

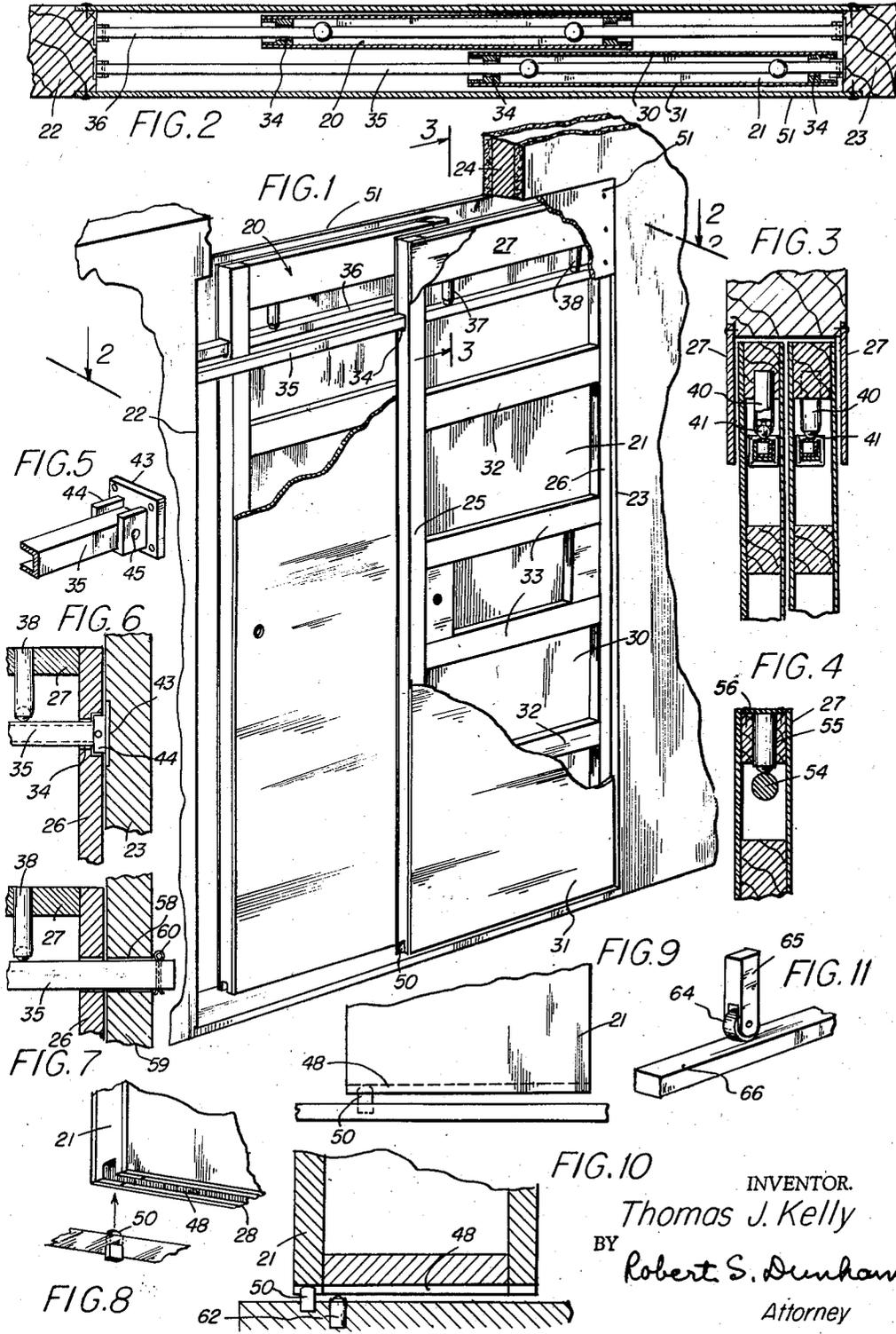
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SLIDING DOOR

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SLIDING DOOR

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This invention relates to sliding doors and particularly to improvements in supporting or suspension means, having a novel structural relation to the body of the door. Although the improved structures are useful for other sliding closures, the invention is of special significance for interior doors of buildings, for example where a plurality of doors sliding across each other are employed for closets or the like, or where a door is arranged to slide into and out of a wall pocket or recess at one side of the doorway.

A conventional mode of support for a sliding door in dwellings and similar buildings involves a track mounted on the lintel or other frame member across the top of the doorway, and hangers which are affixed to the door at or adjacent its top edge and which have appropriate rollers or wheels to ride in the track. These parts are relatively costly, are usually difficult to install, or require special skill for installation, and are in general rather complex; if the track is not properly leveled or the hangers not properly aligned, the door will not function as intended. Additional complexity and difficulty of installation are apt to be involved where two or more doors are hung, to cover a single opening jointly, since a plurality of parallel tracks are then required, necessarily at the underside of the lintel or corresponding frame structure.

