April 13, 1965 L. E. JOHNSON, JR 3,177,519

FOLDING DOOR HINGE

Filed Nov. 20, 1962 2 Sheets-Sheet 1

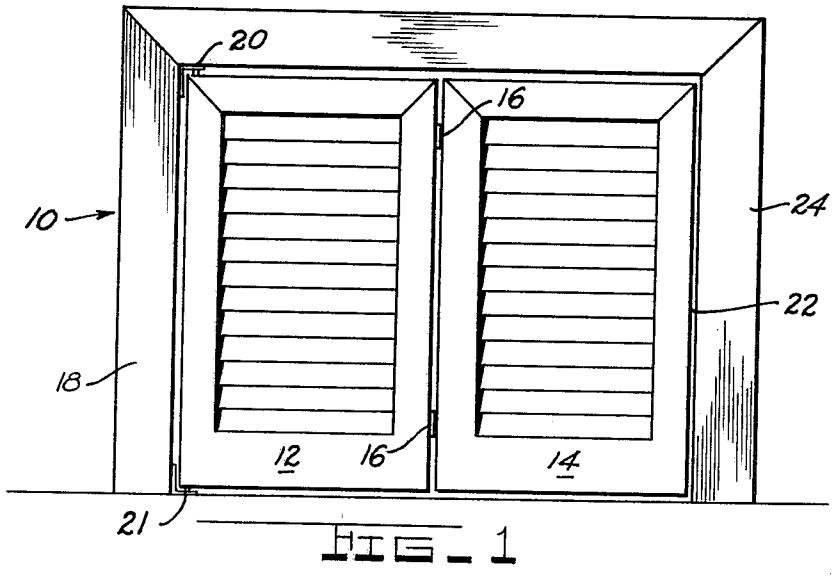


FIG. 1

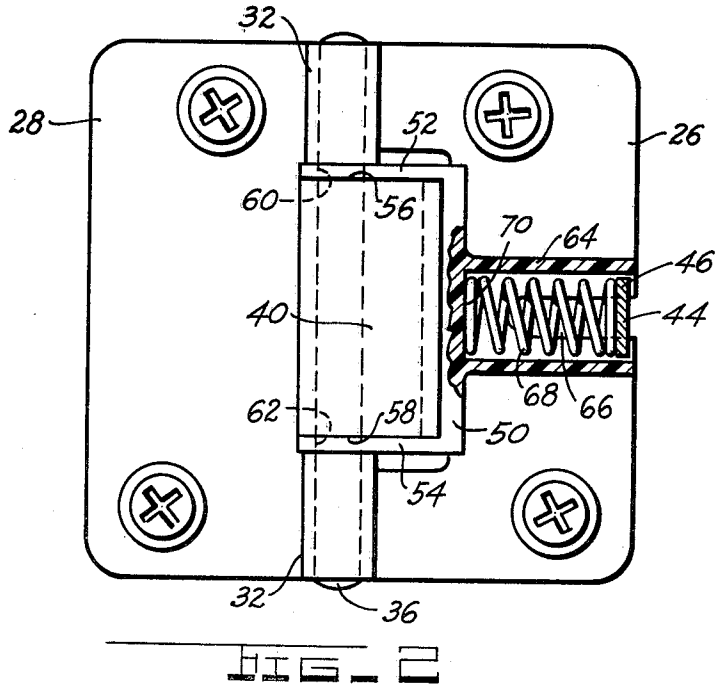


FIG. 2

INVENTOR.
LEONARD E. JOHNSON JR.
BY

ATTORNEY.

