

SPECIFICATION

Swivel Roller Assembly for Folding Doors

Description

This invention pertains to a folding door which is opened and closed by folding and unfolding a plurality of door sections. More specifically, the invention is directed to an improved swivel roller assembly for use in such a folding door.

In a known folding door of the type under consideration, two or more door sections or panels are usually hinged together. One of the stiles of the door is further hinged to one of the side jambs of a doorframe so that the several door sections may be disposed in coplanar relationship to each other in the plane of the doorframe when the door is closed. In opening or closing the door, the other, opening side stile is required to move in the doorframe plane as guided by a header track and a sill track of the doorframe.

Usually, the opening side stile of the folding door is equipped with roller assemblies at its top and bottom ends for rolling engagement with the header and sill tracks. The roller assembly at the top of the stile can be in the form of a simple roller mounted on an upstanding pivot pin. The roller assembly at the bottom, however, must be of a sturdier build as it is required to bear the vertical load of the folding door; nevertheless, the bottom roller assembly must be capable of rolling smoothly along the sill track while permitting easy swivelling motion of the opening side stile.

It has been known to incorporate a ball bearing or the like in such a bottom roller assembly. This known roller assembly is objectionable because of its expensiveness, among other reasons.

The invention provides a swivel roller assembly for a folding door of the type having a plurality of foldable door sections mounted within a doorframe, with one of the door sections having a stile which is movable in the plane of the doorframe during the opening and closing of the door. The swivel roller assembly is intended to be mounted at the bottom end of this stile for moving same along a rail on the sill of the doorframe while permitting the swivelling motion of the stile.

Briefly, the swivel roller assembly comprises a hollow outer member adapted to be immovably received in the bottom end of the stile, a hollow inner member rotatably received in the outer member and adapted to be mounted astraddle the sill rail of the doorframe, and a roller rotatably mounted on the inner member for rolling engagement with the sill rail. Also included is a bearing washer which is disposed within the outer member and through which the outer member bears on the inner member for swivelling motion relative to same.

The invention will be described by way of example with reference to the accompanying drawings, wherein:—

Figure 1 is a perspective view of the folding

door incorporating a swivel roller assembly embodying this invention;

Figure 2 is an enlarged, partial perspective view showing in particular a roller mount on the top end of the opening side stile of the folding door of Figure 1;

Figure 3 is an enlarged, partial perspective view showing in particular the swivel roller assembly embodying this invention mounted at the bottom end of the opening side stile of the folding door of Figure 1;

Figure 4 is a still more enlarged perspective view showing the swivel roller assembly of Figure 3 in its entirety;

Figure 5 is a vertical sectional view of the swivel roller assembly;

Figure 6 is a bottom plan view of the swivel roller assembly;

Figure 7 is a perspective view of the hollow inner member of the swivel roller assembly; and

Figure 8 is a vertical sectional view of the hollow inner member of the swivel roller assembly.

An example of folding doors shown in Figure 1, which is considered particularly suitable for use with a swivel roller assembly embodying this invention, broadly comprises a doorframe 10 defining a doorway in an enclosing wall, and two foldable door sections 11 and 12 mounted within the doorframe to openably close the doorway. The doorframe 10 comprises a header 13 and sill 14 at the top and bottom and side jambs 15 secured at their ends to the header and sill in any convenient fashion.

Each of the door sections 11 and 12 comprises a panel 16 of suitable material and a frame 17 surrounding the panel. The frames 17 of both door sections 11 and 12 share a central cross-bar or mullion 18 through which the door sections are foldably hinged together. Further included in each door section frame 17 are top and bottom horizontal members or rails 19 and 20 and a stile 21 at one of the opposite sides of the door sections.

The stile 21 of the right hand door section 11, as seen in Figure 1, is hinged as at 22 to one of the doorframe jambs 15. This particular door section 11 is therefore swingable on the hinges 22 out of and back to the plane of the doorframe 10 during the opening and closing of the door. As will be noted from Figure 1, in which the door sections 11 and 12 are shown in a partly open position within the doorframe 10, the stile 21 of the left hand door section 12 is required to move in the plane of the doorframe 10 while permitting the swinging motion of the door section 12. For the fulfillment of this dual requirement, the left hand door section stile 21 is provided with a roller 23 at its top end and with a swivel roller assembly 24 embodying this invention at its bottom end.

As depicted on an enlarged scale in Figure 2, the roller 23 is rotatably mounted on a pivot pin 25 extending upwardly from the top end of the left hand door section stile 21. The roller 23 makes rolling engagement with a track 26 of

inverted U-shaped cross section formed on the underside of the doorframe header 13.

