, so as to keep the vertically extending edge **26** of the door, parallel with the vertical frame member **11** so that the door engages the frame member throughout its entire height when the door is moved into closed position.

There is a groove **28** in the bottom of the door for receiving a guide **30**. This guide **30** is attached to the floor **25** and serves to prevent the lower edge of the door from swinging inwardly and outwardly. When the door is made of composition material that is not suitable for grooving, the bottom element **31** of the door is made of different material and is made somewhat higher than the groove **28**.

The door **18** extends across one-half of the width of the opening in the door frame **10**. In order to close the other half of this opening, there is another door **32**. Since the doors **18** and **32** have to pass each other, it is necessary to have one located outwardly of the other, and in the illustrated construction, the door **32** is the rearward door, its front face being located just beyond the rear face of the door **18**.

The door **32** is shown in a partly open position for clearer illustration. When both doors are closed there is preferably little or no overlap. The rearward door **32** is similarly supported from a guide rail located behind the guide rail **16**, as will be more fully understood by reference to Fig. 2.

In Fig. 2, the top frame member **14** is shown with a downwardly extending web **33** secured to it, and there is a rail support **34** attached to the bottom of the web **33** by fastening means such as screws **35**. In the preferred construction the web **33** and rail support **34** are made of hard wood.

The forward rail **16** is attached to the front face of the rail support **34** by screws, and a similar rail **36** is secured to the rearward face of the rail support **34** by similar screws. The screws for the rails **16** and **36** are indicated by the reference characters **38**. These rails **16** and **36** rest on underlying shoulders of the rail support **34**, in the construction illustrated, but this is not essential if the rails are supported by screws at closely spaced intervals throughout the length of the rails. Each of the rails **16** and **36** extends above the top of the rail support **34** and has a top surface of convex transverse curvature. The rails **16** and **36** are preferably made of fibre board, either black or red.

Each of the slide blocks **20** has a longitudinally extending groove that fits over the bearing surface on the top of the rail **16** or **36**. This groove is of concave transverse contour and preferably has a radius of curvature greater than that of the convex bearing surface of the rail so that the block **20** can rock transversely through a limited angle of movement without binding on the rail. A block holder **40** covers the top and sides of the block **20** and has inwardly extending projections at its bottom edges and at the longitudinal ends of the block for preventing displacement of the block **20** in the block holder

40. The sides of the block holder have short flanges that extend under the bottom longitudinal corners of the block, and the holder 40 is slightly longer than the block 20 and has displaced edge portions 42 just beyond the ends of the block for holding the block against longitudinal displacement. It will be evident that the block can be held in the holder 40 in various other ways.

There is a bracket 44 with a top portion 45 (Fig. 3) extending across the upper surface of the block holder 40. This top portion 45 of the bracket has a curved face 47 which touches the top of the block holder 40 to provide a rocker bearing on which the bracket and block can rock with respect to one another about an axis extending transversely of, and preferably normal to, a vertical plane through the longitudinal axis of the rail 36. The block holder 40 is connected to the top portion 45 of the bracket by a rivet 49 extending through the top portion of the bracket and through the top of the block holder 40. The diameter of this rivet is somewhat less than the holes through which it extends, and it thus provides a loose connection which does not interfere with the rocking of the block on the surface 47. There is a recess 50 in the top of the block to give clearance for the bottom head of the rivet 49.

This construction provides a universal alignment for the bracket 44 with respect to the rail 36. The rocking of the block 20 on the convex bearing surface of the rail 36 provides for transverse components of mis-alignment; whereas the rocking bearing provided by the curved surface 47 permits mis-alignment of the bracket 20 without disturbing the contact of the block along its entire longitudinal length with the rail 16.

The receptacle 24 is preferably countersunk into a recess in the door 18, and there is an opening at the top of the receptacle and through the top of the door for the bracket 22 which extends downwardly past the rail 16 and into the receptacle 24. The downwardly-extending section of the bracket 22 contacts with an end wall 52 of the receptacle. There are screws 53 extending through slots 54 in the bracket 22 and these screws 53 thread into the end wall 52 of the receptacle and clamp the bracket 22 against the end wall of the bracket.

The receptacle 24 has a flange 56 which is preferably made by striking out a portion of the end wall 52. This flange can be made in other ways and it is merely representative of a fixed part of the receptacle 24 lodged under a lower portion 58 of the bracket 22. This lower portion 58 extends rearwardly to a position under the rail 16.