April 13, 1965 L. E. JOHNSON, JR 3,177,519

FOLDING DOOR HINGE

Filed Nov. 20, 1962 2 Sheets-Sheet 2

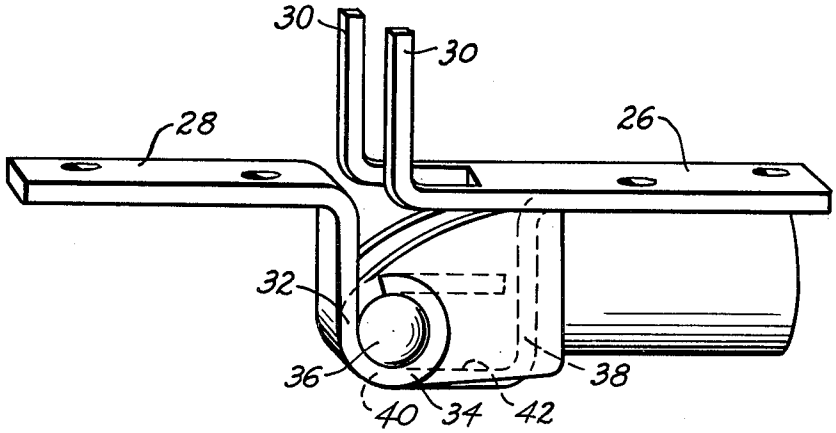
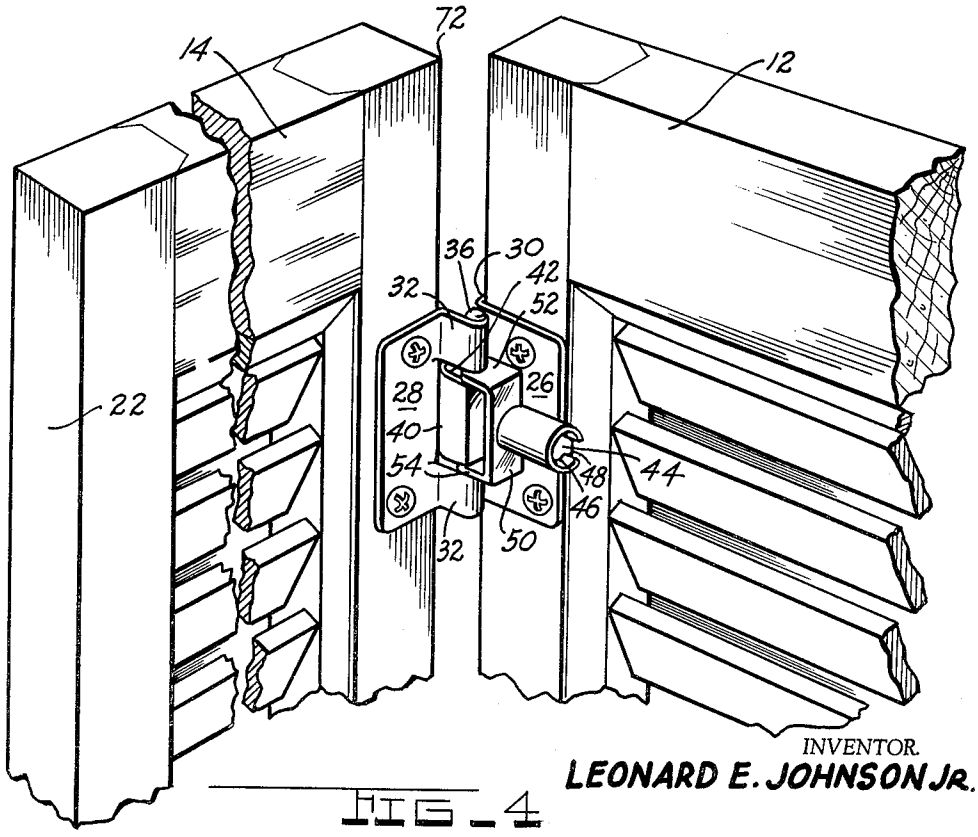


FIG. 3



INVENTOR.
LEONARD E. JOHNSON JR.

FIG. 4

United States Patent Office 3,177,519 Patented Apr. 13, 1965

3,177,519

FOLDING DOOR HINGE

Leonard E. Johnson, Jr., 2100 Sterling Ave., P.O. Box 114, Elkhart, Ind.

Filed Nov. 20, 1962, Ser. No. 238,845
4 Claims. (Cl. 16—137)

The present invention relates generally to folding door hinges and more particularly to an improved hinge pin construction and aligning means for such hinges.

During the initial opening or final closing of a folding door having a pair of hinged panels, the overall width of the door is greater than the width of the door in the closed position with the panels co-planar. It has been the prior practice to leave a space between the folding door and its adjacent door or door jamb of sufficient size to accommodate for the entire increase of width of the door occuring during the initial opening or final closing movements thereof. This space or crack is, of course, unsightly and various attempts have been made to locate all of the space between the door jamb and the panel hinged thereto so that the space may be hidden by extra trim. The use of extra trim is, however, undesirable in that it makes the installation of the doors more difficult and expensive.

The hinge of the present invention pivotally joins the two-door panels in a manner to provide sufficient relative translatory movement of the two-door panels so that when the doors are opened or closed the panels may move with respect to each other and thereby eliminate or minimize an increase in overall width of the door. With the hinge of the present invention folding doors may be installed without providing unsightly spaces or extra trim.

In actual use folding doors are sometimes flung open with sufficient force to over-fold the door panels, i.e. to open the doors beyond the designed point, thereby putting a shock load on the hinges which tends to loosen or disalign the hinges causing hinge bind or sticking. The hinge of the present invention utilizes a spring loaded shiftable hinge pin which in addition to compensating for the increase in width of the door, as noted above, also acts as a shock absorber to minimize damage in the event the doors are over-folded.