The configuration of the exemplified folding door as so far described is conventional, and therein lies no feature of this invention. The invention is specifically directed to the improved construction of the swivel roller assembly 24 mounted at the bottom end of the left hand door section stile 21 for rolling engagement with an upstanding rail 27 on the doorframe sill 14, as shown on an enlarged scale in Figure 3. This swivel roller assembly 24 will hereinafter be described in detail with reference to Figures 4 to 8.

As will be seen from Figures 4, 5 and 6, the swivel roller assembly 24 broadly comprises a hollow outer member 28 adapted to be pressed into the left hand door section stile 21, and a hollow inner member 29 rotatably nested in the outer member. Preferably molded from a rigid synthetic resin, the outer member 28 is shown to be substantially semicylindrical in shape. A pair of groups of vertically spaced, resilient fins 30 are molded integral with and project laterally from the outer member 28 for frictional engagement with the inside surface of the left hand door section stile 21. A bottom flange 31 is also molded integral with the outer member 28. The hollow 32 formed in the outer member 28 is cylindrical in shape and is reduced stepwise in diameter as it extends upwardly.

Figures 7 and 8 are illustrations of the hollow inner member 29 as detached from within the outer member 28. The inner member 29 comprises a body 33 adapted to be rotatably received in the hollow 32 of the outer member 28, an enlarged base 34 at the bottom end of the body, and a pair of opposed retainer hooks 35 extending upwardly from the body to prevent accidental detachment of the inner member from the outer member.

Substantially cylindrical in shape, the inner member body 33 is reduced stepwise in its outside diameter as it extends upwardly; in conformity with the shape and size of the outer member hollow 32 in which the body is to be slidably received. The uppermost external annular shoulder or step 36 of this inner member body 33 is intended to provide a seat for a bearing washer 37, as of smooth-finished stainless steel, as will be seen by referring back to Figure 5. The corresponding internal annular step 38 of the outer member 28 bears on this bearing washer 37, as will be detailed subsequently.

The inner member body 33 has formed therein a hollow 39 and size suitable for accommodating a roller 40 with substantial clearance. The roller 40 is rotatably mounted on a pivot pin 41 having its opposite ends engaged in a pair of bores 42 formed in the inner member body 33.

The enlarged base 34 of the inner member 29 is shown to be cylindrical in shape and, in the assembled swivel roller assembly, projects downwardly from the outer member 28. The outer member bottom flange 31 is in sliding

contact with this inner member base 34. A pair of downwardly open slots 43 are formed in the inner member base 34 in alignment with the roller 40. As will be best understood from Figure 3, these aligned slots 43 are intended to receive the sill rail 27 of the doorframe 10 and hence to establish the rolling engagement of the roller 40 with the sill rail.

Extending upwardly from the inner member body 33, the pair of opposed retainer hooks 35 project upwardly of the outer member 28 through its reduced diameter hollow portion 44. The retainer hook pair 35 is further held in sliding engagement with the top end of the outer member 28. Thus, the inner member 29 is prevented from accidental detachment from within the outer member 28, prior to the installation of this swivel roller assembly 24 under the left hand door section stile 21, but is nevertheless allowed to rotate relative to the outer member.

The swivel roller assembly 24 of the foregoing construction can be readily assembled as the inner member 29, together with the bearing washer 37 seated on its annular step 36, is inserted into the outer member 28. During their passage through the reduced diameter hollow portion 44 in the outer member 28, the pair of retainer hooks 35 are resiliently compressed toward each other and, upon full insertion of the inner member 29 into the outer member, spring back to properly engage the top end of the latter.

Thus, with the swivel roller assembly 24 installed under the left hand door section stile 21, the folding door of Figure 1 can be opened and closed by folding and unfolding its sections 11 and 12 at the central crossbar 18. During such opening and closing of the folding door, the outer member 28 of the swivel roller assembly 24 swivels with the left hand door section stile 21 relative to the inner member 29, whereas the roller 40 rolls along the sill rail 27 as guided by the inner member mounted astraddle the sill rail. The outer member 28 will smoothly swivel around the inner member 29 by virtue of the bearing washer 37 installed therebetween, in spite of the vertical load exerted on the swivel roller assembly 24 by the folding door. It will also be appreciated that the swivel roller assembly 24 is not to be easily displaced with respect to the left hand door section stile 21 because the groups of resilient fins 30 of the roller assembly are held in frictional engagement with the inside surface of the stile.

