ABSTRACT: A sliding guide for the lead or guide door of a set of folding doors. The guide is slidable along an overhead track and carries two aligned, longitudinally spaced coil springs acting in compression and receiving therebetween an upstanding guide pin adjacent the leading edge of the guide door. When the guide encounters a stop at either end of its travel along the track, the guide pin compresses the corresponding spring to bring the doors to a cushioned stop when opening them and to snug the doors closed when closing them.

The pivoted or jamb door of the set carries adjacent its pivot edge an upstanding pivot pin identical to the aforementioned guide pin. Thus, the set of doors may be pivoted on either the left or the right side without modification.
FOOLDING DOOR INSTALLATION AND SLIDING GUIDE THEREFOR

BACKGROUND OF INVENTION

The present invention relates in general to a folding door installation and to a guide for the lead or guide door of such an installation.

As shown in U.S. Pat. No. 3,162,890, issued Dec. 29, 1964 to Robert Brydolf and Council A. Tucker, and in a copending application Ser. No. 781,695, filed Nov. 29, 1968 by Robert Brydolf and me and assigned to the same assignee as this application, a folding door installation of the type to which the present invention relates typically includes an overhead track means comprising a downwardly facing, generally channel-shaped track. The pivoted door of the set of folding doors is provided adjacent its vertical pivoted edge with aligned upward and downward pivot pins respectively inserted into and pivotally engaging upper and lower pivot brackets, the upper pivot bracket being secured to the track means and being disposed in the channel-shaped track, and the lower pivot bracket being suitably secured to the adjacent door jamb, or to the floor. The lead or guide door is provided adjacent its vertical leading edge with an upwardly engaging guide pin along the leading edge of the guide wheel. The latter engages with the respective horizontal edges of the respective doors in the manner disclosed in the aforementioned copending application filed by Robert Brydolf and me.

In prior folding door installations of the foregoing type, a suitable resilient means is typically carried by the track means and disposed in the channel-shaped track in the path of the guide wheel. The latter encounters this resilient means just before termination of closing movement of the set of doors, and yieldably retards closing movement as the set of doors approaches its closed position, so as to bring the set of doors to a cushioned stop, and to snug the set of doors in its closed position.

It will be noted that, with the foregoing prior construction, the upper pivot pin adjacent the pivoted edge of the pivoted door and the wheeled upper guide axle adjacent the leading edge of the guide door limit the installation to a particular "hand". In other words, the set of folding doors must be pivoted at either its left-hand vertical edge or its right-hand vertical edge, and cannot be achieved once the doors are drilled because they are frequently drilled and inserted identically to eliminate errors. The identical upper pivot and upper guide pins are then installed in the drilled holes in the upper edges of the two doors, either of which may be the pivoted door, or the guide door. Which door becomes the pivoted door is determined by installing the lower pivot pin in the hole drilled in the lower edge thereof. The hole drilled in the lower edge of the other door is simply not used. Thus, drilling of the necessary holes and installation of the two pivot pins and the guide pin therein are greatly simplified, which is an important feature of the invention.

Considering the invention more specifically now, an important object thereof is to provide a guide for the upstanding guide pin adjacent the leading edge of the guide door, which is disposed in and slidably engaging the channel-shaped track and which is retained therein by the guide pin. With this construction, it is merely necessary during installation to insert the upstanding guide pin into the sliding guide, and to insert the sliding guide into the channel-shaped track which is an important feature of the invention.

Another important object of the invention is to provide a guide of the foregoing nature which carries spring means engageable with the guide pin inserted thereinto for yieldably retarding movement of the set of doors as they approach their open positions and to snug the doors closed. More particularly, an object in this connection is to provide spaced stops on the channel-shaped track corresponding to the open and closed positions of the set of doors, the springs means yieldably retarding movement of the set of doors upon engagement of the guide with either of these stops. Each stop may be an abutment in the track such as a screw, nail, or other obstruction, expressly provided for the purpose. However, the upper pivot bracket may be used as the opening movement stop, and a sliding guide associated with another set of doors on the same track, in a double installation, may be used for the closing movement stop.

Still another object of the invention is to provide a sliding guide of the foregoing nature wherein the spring means comprises two coil springs in compression carried by the guide on opposite sides of and engaging the guide pin and respectively compressible upon engagement of the guide with its stops.

Yet another object of the invention is to provide a guide conforming externally to the track along which it slides and provided therein with a longitudinally extending channel containing the two coil springs in axil alignment, the guide pin being inserted between the two springs.

A further object is to provide means on the guide for spacing the springs apart longitudinally of their channel to facilitate insertion of the guide pin therebetween, the spacing preferably being less than the guide pin diameter so that the springs hold the guide or the guide pin to facilitate installation of the guide in the track when installing the set of doors.