In installations where the door panels are warped or there is a misalignment of the overhead track with respect to the door, the hinges of the present invention provide an additional advantage in that the hinge pin of one of a pair of hinges joining adjacent door panels may move relative to the other, thereby permitting one of the door panels to rotate slightly in the vertical plane and thus minimize or eliminate binding of the over-head roller in the track.

It is an object of the present invention to provide a folding door hinge having a shiftable axis of rotation to hingedly join a pair of door panels in a manner to permit relative translatory movement when the door meets a mating door or jamb.

It is a further object of the invention to provide improved bearing means for a folding door hinge having a shiftable axis of rotation.

It is another object of the invention to provide a folding door hinge having a yieldable hinge pin to absorb the shock in the event the door is over-folded.

It is a further object of the invention to provide a pair of hinges for joining adjacent folding door panels having individually shiftable hinge pins to permit rotation of a door panel in a vertical plane to minimize binding or sticking.

It is a still further object of the invention to provide aligning means for folding door hinges which may be

simply installed with assurance that the axis of the hinge pins of a pair of hinges will be aligned.

It is another object of the invention to provide a folding door hinge having a shiftable axis of rotation, which is relatively inexpensive to manufacture and easy to properly install without jigs or fixtures.

These and other objects and advantages of the invention will become readily apparent from the following detailed description taken in connection with the appended drawing in which:

FIGURE 1 is a front view of a closed folding door having hinges embodying the present invention;

FIGURE 2 is a front view of a hinge shown in FIGURE 1;

FIGURE 3 is a top view of a hinge shown in FIGURE 2; and

FIGURE 4 is a rear view of the doors shown in FIGURE 1 in a partially open position.

Referring now to the drawings, and more particularly to FIGURE 1, numeral 10 designates a folding door having first and second panels 12 and 14 joined by a pair of hinges 16. The first panel 12 is pivotally supported adjacent to jamb 18 by means of pivots 20 and 21. The unhinged edge 22 of panel 14 is adapted to meet or engage jamb 24.

The pair of hinges 16 are identical in construction and as best seen in FIGURES 2, 3 and 4 comprise a first plate 26 and a second plate 28 adapted to be respectively and oppositely secured to the rear sides of panels 12 and 14. Plate 26, as best seen in FIGURE 3, is provided with a pair of turned over locating members 30 to engage an edge of a panel and thereby properly locate the hinge and provide a proper spacing between panels 12 and 14. Plate 28 is formed with spaced rearwardly extending flanges 32 which are rolled over at their ends to form a hinge pin receiving cylinder or portion 34. The cylinders or portions 34 of hinges 16 are coaxial and are located a predetermined distance from plate 28. This predetermined distance is a function of the thickness of the panels 12 and 14. A hinge pin 36 is secured at its ends in the cylinders or portions 34. The locating members 34 assure that the axes of pins 36 of hinges 16 are aligned so as to minimize or prevent hinge bind.

Plate 26 is provided with a flange 38 rolled over at its end to form a sleeve member 40 defining a transversely elongated axial bore or opening 42. Plate 26 is also provided with a turned-up spring abutment 44. Abutment 44 consists of a circular portion 46 which is connected to the plate 26 by a narrow stem 48.

A bifurcated member 50 preferably molded from nylon is provided with arms 52 and 54 which respectively slidingly engage the opposite ends 56 and 58 of sleeve member 40. The arms 52 and 54 are respectively formed with coaxial holes or bores 60 and 62 to receive hinge pin 36. The bifurcated member 50 is also provided with a cylindrical stem 64 to reciprocably receive the circular portion 46 of spring abutment 44. An axial slot 66 is formed in stem 64 to receive the stem 48 of spring abutment 44. A spring 68 is disposed in cylindrical stem 64 to act against one end 70 thereof and spring abutment 44 to urge the bifurcated member 50 in a direction to position hinge pin 36 in one of its extreme positions in the bore 42 of sleeve member 40.

When the panels 12 and 14 are in their co-planar, closed position, the position of parts is as shown in FIGURES 2 and 3 wherein the hinge pin 36 is located at the extreme left-hand edge of the transversely elongated bore 42. As the folding door is opened and the panels 12 and 14 are at an angle to each other, the hinge pin 36 moves toward the right hand edge of the elongated bore 42 moving with it the bifurcated member 50 which in moving

causes the spring **68** to be compressed. The movement of hinge pin **36** or the shifting of the axis of rotation from the left side of elongated bore **42** to the right side increases with the amount of rotation in a manner to permit rearward edge or corner **72** of panel **14** to remain in contact with the turned over locating members **30** on panel **12** until such time as the unhinged edge **22** of panel **14** is no longer in engagement with the door jamb **24**. As the edge **22** disengages from the jamb **24** spring **68** urges hinge pin **36** back toward the left side of elongated bore **42**.