A feature of the above-described arrangement resides in the bearing washer 37 interposed between outer and inner members 28, 29 to permit smooth relative swivelling motion thereof in spite of a considerable vertical load to be exerted on the roller assembly 24 by the folding door. The bearing washer 37 is much simpler and less expensive than ball bearings or the like heretofore employed for the same purpose and, further, is free from the trouble of rusting. Still further, since the bearing washer 37 is completely

enclosed by the outer and inner members 28, 29, there is absolutely no possibility of the washer 37 being damaged or malfunctioning through intrusion of foreign matter. The useful life of the swivel roller assembly 24 is thus markedly extended.

The above-described swivel roller assembly 24 is materially simplified and inexpensive but sturdy and durable in construction, and can be readily installed in place on a folding door, and is capable of rolling smoothly along a predetermined track while permitting easy swinging motion of one of the folding door sections mounted thereon.

Claims

1. A folding door comprising a plurality of foldable door sections mounted within a doorframe, one of the door sections including a stile which is movable in the plane of the doorframe during the opening and closing of the door, and a swivel roller assembly mounted at the bottom end of the stile for permitting same both to move along a rail on the sill of the doorframe and to swivel relative to the sill rail, the swivel roller assembly comprising:

(a) a hollow outer member immovably received in the bottom end of the stile;
(b) a bearing washer within the outer member;
(c) a hollow inner member rotatably received in the outer member and mounted astraddle the sill rail of the doorframe, the outer member bearing on the inner member via the bearing washer for swivelling motion relative to same; and
(d) a roller rotatably mounted within the inner member for rolling engagement with the sill rail.

2. A folding door according to claim 1, wherein the outer member is provided with a plurality of resilient fins projecting laterally therefrom for frictional engagement with the inside surface of the stile.

3. A folding door according to claim 1 or 2, wherein the inner member has formed thereon an external annular step for seating the bearing washer, and wherein the outer member has correspondingly formed thereon an internal annular step which bears on the bearing washer.

4. A folding door according to claim 1, 2 or 3, wherein the inner member has a portion projecting downwardly from the outer member, and wherein the projecting portion of the inner member has a pair of downwardly open slots formed therein in alignment with the roller, the pair of slots receiving the sill rail.

5. A folding door according to claim 4, wherein the projecting portion of the inner member is enlarged.

6. A folding door according to claim 5, wherein the outer member has formed at its bottom end a flange overlying the enlarged projecting portion of the inner member.

7. A folding door according to any preceding claim, wherein the inner member has a pair of

retainer hooks extending upwardly therefrom through an opening formed in the outer member and slidably engaged with the top end of the latter, whereby the inner member is restrained from accidental detachment from the outer member but is allowed to rotate relative to same.

8. A swivel roller assembly adapted to be mounted at the bottom end of a stile of a folding door having a plurality of foldable door sections mounted within a doorframe, one of the door sections including said stile which is movable in the plane of the doorframe during the opening and closing of the door, for permitting same both to move along a rail on the sill, of the doorframe and to swivel relative to the sill rail, the swivel roller assembly comprising:—

(a) a hollow outer member adapted to be immovably received in the bottom end of the stile;
(b) a bearing washer within the outer member;
(c) a hollow inner member rotatably received in the outer member and adapted to be mounted astraddle the sill rail of the doorframe, the outer member bearing on the inner member via the bearing washer for swivelling motion relative to same; and
(d) a roller rotatably mounted within the inner member for rolling engagement with the sill rail.

9. A swivel roller assembly according to claim 8, wherein the outer member is provided with a plurality of resilient fins projecting laterally therefrom for frictional engagement with the inside surface of the stile.

10. A swivel roller assembly according to claim 8 or 9, wherein the inner member has formed thereon an external annular step for seating the bearing washer, and wherein the outer member has correspondingly formed thereon an internal annular step which bears on the bearing washer.

11. The swivel roller assembly according to claim 8, 9 or 10, wherein the inner member has a portion projecting downwardly from the outer member, and wherein the projecting portion of the inner member has a pair of downwardly open slots formed therein in alignment with the roller, the pair of slots being adapted to receive the sill rail.

12. A swivel roller assembly according to claim 11, wherein the projecting portion of the inner member is enlarged.

13. The swivel roller assembly according to claim 12, wherein the outer member has formed at its bottom end a flange overlying the enlarged projecting portion of the inner member.