An additional object is to provide a sliding guide having a longitudinal channel which is arcuate in cross section and which has an angular extent of more than 180° so as to retain the two springs therein, the springs being initially insertable into their channel by temporary deformation of the guide and/or springs.

Yet another object of the invention is to provide a sliding guide having intermediate its ends and on opposite sides thereof arcuate bearing surfaces concentric about the axis of the guide pin and respectively engageable with the sides of the channel-shaped track with substantially line contact. With this construction, the sliding guide is set slightly about the vertical guide pin axis to prevent binding in the track.

Still another object is to provide a sliding guide of sufficient length to engage the upper pivot bracket, or other stop, during opening of the set of doors, before the set of doors is opened far enough to be locked open. This permits locating the guide pin hole in the same relative position as the upper pivot pin hole so that the doors can be drilled identically, which is an important feature.

While the hereinbefore described sliding guide of the invention, with its coil springs capable of acting on a guide element inserted there between to cushion both door closing move-
ment and door opening movement, is particularly useful in connection with a set of folding doors, it may also under some circumstances be used in connection with a sliding door.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the art to which the invention relates in the light of this disclosure, may be achieved with the exemplary embodiment of the invention described in detail hereinafter and illustrated in the accompanying drawings.

DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of a doorway equipped with a double set of folding doors each incorporating the present invention;

FIG. 2 is an enlarged, fragmentary view, partially in vertical section and partially in elevation, showing one of the sets of folding doors of FIG. 1 and a fragment of the other;

FIG. 3 is an exploded perspective view showing the relationship between an upper pivot pin and an upper pivot bracket, and the relationship between an upper guide pin and a sliding guide, of the set of folding doors shown in FIG. 2;

FIG. 4 is an enlarged transverse sectional view through the sliding guide and a channel-shaped track in which it is disposed, FIG. 4 being taken along the arrowed line 4-4 of FIG. 5;

FIG. 5 is a sectional view taken as indicated by the arrowed line 5-5 of FIG. 4; and

FIG. 6 is a fragmentary sectional view taken as indicated by the arrowed line 6-6 of FIG. 5 of the drawings.

DESCRIPTION OF EXEMPLARY EMBODIMENT OF INVENTION

Referring initially to FIG. 1 of the drawings, illustrated therein is a wall 20 provided with a doorway 22 bounded by a header 24, jams 26 and 28, and a floor 30. Within the doorway 22 are a pair 32 of folding doors 34 and 36 and a pair 38 of folding doors 40 and 42. The two pairs 32 and 38 are identical, except that one is a mirror image of the other, both pairs being identically installed. Consequently, the description which follows will be restricted to the pair 32 as a matter of convenience.

Considering the pair 32 more specifically, the doors 34 and 36 are hinged together along their adjacent vertical edges by suitable hinges 46, preferably in the manner disclosed in the aforementioned Kellens-Brydolf application, this track means includes two laterally-spaced, parallel, depending flanges 52 connected by a transverse web means 54 and cooperating therewith to form below the web means a downward-facing, channel-shaped track 56. The upper side of the track 56 is defined by laterally inwardly extending flanges 57 integral with the flanges 52.

Disposed in the track 56 adjacent the jamb 26, and suitably secured to the track means 50, is an upper pivot bracket 58 providing a pivot socket 60. Secured to the jamb 26 and the floor 30 below the upper pivot bracket 58 is a lower pivot bracket 62 providing a pivot socket 64 aligned with the upper pivot bracket 58. The pivot brackets 58 and 62 may be identical as to structure and installation to the corresponding pivot brackets of the aforementioned Kellens-Brydolf application.

The door 34, hereinafter referred to as the pivoted or jamb door, is provided in its upper and lower edges, and adjacent a vertical edge 66 thereof, with upper and lower drilled bores or holes 68 and 70. Driven into the upper and lower holes 68 and 70 are upper and lower pivot assemblies 72 and 74 respectively providing upstanding and depending upper and lower pivots or pivot pins 76 and 78 extending into the upper and lower pivot sockets 60 and 64. The upper and lower pivot assemblies 72 and 74 are respectively similar to the upper and lower pivot assemblies 66 and 68 of the aforementioned Kellens-Brydolf application, and are installed in substantially the same way. Consequently, they need not be described in detail herein.

The door 36 is a lead or guide door which is provided in its upper edge, adjacent a vertical edge 80 thereof, with a drilled bore or hole 82 located the same distance from the edge 80 as the hole 68 is from the edge 66. Driven into the hole 82 is an assembly 84 which is substantially identical to the assembly 72 and which includes an upstanding guide pin 86 at least substantially identical to, and preferably identical to, the upper pivot pin 76. Thus, either the pivot pin 76 or the guide pin 86 may be inserted into the upper pivot socket 60 so that either of the doors 34 and 36 may be the jamb door or the guide door.