The operation of the hinge **16** has been described in connection with the door opening movement, but it will be obvious that in a door closing movement when the edge **22** engages jamb **24** the hinge pin **36** will shift in bore **42** to permit the panels **12** and **14** to assume a fully closed coplanar position. With the hinge of the present invention, the panels **12** and **14** when in the fully closed position are separated only the distance of the relatively thin locating members **30** and the spaces between the other edges of the door and the jambs may be the same as is conventionally provided with one piece swinging doors. There are no unsightly cracks and no need for extra trim. The bifurcated bearing member **50** provides smooth rotation and translation, eliminating or substantially minimizing hinge bind.

Although only one embodiment of my invention has been described in detail, it will readily apparent to those skilled in the art that various changes and modifications may be made without departing from the spirit of the invention.

I claim as my invention:

1. A hinge for a pair of folding door panels comprising:
- first and second plates adapted to be respectively and oppositely secured to the rear sides of first and second adjacent door panels,
- a pair of locating members formed on said first plate and adapted to engage an edge of said first panel,
- a pair of spaced flanges extending rearwardly from an edge of said second plate a predetermined distance and having coaxial hinge pin receiving portions formed at the ends thereof,
- a hinge pin secured at its ends in said portions and spanning the space between said flanges,
- a sleeve member mounted on said first plate at a distance therefrom substantially equal to said predetermined distance and adapted to be disposed between said spaced flanges,
- there being an elongated opening in said sleeve member adapted to receive said hinge pin, said opening having its major dimension extending parallel to said first plate,
- an abutment formed on said first plate,
- a bifurcated member having arms adapted to slidingly engage the opposite ends of said sleeve member,
- means defining axially aligned holes in said arms for receiving said hinge pin,
- an axially slotted cylindrical stem formed on said bifurcated member for reciprocably receiving said abutment, and
- a spring in said stem acting between one end thereof and said abutment to urge said bifurcated member in a direction to position said hinge pin in one of its extreme positions in said elongated opening.

2. A folding door hinge comprising:
- first and second plates,
- a hinge pin,

- spaced means formed on said second plate for securing the ends of said pin a predetermined perpendicular distance from said second plate,
- sleeve means having a transversely elongated axial bore for receiving said pin and being mounted on said first plate with the major transverse dimension of said bore spaced from and parallel to said first plate,
- bifurcated means having arms rotatably secured to said pin on opposite sides of said sleeve means,
- cylinder means extending from said bifurcated means and formed with an axial slot,
- abutment means disposed in said cylinder means,
- a stem disposed in said slot and connecting said abutment means to said first plate, and
- resilient means disposed in said cylinder means acting against said abutment means and urging said bifurcated means in a direction to position said pin in one of its extreme positions in said elongated bore, said pin being movable to the other of its extreme positions in said bore in opposition to said resilient means as said plates are rotated from a co-planar position.

3. A folding door hinge comprising:
- first and second base plate members,
- bifurcated means reciprocably mounted on said first member,
- a hinge pin,
- means for rotatably securing said bifurcated means to said hinge pin,
- spaced flange means extending a predetermined perpendicular distance from said second member for securing the ends of said hinge pin,
- sleeve means fixed to said first member and having a transversely elongated axial bore adapted to receive said pin, and
- resilient means urging said bifurcated means in one direction to transversely position said pin in one of its extreme positions in said transversely elongated bore, said pin being movable toward the other of its extreme positions in said bore as said base plate members are rotated from a co-planar position.

4. A hinge for pivotally interconnecting folding door panels comprising: a first plate secured to one panel and a second plate secured to an adjacent panel, a hinge pin, spaced means adapted to secure the ends of said pin a predetermined perpendicular distance from said second plate, a sleeve secured to said first plate and having an elongated opening adapted to receive a medial portion of said pin, a member reciprocably mounted on said first plate for movement between two extreme positions, bearing means rotatably receiving said pin and disposed between each said spaced means and said sleeve, means connecting said bearing means to said member for movement therewith, and resilient means urging said member toward one of its extreme positions.

References Cited by the Examiner

UNITED STATES PATENTS

920,605	5/09	Miller	16—190
1,498,654	6/24	Hauptman.	
2,162,463	6/39	Schunk	16—190 X
2,987,756	6/61	Hollansworth	16—151
3,008,178	11/61	Hofgesang	16—190

DONLEY J. STOCKING, *Primary Examiner.*