

FOLDING DOOR SYSTEM

DESCRIPTION

TECHNICAL FIELD

[0001] The present disclosure relates to doors and more particularly to a folding door system for providing an unimpeded movement of the door panels during the folding and unfolding of the folding door.

BACKGROUND

[0002] Folding doors are a type of door which opens by folding back in sections and are usually to be found indoors. They are designed to provide quick and easy space division with moderate sound attenuation and a pleasing visual appearance with a simple pull-and-latch operation. The advantageous of these folding doors are the saving of space especially in apartment living, lightweight, ease of installation and their relative low cost. Most designs include upper and lower guide tracks, rollers attached to the top and bottom of an outer panel for running along the tracks and a plurality of hinges for coupling the door panels together. A handle is usually provided for a user to grip the outer panel in order to push or pull the panels to a folded or unfolded state thus opening and closing the door respectively.

[0003] In spite of the advantages noted above, a familiar problem encountered by users is the jamming of the folding door over time. These problems are mainly attributed to the weight of the door itself and also the alignment of the track due to building settlement and wear and tear of the sliding parts of the rolling and folding mechanisms. Another problem is the jamming of the panels caused by an off-centered pull on the door which causes the rollers to be caught against the sides of the tracks resulting in a stalled door in between opening or closing of the door.

[0004] With the advent of more decorative designs using aesthetic materials such as glass panels, teak wood and other thicker materials, the aforementioned problems becomes more acute especially when large and heavy installations are involved.

[0005] In view of the foregoing problems, a need remains for a folding door that can overcome the above-noted shortcomings. The non-limiting exemplary embodiments of this disclosure satisfies such a need by providing a folding door system that is convenient and easy to use, lightweight yet durable in design, versatile in its applications, and designed for providing an unimpeded movement of the door panels during the folding and unfolding of the folding door.

SUMMARY

[0006] In view of the foregoing background, it is therefore an object of the non-limiting exemplary embodiments to provide a folding door system. These and other objects, features, and advantages of the invention are provided by a folding door system for providing an unimpeded movement of the door panels during the folding and unfolding of the door.

[0007] In accordance with one aspect of this disclosure, there is disclosed a folding door system for providing an unimpeded movement of the door panels during the folding and unfolding of the door. The folding door system may include a plurality of door panels rotatably inter-coupled for operating between a folded state and an unfolded state. The plurality of door panels may include a first panel and a second panel forming extremities thereof. A hinging means for coupling the first panel to a door frame may be used for rotational displacement of the first panel about a first axis. A track may be couplable adjacent a bottom surface of a top portion of the door frame and defining a path along a second axis, the second axis substantially perpendicular the first axis.

[0008] In accordance with another aspect of this disclosure, a roller carrier may be configured with the track for travel along the path.

[0009] In accordance with another aspect of this disclosure, a support structure may be detachably coupled to the roller carrier. Such a support structure may include a first flange, a second flange and a separator extending from the first flange where to the second flange is couplable. The separator may spatially dispose the first flange from the second flange for accommodating the second panel therebetween when the separator is received through an opening defined in the second panel. The support structure may further be rotatably coupled to the roller carrier for supporting at least one of the plurality of door panels from the track during travel of the roller carrier along the path, when the plurality of door panels are operated between the folded state and the unfolded state.

[0010] In accordance with another aspect of this disclosure, the roller carrier may provide a rolling engagement for the second panel with the door frame, wherein the roller carrier supports a vertical weight of the plurality of door panels.

[0011] In accordance with another aspect of this disclosure, the separator may enable the second panel to be rotatable about a third axis, the third axis substantially perpendicular to the first axis and the second axis, wherein the third axis provides unimpeded movements of the plurality of door panels for operating between a folded state and an unfolded state.

[0012] There has thus been outlined, rather broadly, the more important features of this disclosure in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are additional features of this disclosure that will be described hereinafter and which will form the subject matter of the claims appended hereto.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0013] Embodiments of the disclosure are described hereinafter with reference to the following drawings, in which:

[0014] FIG. 1 is a perspective view showing a folding door system, in accordance with the non-limiting exemplary embodiments;

[0015] FIG. 2 is a side elevational view showing the inter-related parts of the track, the roller carrier and the support structure; and

[0016] FIG. 3 is an exploded view showing the relationship between the roller carrier, the support structure and the second panel.

[0017] Those skilled in the art will appreciate that the figures are not intended to be drawn to any particular scale; nor are the figures intended to illustrate every embodiment of the invention. This disclosure is not limited to the exemplary embodiments depicted in the figures or the shapes, relative sizes or proportions shown in the figures.

DETAILED DESCRIPTION

[0018] The non-limiting exemplary embodiments will now be described more fully hereinafter with reference to the accompanying drawings, in which a preferred embodiment of the invention is shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiment set forth herein. Rather, this embodiment is provided so that this application will be thorough and complete, and will fully convey the true scope of the invention to those skilled in the art. Like numbers refer to like elements throughout the figures.