Alternatively, the guide pin 86 may be inserted into an upper pivot bracket, not shown, adjacent the other jamb 28 so that the door pair 32 is pivoted adjacent the right-hand side of the doorway, instead of the left-hand side. Thus, making the assemblies 72 and 84 identical and identically located permits making the door pair 32 of either hand, it being necessary only to install the lower pivot assembly 74 in alignment with whichever one of the assemblies 72 and 84 is to be the pivot assembly, the other of these then becoming a guide assembly, as hereinafter discussed.

In view of the foregoing, the door 36 is preferably provided in its lower edge with a drilled hole 88 in alignment with the hole 82. In the particular installation illustrated, the hole 88 is not used, but it could receive the lower pivot assembly 74 if it were desired to make the door 36 the jamb door, instead of the door 34. It will be understood that, in volume production, it is cheaper to drill the upper and lower edges of both doors of each pair rather than drill them differently and maintain separate stocks of both. By drilling the doors alike and using identical upper assemblies 72 and 84, the presence or absence of the lower assembly 74 determines whether a particular door is a jamb door or a guide door, which is an important feature of the invention.

In the particular installation illustrated, the pin 86 is a guide pin and extends upwardly into and engages a sliding guide 90 disposed in and slidably longitudinally of the track 56 to guide the leading edge of the guide door 36. The sliding guide 90, which may be molded from a suitable low friction plastic material, is elongated longitudinally of the track 56 and is provided on opposite sides thereof and intermediate its ends with external, arcuate convex bearing surfaces 92. FIGS. 3, 4 and 5, concentric with the guide pin 86 and engageable with the flanges 52 forming the sides of the track 56 with substantially line contact to minimize friction. With this construction, the sliding guide 90 can pivot slightly about the axis of the guide pin 86 as required to prevent binding during longitudinal movement of the sliding guide along the track 56. The sides of the guide 90 are provided at their ends with narrow, rounded edge surfaces 91, FIGS. 3 and 5, which also engage the sides of the track 56 with substantially line contact to minimize friction.

The top of the guide 90 is provided intermediate its ends on opposite sides thereof with rounded corners 93, FIG. 4, engageable with the track flanges 57 with substantially point contact, it being understood that a spring, not shown, in the guide assembly 84 biases the guide pin 86 upwardly to hold the guide 90 against the flanges 57. The corners 93 permit the guide 90 to rock about a transverse horizontal axis intersecting the guide pin axis to further minimize any binding tendency. The top of the guide 90 is provided at its ends with narrow, rounded surfaces 95, FIGS. 3 and 4, engageable with the track flanges 57 with small area contact to reduce friction.

The sliding guide 90 carries spring means 94 engaging the guide pin 86 for yieldably retarding opening movement of the doors 34 and 36 upon engagement of the sliding guide with a stop 96, FIG. 2, in the path of the sliding guide, and for
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snuggling the doors closed upon engagement of the guide with another stop 98. Conveniently, the stop 96 is formed by the upper pivot bracket 58 and the stop 98 is formed by another sliding guide 100 associated with the guide door 42 of the other pair 38. However, other stops may be used in both instances. For example, a nail may be driven through the track into the header as the stop 98.

The spring means 94 comprises two longitudinally extending, axially aligned coil springs 102 and 104 which act in compression and which receive the guide pin 86 therebetween. The two springs 102 and 104 are contained in a longitudinally extending inverted channel 106 formed in the sliding guide 90, such channel having an arcuate cross section conforming to the spring 94. As best shown in FIG. 4, the channel 106 has an angular extent of somewhat more than 180° so that it retains the springs 102 and 104 therein. The springs may be snapped into the channel 106, the material of which the sliding guide 90 is made preferably being sufficiently flexible to permit this.

To facilitate insertion of the guide pin 86 between the springs 102 and 104, the sliding guide 90 is provided within the channel 106, midway between its ends, with two laterally spaced bosses 108 on opposite sides of the channel and a boss 110 at the top of the inverted channel. These bosses extend into the channel sufficiently to maintain the adjacent ends of the springs 102 and 104 apart a distance slightly less than the diameter of the upper ends of the guide pin 86. This facilitates insertion of the guide pin and, at the same time, the springs 102 and 104 bear against the guide pin at all times to prevent rattling. Further, the springs 102 and 104 hold the guide 90 on the guide pin 86 to facilitate inserting the guide in the track 56 when installing the doors. Additionally, the bosses 108 and 110 assure that the guide 90 is biased by the springs 102 and 104 toward a center position relative to the pin 86 when the set of doors is fully open, thus preventing inadvertent locking open of the set because of too close an approach of the guide door 36 to the jamb door 34. The lateral bosses 108 and 110 also serve as lateral bearing surfaces for the guide pin 86, while the upper boss 110 acts as a thrust bearing surface.