The present invention is designed to provide sliding doors having improved supporting and sliding means, of simplified and relatively inexpensive construction, and of such character as to be easy to install, with a minimum of parts external to the door itself. Further objects are to provide supporting means requiring no elements attached to the outer surface of the door or projecting therefrom, and particularly to provide an arrangement that can be built into the door, as the latter is manufactured, with corresponding advantages of convenience and appearance.

To these and other ends, the invention comprises a sliding door arrangement wherein the door itself has a horizontal passage near the top, extending from one vertical edge to the other and parallel to and between the faces of the door, the passage being shaped to receive a supporting rod in free relation, and the door having internal bearing means designed to bear or rest in sliding relation on the rod. The rod is mounted, at its ends, in the side pieces of the frame within which the door is to slide, so that the door is suspended on the rod and may be moved along it for the desired sliding function. The bearing means most advantageously comprise two bearing elements embedded or otherwise concealed within the uppermost part of the door and spaced along the passage, each element being designed for free-sliding engagement with the rod, conveniently as roller means, either of ball or roller wheel type.

A further and presently preferred feature of invention is the embodiment of this arrangement in doors of the so-called hollow core type, for example doors (usually of flush design) having a peripheral wood frame and two panels of plywood or the like constituting the respective

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faces of the door, with or without spacing or filling pieces or members at appropriate localities in the hollow interior of the assembly, for increased rigidity of the face panels. With such structure, the rod passage is constituted by the provision of holes in the upright pieces of the frame, and in internal spacers if necessary, so that the supporting rod passes freely through the door from edge to edge, traversing the hollow interior. The bearing elements are mounted in the uppermost, horizontal frame piece, conveniently by having their supporting parts seated in appropriate recesses in such piece, so that their rollers face downwardly at localities to abut a rod in the described passage.

As will now be appreciated, the bearing means and the apertures constituting the passage can be readily provided in the door structure at the time of its manufacture, so that the assembly is thus in effect prefabricated and sold as a sliding door unit, yet with no externally attached or projecting parts that might become damaged in transportation or handling. For installation, it is essentially only necessary to provide simple mountings for the ends of the supporting rod in the doorway, and then to slide the rod into the door passage and insert the rod (now supporting the door) in its mountings. Although basic features of the invention are applicable to doors of other types and uses, and of other materials, the above embodiment of a pre-fabricated sliding door represents a special improvement of unusual practical value.

Further details and cooperating structures, including screening means for the rods at the upper part of the doorway, are described below in connection with certain embodiments of the invention as shown in the accompanying drawing.

Referring to the drawing:

Fig. 1 is a perspective view, with parts broken away, of a pair of sliding doors embodying the invention and installed in a suitable doorway;

Fig. 2 is a horizontal section on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary vertical section on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary vertical section of a single door, similar to Fig. 3, showing certain parts in modified forms;

Fig. 5 is a fragmentary perspective view of a means for mounting the supporting rod;

Fig. 6 is a fragmentary vertical section, parallel to the door face, showing the rod mounting of Fig. 5;

Fig. 7 is a section similar to Fig. 6, showing a modified rod mounting;

Fig. 8 is an exploded, fragmentary, perspective view of a guide arrangement for the bottom of the door;

Fig. 9 is an elevational view showing the guide arrangement of Fig. 8;

Fig. 10 is a vertical section, parallel to the door face, showing the bottom guide and supplemental support; and

Fig. 11 is a fragmentary perspective view of another roller bearing element for support of the door on the rod.

Referring to Figs. 1, 2 and 3, the drawing shows a pair of sliding doors 20, 21 mounted to operate across a doorway having upright vertical members or jambs 22, 23 and a horizontal member or lintel 24. Such arrangement is appropriate, for example, as a door arrangement for a closet, whereby access to either side of the closet is afforded by sliding one or the other of the doors across the other.

Since both of the doors 20, 21 are identical, detailed description of one will suffice for both, the same reference numbers being used to indicate identical parts in each. Thus, the door 21 is of the hollow core construction described above, having a peripheral frame consisting of upright pieces 25, 26 at the side edges, a top piece 27 and a bottom piece 28 similar to the top piece and in-

licated in Fig. 7. The front and rear faces of the door are respectively provided by flat panels 30, 31 of plywood or the like, completely covering the internal frame. Additional bracing or filling members may be employed within the hollow central region, for instance as indicated at 32, 33. Doors of this type are of conventional construction for a variety of purposes, it being understood that other specific arrangements of the frame and of the filling or bracing elements may be employed as desired.