14. The swivel roller assembly according to any one of claims 8 to 13, wherein the inner member has a pair of retainer hooks extending upwardly therefrom through an opening formed in the outer member and slidably engaged with the top end of the latter, whereby the inner member is restrained from accidental detachment from the outer member but is allowed to rotate relative to same.



enclosed by the outer and inner members 28, 29, there is absolutely no possibility of the washer 37 being damaged or malfunctioning through intrusion of foreign matter. The useful life of the swivel roller assembly 24 is thus markedly extended.

- 10 The above-described swivel roller assembly 24 is materially simplified and inexpensive but sturdy and durable in construction, and can be readily installed in place on a folding door, and is capable of rolling smoothly along a predetermined track while permitting easy swinging motion of one of the folding door sections mounted thereon.

Claims

- 15 1. A folding door comprising a plurality of foldable door sections mounted within a doorframe, one of the door sections including a stile which is movable in the plane of the doorframe during the opening and closing of the door, and a swivel roller assembly mounted at the bottom end of the stile for permitting same both to move along a rail on the sill of the doorframe and to swivel relative to the sill rail, the swivel roller assembly comprising:

- 25 (a) a hollow outer member immovably received in the bottom end of the stile;
(b) a bearing washer within the outer member;
(c) a hollow inner member rotatably received in the outer member and mounted astraddle the sill rail of the doorframe, the outer member bearing on the inner member via the bearing washer for swivelling motion relative to same; and
(d) a roller rotatably mounted within the inner member for rolling engagement with the sill rail.

- 35 2. A folding door according to claim 1, wherein the outer member is provided with a plurality of resilient fins projecting laterally therefrom for frictional engagement with the inside surface of the stile.

- 40 3. A folding door according to claim 1 or 2, wherein the inner member has formed thereon an external annular step for seating the bearing washer, and wherein the outer member has correspondingly formed thereon an internal annular step which bears on the bearing washer.

- 45 4. A folding door according to claim 1, 2 or 3, wherein the inner member has a portion projecting downwardly from the outer member, and wherein the projecting portion of the inner member has a pair of downwardly open slots formed therein in alignment with the roller, the pair of slots receiving the sill rail.

- 50 5. A folding door according to claim 4, wherein the projecting portion of the inner member is enlarged.

- 55 6. A folding door according to claim 5, wherein the outer member has formed at its bottom end a flange overlying the enlarged projecting portion of the inner member.

- 60 7. A folding door according to any preceding claim, wherein the inner member has a pair of

- retainer hooks extending upwardly therefrom through an opening formed in the outer member and slidably engaged with the top end of the latter, whereby the inner member is restrained from accidental detachment from the outer member but is allowed to rotate relative to same.

8. A swivel roller assembly adapted to be mounted at the bottom end of a stile of a folding door having a plurality of foldable door sections mounted within a doorframe, one of the door sections including said stile which is movable in the plane of the doorframe during the opening and closing of the door, for permitting same both to move along a rail on the sill, of the doorframe and to swivel relative to the sill rail, the swivel roller assembly comprising:—

- (a) a hollow outer member adapted to be immovably received in the bottom end of the stile;
(b) a bearing washer within the outer member;
(c) a hollow inner member rotatably received in the outer member and adapted to be mounted astraddle the sill rail of the doorframe, the outer member bearing on the inner member via the bearing washer for swivelling motion relative to same; and

- (d) a roller rotatably mounted within the inner member for rolling engagement with the sill rail.

9. A swivel roller assembly according to claim 8, wherein the outer member is provided with a plurality of resilient fins projecting laterally therefrom for frictional engagement with the inside surface of the stile.

10. A swivel roller assembly according to claim 8 or 9, wherein the inner member has formed thereon an external annular step for seating the bearing washer, and wherein the outer member has correspondingly formed thereon an internal annular step which bears on the bearing washer.

11. The swivel roller assembly according to claim 8, 9 or 10, wherein the inner member has a portion projecting downwardly from the outer member, and wherein the projecting portion of the inner member has a pair of downwardly open slots formed therein in alignment with the roller, the pair of slots being adapted to receive the sill rail.

12. A swivel roller assembly according to claim 11, wherein the projecting portion of the inner member is enlarged.

13. The swivel roller assembly according to claim 12, wherein the outer member has formed at its bottom end a flange overlying the enlarged projecting portion of the inner member.

14. The swivel roller assembly according to any one of claims 8 to 13, wherein the inner member has a pair of retainer hooks extending upwardly therefrom through an opening formed in the outer member and slidably engaged with the top end of the latter, whereby the inner member is restrained from accidental detachment from the outer member but is allowed to rotate relative to same.