A connector 60 attaches the lower portion 58 of the bracket to the flange 56 of the receptacle. This connector 60 is preferably a screw or bolt which extends through the flange 56 and threads into the lower portion 58 of the bracket or into a nut carried by the bracket and forming, in effect, a part of the bracket. The opening in the flange 56 for the connector 60 is a slot, that opens through the end of the flange, instead of merely a hole. This facilitates the assembly of the structure because the door can be lifted to the proper level and the flange 56 then brought into position by endwise movement that engages the slot of the flange over the shank of the screw.

The door 18 is supported by the screw 60. When the clamping screws 53 are loose, the screw 60 is rotated to raise or lower the flange 56 and the door 18 to which the flange is rigidly connected. The screw 60 thus provides a threaded connector by which the end of the door, in which the receptacle 24 is located, can be raised or lowered, as previously described. When the desired adjustment has been obtained, by means of the screw 60, the screws 53 are tightened to hold the bracket 22 rigidly connected to the receptacle, and to prevent any angular movement of the bracket 22 with respect to the receptacle 24.

The receptacle 24 can be held within its countersunk recess in the door 18 by screws 62, or other fastening means, extending through the end wall 52 of the receptacle 24; or by screws 64, or other fastening means, extending through the side walls of the receptacle. The latter are better suited for use with doors having a thickness only slightly greater than the depth of the countersunk recess in which the receptacle 24 is located. For very thin doors, the receptacle 24 need not be completely countersunk, and in the most extreme case can be merely attached to the rear face of the door.

The rearward door 32 has a countersunk receptacle 24 which is the same as the receptacle in the forward door 18, but it is necessary to have the bracket 44 on the rearward door 32 shaped differently from the bracket 22 of the forward door.

The bracket 44 is connected to a block holder 40 which holds a block 20 that slides along the rearward rail 36. The connection is similar to that between the block holder 40 and the forward bracket 22. The bracket 44 extends downwardly past the rearward face of the rail 36 and then extends horizontally at an intermediate level into the upper part of the receptacle 24 and under the rail 32. At the end wall of the receptacle 24, the bracket 44 turns downwardly again and has a slotted section that contacts with the end wall of the receptacle and that is attached to the end wall by screws 53 corresponding to the similar screws 53 that attach the forward bracket 22 to its receptacle 24.

The bracket 44 has a lower end 58 which is the same as on the bracket 22 and the door 32 is similarly supported by a screw 60 connecting the flange 56 of the receptacle to the lower end 58 of the bracket 44.

In the construction illustrated, the screws 60 are not located at the center planes of the doors 18 and 32, that is, the center of gravity of each of the doors is not in the plane with the axes of the screws 60 by which each of the doors is supported. The receptacles 24 are countersunk into the doors far enough to leave ample running clearance between the rearward face of the forward door and the forward face of the rearward door. The actual location of the center planes of the doors may be in front or behind their supporting rails depending upon the thicknesses of the doors.

When the doors 18 and 32 are used for closets, the receptacles 24 are left open since they are not visible and the screws 60 are more easily available for adjustment with the receptacles open. When the doors are used between rooms, covers are placed over the receptacles 24 in order to obtain a neater appearance.

A front cover board 70 extends downward in front of the rail 16 and the rail support 34 so as to hide the sliding blocks and the upper portions of the brackets 22. Ordinarily there is no corresponding cover plate at the back of the door frame when the doors are used for a closet; but when they are used between rooms, there is a similar cover board on the inside of the door frame.

The preferred embodiments of the invention have been illustrated and described, but changes and modifications can be made without departing from the invention as described in the claims.

What is claimed is:

1. In a sliding door hanger assembly for supporting a door from an overhead rail that has a bearing surface of convex transverse contour, said assembly including a slide block having a concave bearing surface that fits over the bearing surface of the rail, the concave bearing surface being of greater radius of curvature than the contour of the rail surface so that the block can rock transversely on the rail without binding, a block holder in which the slide block is retained, a bracket having a top portion extending across the block holder and having a bearing thereon which is supported from the block, said bearing having a curved surface that provides for rocking of the holder with respect to the bracket substantially at right angles to the rocking of the block on the rail, said bracket also having a vertically extend-

ing section in position to pass downwardly in front of an overhead rail by which the slide block is supported when the hanger assembly is in its intended relation to said rail, and a vertically adjustable connection by which the bracket is connected to the door with which it is intended to be used.