To provide a transverse passage for the supporting rod, each of the members 25, 26 has an opening 34, here shown as of rectangular shape to admit a rod of like contour, the opening being conveniently slightly larger than the rod. Thus, as clearly shown in Figs. 1-3, the supporting rod 35 freely traverses the passage constituted by the openings 34 in the door 21 and a like rod 36 similarly traverses a like passage in the door 20.

For support of the door on the rod, two roller bearing means 37, 38 are mounted in the upright frame piece 27. These devices 37, 38 may be generally of a type employed for roller support, such as under furniture or the like, and may each consist of a mounting shank 40 and a roller ball 41 seated against appropriate ball bearing means as conventionally employed in roller devices of this type. The structures 37, 38 are mounted by appropriately imbedding the upper part of the shank 40 of each in the wooden frame piece 27. As will be appreciated, these devices are positioned so that the balls 41 engage rod 35 in bearing relation and at relatively widely spaced localities, for stable support of the door. Thus when the rod 35 is inserted through the passage, the entire weight of the door is carried by the bearing elements 37, 38, the roller elements of each freely travelling on the rod and the rod traversing the openings 34 without appreciable contact. Hence the door slides readily on the rod, and since its center of gravity is far below the latter in a direct vertical line, the door is thus hung in a position of stable equilibrium. The door 20, including identical bearing means 37, 38, is similarly supported on its rod 36.

Any of a variety of sockets or similar means may be provided to mount the ends of the rods in the jambs or upright portions of the doorway frame. Simply by way of illustration, Figs. 5 and 6 show a simple socket device comprising a mounting plate 43 and a projecting U-shaped socket 44 into which the end of the rod 35 may be seated. If desired, a suitable pin or set screw may be inserted in an opening 45 in the side of the socket to retain the rod in place. While other shapes, such as solid, round or rectangular members may be employed, the rods 35 and 36 are here shown as lengths of channel-shaped sections, conveniently arranged with the channel opening at one vertical side. It has been found that channel shapes of steel or the like are effective for supporting sliding doors in the manner indicated, without appreciable sagging. It will also be seen that the side frame members of the doors 25, 26 may be appropriately countersunk at the openings 34, for example, as indicated in Fig. 6, to receive the socket portions 44 of the rod supports, so that the doors may be closed tight against the door jambs when desired.

As conventional in sliding doors of this general type, guide means may be provided, if desired, at the bottom of the door, to avoid any tendency toward swinging in a direction transverse of the doorway. For example, the bottom of each door may be transversely grooved as at 48 (in Figs. 8, 9 and 10) and a guide element 50 is mounted in the floor or other cross member at the bottom of the doorway, projecting into the groove 48. As will be seen, one guide is provided for each door, conveniently at a location near the center of the doorway. Since the doorway has a width slightly less than twice the width of each door, each guide can be disposed so as to be continuously received within a groove 48, regardless of the door position.

If the presence of the rods 35, 36 is undesirable in appearance, a cover or skirt panel 51 may be provided at the top of the doorway on one side or on both sides, i. e., in the nature of a valance, so as to enclose the uppermost portions of the doors and the otherwise exposed portions of the rods 35, 36.

It will now be seen that the described assembly affords a simple yet highly effective means for supporting the sliding doors in a securely suspended relation, with full freedom to slide easily across the desired path. The entire assembly constituted by each door itself, including the apertured arrangement that provides the rod passage and including the bearing members 37, 38, may be entirely prefabricated and sold as a sliding door unit to builders or other users, for ready installation. The mounting means for the rods, such as the brackets 43-44, are readily secured, as by screws, in the upright members of the doorway, at an appropriate height which can be easily determined by measurement against the door itself. The mounting plate portions 43 of each bracket may be recessed in the jamb, in a manner generally similar to other types of door hardware. A slight space may be provided between the desired normal position of the top of the door and the lintel 24, to facilitate insertion of the rods. In completing the assembly, it is only necessary to insert each rod in its corresponding door, and then bring the parts into place in the doorway, seating the ends of the rod in the sockets, the lower groove 48 of the door being at the same time seated over the guide 50. The cover panels 51 can then be installed and the sliding door arrangement is complete and ready for use.