Considering the operation of the sliding guide 90, it will be apparent that it slides back and forth along the track 56 as the doors 34 and 36 are opened and closed. When the doors 34 and 36 are closed, the sliding guide 90 engages the stop 98, as shown in FIG. 2, thereby causing the guide pin 86 to compress the spring 104. This has the effect of cushioning the closing movement of the doors 34 and 36. More importantly, the spring 104 snugs the door set 32 closed, i.e., it maintains a load on the toggle joint formed by the two doors 34 and 36 to prevent accidental opening thereof. During opening movement of the doors 34 and 36, the guide pin 86 compresses the spring 102, upon engagement of the sliding guide 90 with the stop 96, to cushion opening engagement.

The guide 90 is of sufficient length that, when it engages the stop 96, it prevents too close an approach of the guide door 36 to the jamb door 34, thereby preventing locking of the set 32 of doors open. However, if additional opening of the set 32 is desired, as to improve access to an end of a closet, the door 36 can be forced closer to the door 34 with only the effort required to compress the spring 102, which normally holds the guide pin 86 at the center of the guide 90 to prevent locking the doors open.

As will be apparent, the sliding guide 90 may be used with the guide pin 86, or the pivot pin 76, depending on whether the left-hand edge or the right-hand edge of the door pair 32 is to be the pivoted edge. As previously discussed, this avoids making and stocking left-hand and right-hand pairs, which is an important feature of the invention.

Although an exemplary embodiment of the invention has been disclosed for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiment without departing from the spirit of the invention.

I claim:
1. In combination:
a. a track;
b. spaced stops on said track;
c. a guide engaging and movable along said track between said stops;
d. a door movable longitudinally of said track and having a guide element; and

e. spring means carried by said guide and engaging said guide element and yeldable upon engagement of said guide with either of said stops.

2. The combination set forth in claim 1 wherein said spring means comprises two coil springs in compression carried by said guide on opposite sides of and engaging said guide element and respectively compressible upon engagement of said guide with said stops.

3. In combination:
a. a downwardly facing, channel-shaped track;
b. spaced stops in said track;
c. a guide in and movable along said track between said stops;
d. a door movable longitudinally of said track and having an upstanding guide pin;
e. two aligned, longitudinally spaced coil springs in compression carried by said guide and engaging opposite sides of said guide pin and respectively compressible upon engagement of said guide with said stops; and
f. two arcuate bearing surfaces on opposite sides of said guide intermediate ends thereof and respectively engageable with the sides of said track, said bearing surfaces being coaxial with said guide pin.

4. In a device for guiding a door having a guide element along a track, the combination of:
a. an elongated guide conforming to and movable along the track, and
b. spring means carried by said guide and engageable with the guide element for biasing the guide element longitudinally of said guide in opposite directions.

5. In a device for guiding a door having a pin along a track, the combination of:
a. an elongated guide having a channel extending longitudinally thereof;
b. said guide having an external cross section conforming to said track and being slidable therealong; and
c. two coil springs in and extending longitudinally of said channel and capable of receiving the guide pin therebetween upon axial compression of said springs.

6. A device as set forth in claim 5 including means on said guide for spacing said springs apart longitudinally of said channel to facilitate insertion of the guide pin therebetween.

7. A device according to claim 5 wherein said channel is arcuate in cross section and has an angular extent of more than 180° to retain said springs therein.

8. A device as defined in claim 5 for guiding the door along a track which is generally channel-shaped in cross section, and wherein said guide is provided intermediate its ends and on opposite sides thereof with arcuate bearing surfaces concentric about the axis of the guide pin and respectively engageable with the sides of the channel-shaped track with substantially line contact.

9. A device according to claim 8 herein said guide is provided intermediate its ends and on opposite sides thereof with corners engageable with said track with substantially point contact.

10. In a folding door installation for a doorway, the combination of:
a. a downwardly facing, channel-shaped track extending across the top of the doorway;
b. a pivot bracket at one side of the doorway in alignment with said track;
c. an elongated guide in and slidable along said track between said pivot bracket and the other side of the doorway;
d. two doors having hingedly interconnected vertical edges;
e. two identical upstanding pins respectively carried by said doors adjacent the vertical edges thereof opposite their hingedly interconnected edges;
f. one of said pins extending into and removably engaging said pivot bracket;
g. the other of said pins extending into and removably engaging said guide; and

h. spring means carried by said guide, and engaging that one of said pins which extends into said guide, for biasing that pin in opposite directions longitudinally of said track.