2. A sliding door hanger assembly for suspending a door from an overhead rail which is connected with a fixed supporting structure, said assembly including a lignum vitae slide block having a curved bearing face that engages a supporting surface of the rail, the top of the block having a recess therein, a block holder extending lengthwise of the block and beyond the ends of the block and having inwardly displaced sections beyond the end of the block, to hold the block against displacement in the holder, a bracket that has a top portion, extending across the top of the block holder, which has a curved surface in contact with the top of the block holder and has a radius of curvature extending transversely of the rail so that the block holder has a rocking movement with respect to the bracket in the plane of the longitudinal extent of the rail, a fastening element loosely connecting the block to the bracket, said fastening element extending through the top of the holder and into a clearance provided by the recess in the top of the block, said bracket also has a vertically-extending section in position to pass downwardly beyond an overhead rail by which the slide block is supported when the hanger assembly is in its intended relation to said rail, and a horizontally-extending lower portion in position to project under the rail at a substantial distance below the rail when the hanger assembly is in said intended relation, a receptacle for fitting within a recess in a face of the door, and a vertically-adjustable fastening means connecting the lower portion of the bracket with the receptacle for supporting the door from said bracket.

3. A sliding door hanger assembly comprising a slide block having a curved bearing face for sliding contact along a supporting rail, a holder for the block with inwardly displaced portions of the holder retaining the block within the holder, a bracket having a horizontally-extending top portion with a rocker bearing connecting the top portion of the bracket to the block holder, the radius of curvature of the rocker bearing extending transversely of the radius of curvature of the slide block curve, said bracket having a vertically extending section extending downwardly from the top portion and also having a horizontally-extending portion at the lower end of the vertically extending section, said horizontally-extending portion being turned inward under the top portion, a receptacle for connection with a door, and connecting means within the receptacle securing the receptacle to the lower inwardly turned portion of the bracket, said connecting means including an adjustable device for moving the receptacle vertically with respect to the bracket.

4. The door hanger assembly described in claim 3, characterized by a construction in which a portion of the vertically extending section of the bracket abuts against an end wall of the receptacle and has vertically extending slots therein through which threaded connectors extend for clamping the bracket to the back of the receptacle, said receptacle having a flange extending from the end wall thereof under the lower horizontally extending portion of the bracket, and a screw passing through the flange and bracket to adjustably support the flange at an adjusted position below the lower horizontally-extending portion of the bracket.

5. A sliding door hanger assembly for a door having a recess opening through a vertical face thereof adjacent to the top of the door, and with the wall of the recess comprising at least the major part of the side of a cylinder that has its axis of revolution generally normal to said vertical face, and with the horizontal diameter of the recess located at a substantial distance below the top of the door, said assembly including a generally cylindrical receptacle that is adapted to fit within the recess so as to be held against upward displacement by the portion of the door which defines that part of the recess above the horizontal diameter thereof, a bracket having a horizontal portion positioned within the receptacle and extending to the front of the receptacle and having a vertically extending section connected to the forward end of the horizontal portion and projecting upwardly for a substantial distance beyond the top limit of the receptacle for connection with supporting structure that runs along an overhead rail, and vertically adjustable means connecting the horizontal portion of the bracket to a part of the receptacle.

6. A sliding door hanger assembly for suspension from a supporting rail, said assembly including a slide block having a face that fits over the rail, a holder with top, end and side walls forming a recess in which the block is retained, the side walls extending below the face of the block that slides along the rail, a bracket to which the holder is flexibly connected, said bracket having a top portion, positioned above the top wall of the holder and extending beyond an outer side face of the block holder, a vertical section extending downwardly, and a lower portion secured to the lower edge of said vertical section and extending inwardly under the top portion for insertion in a recess in one side of the door, a receptacle adapted to be positioned in said recess in the door and adapted to be secured therein and means connecting the lower portion of the bracket to a part of the receptacle.

7. In a sliding door hanger assembly for supporting a door from an overhead rail having a bearing surface of convex transverse contour, said assembly including a slide block having a longitudinally extending bearing surface for contact with the rail along at least the major portion of the length of the block, said bearing surface being of concave transverse contour with its radius of curvature greater than that of the rail face on which the block is intended to be used, a holder in which the block is retained, a bracket connected to the holder with a section of the bracket extending downwardly past the front of the block holder and adapted to extend below the top of the door with which it is intended to be used, and a lower portion extending inwardly below the block holder and adapted to extend into a recess in the back of the door when the assembly is attached to the door, and a vertically adjustable connector secured to the bracket and adapted to be secured to the door.

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