As explained, the various elements are susceptible of embodiment in other forms. Simply by way of example, Fig. 4 shows the use of a supporting rod 54 of solid, round cross-section. The bearing means are also here shown as comprising a like roller ball assembly 55 arranged to be mounted in a passage that extends entirely through the upper door frame member 27 in a vertical direction, with a mounting flange 56 at the top of the bearing assembly 55. With this modified form of bearing device, the door may either be prefabricated as contemplated in Figs. 1 and 3, or the parts may be applied to an otherwise standard blank door assembly, by the builder or other person installing the door.

Fig. 7 shows another, entirely simple mode of supporting the carrying rods such as the rod 35. Here an appropriate opening 58 is made in each door jamb 59, conveniently of a size for admitting the rod without much clearance. The rod is then simply passed through the openings, i. e., first into one side of the doorway and then back into the other side, and may be held at each end by suitable means, such as a cotter pin 60, as indicated in Fig. 7. It will be appreciated that this arrangement is particularly suitable where the door can be permanently hung prior to finishing of the adjoining wall at one face of the doorway.

Although in general the entire support of the doors is carried by the bearings 37, 38, auxiliary support may be provided if desired, as with the roller bearing element 62 imbedded in the floor beneath the bottom of the door at one side of the groove 48, all as indicated in Fig. 10. Fig. 11 shows a modified bearing arrangement for the support of the doors on the rods, i. e., in lieu of the ball roller devices 37, 38. Here a wheel roller 64 is shown having a supporting shank 65 which can be mounted in the upper door frame member, e. g. as shown in Fig. 3 or Fig. 4, so that the door is appropriately hung in sliding relation on the rod 66, the latter being shown in the alternative form of a solid rectangular cross-section.

Although the invention has been illustrated in connection with doors of a specific type, arranged as a pair for a closet entrance or the like, the supporting and mounting parts are adaptable for many different kinds of doors, used in various arrangements, including single doors of the type intended to slide into a recess or pocket at one

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side of the doorway. In all instances, the structure is correspondingly simple and the installation of the door or doors, appropriately hung for sliding, is a simple matter, requiring no great skill to attain proper positioning and alignment.

It is to be understood that the invention is not limited to the specific embodiments herein shown and described but may be carried out in other ways without departure from its spirit.

I claim:

1. A sliding door comprising a door having within its upper part a horizontal passage extending from one vertical edge to the other parallel to and between the faces of the door, said passage being shaped to receive a supporting rod freely traversing same, and bearing means mounted within the door and disposed to bear on said rod traversing the passage, for supporting the door in sliding relation.

2. A sliding door comprising a door having within its upper part a horizontal passage extending from one vertical edge to the other parallel to and between the faces of the door, a rod freely traversing said passage and adapted to be supported at its ends in frame structures between which the door is to slide, and bearing means mounted within the door adjacent the said passage and arranged to support the door in sliding relation on the rod.

3. A sliding door comprising a hollow core door including top and vertical edge members and face panels and having a horizontal passage therein near the top of the door extending through openings in the edge members from one vertical face to the other parallel to and between the face panels, said passage being shaped to receive a supporting rod freely traversing same, and a plurality of horizontally spaced roller means carried by the top member and disposed to bear on said rod traversing the passage, for supporting the door in sliding relation.

4. A sliding door comprising a hollow core door including top and vertical edge members and face panels and having a horizontal passage therein near the top of the door extending through openings in the edge members from one vertical edge to the other parallel to and between the face panels, a rod freely traversing said

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opening and adapted to be supported at its ends in frame structures between which the door is to slide, and a plurality of horizontally spaced roller means carried by the top member and bearing on the rod, for supporting the door in sliding relation.

5. A sliding door assembly comprising a doorway frame having upright members at the sides of the doorway, a plurality of doors for collectively closing said doorway, each door having within its upper part a horizontal passage extending from one vertical edge to the other parallel to and between the faces of the door, a plurality of rods respectively corresponding to the doors disposed across the doorway and supported at their ends by the said upright members, each rod freely traversing the passage in the corresponding door, and bearing means mounted within each door adjacent the said passage thereof and arranged to support the door in sliding relation on the rod that traverses the passage.

6. A sliding door assembly comprising a doorway frame having upright members at the sides and a cross member at the top, a plurality of doors for collectively closing said doorway, each door having a horizontal passage therein near the top of the door extending from one vertical edge to the other parallel to and between the faces of the door, a plurality of rods respectively corresponding to the doors disposed in parallel relation in a horizontal plane across the doorway and supported at their ends by the said upright members, each rod freely traversing the passage in the corresponding door, a plurality of horizontally spaced bearing means mounted within each door adjacent the said passage thereof and arranged to support the door in sliding relation on the rod that traverses the passage, and panel means disposed across the doorway adjacent the top thereof, extending between the upright members and along the cross member outside of the doors, for covering the region traversed by the rods.

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