[0019] Embodiments of this disclosure relate to a folding door system for use in conjunction with the doors of buildings or any other structure that requires a folding door. In particular, the folding door system may be utilized in an apartment, a landed home, an office or on any of the doors of these buildings and structures.

[0020] Referring to Fig. 1, the folding door system 10 may include a plurality of door panels 21, 22 rotatably inter-coupled for operating between a folded state and an unfolded state. The plurality of door panels may include a first panel 21 and a second panel 22 forming extremities thereof. A hinging means 23 for coupling the first panel 21 to a door frame 11 may be used for rotational displacement of the first panel 21 about a first axis 50. A track 24 may be coupled adjacent to a bottom surface of a top portion 25 of the door frame 11 to define a path 26 along a second axis 51. Such a second axis 51 may be substantially perpendicular the first axis 50.

[0021] Referring to Fig. 2, the folding door system 10 may include a roller carrier 27 configured with the track 24 for travel along the path 26. In this way, the roller carrier 27 travels in a direction perpendicular to the user in response to an inward pull or an outward push of the user on the second panel 22 when the folding door is being operated between a folded state and an unfolded state.

[0022] Referring now to Fig. 3, a support structure 28 may be detachably coupled to the roller carrier 27. Such a support structure 28 may include a first flange 29, a second flange 30 and a separator 31 extending from the first flange 29 to the second flange 30. The separator 31 may spatially dispose the first flange 29 from the second flange 30 for accommodating the second panel 22 when the separator 31 is received through an opening 32 defined in the second panel 22. The support structure 28 may further be rotatably coupled to the roller carrier 27 for supporting at least one of the plurality of door panels 21, 22 from the track 24 during travel of the roller carrier 27 along the path 26 when the plurality of door panels are operated between the folded state and the unfolded state.

[0023] Referring to Fig. 1, the plurality of door panels 21, 22 may be inter-

coupled by at least one hinge 33 and the hinging means 23 for the door frame 11 may include at least one hinge 33 rotatably coupled to the door frame 11. The plurality of door panels 21, 22 may further include decorative designs and be made of glass or any other heavy material in popular use for such doors.

[0024] Referring to Fig. 2, the track 24 may include at least one channel 34 for receiving and locating the plurality of wheels 35 to the path 26. Such an arrangement ensures that the weight of the door panels 21, 22 are adequately supported on the channels 34 by the plurality wheels 35. One skilled in the art understands that such type of wheels may include bearings to provide low friction engagement with the channels 34. Referring to Figs. 2 and 3 now, the roller carrier 27 may include a body 36 having a threaded aperture 42 whereto the support structure 28 is rotatably coupled. A support rod 41 may be rotatably attached to the body 36 with a stopper 43 located at an end portion of the body 36. Such a stopper 43 may advantageously prevent the wheels 35 of the roller carrier 27 from being damaged by the door frame 11 when the door panels 21, 22 are in an unfolded state. The plurality of wheels 35 may further be rotatably coupled to the body 36 for supporting the body 36 thereon. Such an arrangement advantageously allows the roller carrier 27 to provide a rolling engagement for the second panel 22 with the door frame 11, wherein the roller carrier 27 supports a vertical weight of the plurality of door panels 21, 22.

[0025] As shown in Fig. 3, the separator 31 may be formed with the first flange 29. In this way, the separator 31 may advantageously enable the second panel 22 to be rotatable about a third axis 52. Such a third axis 52 may be substantially perpendicular to the first axis 50 and the second axis 51, wherein the third axis 52 may provide unimpeded movements of the plurality of door panels 21, 22 for operating between a folded state and an unfolded state.

[0026] Again referring to Figs. 2 and 3, the support rod 41 may include a threaded portion 45 for attaching to the threaded aperture 42 of the body 36 and a support end 46 for holding the first flange 29. Such an arrangement allows the

support rod 41 to be rotatable in a clockwise and a counter-clockwise direction during the operation of opening and closing of the plurality of door panels 21, 22.

[0027] Referring again to Figs. 1 and 2, the second panel 22 may further include a planar surface having a front portion 37 and a rear portion 38 and a pair of U-shaped handles 39. The pair of handles 39 may be detachably connected to each other at their end portions wherein the end portions are juxtaposed adjacent to the front portion 37 and the rear portion 38 of the planar surface of the first panel 21.

[0028] The combination of the roller carrier 27 and the support structure 28 provides a novel means to advantageously enable the weight of the door panels 21, 22 to be suspended from the track 24 and be moveable in a 3-dimensional direction. In this way, the heavy door panels 21, 22 may be held in place freely thus eliminating jamming of the roller carrier 27 along the path 26 of the track 24 and further eliminating the need for a bottom guide track as found in conventional folding door assemblies.

[0029] While the invention has been described with respect to a certain specific embodiment, it will be appreciated that many modifications and changes may be made by those skilled in the art without departing from the spirit of the invention. It is intended, therefore, by the appended claims to cover all such modifications and changes as fall within the true spirit and scope of the invention. In particular, with respect to the above description, it is to be realized that the optimum dimensional relationships for the parts of the non-limiting exemplary embodiments may include variations in size, materials, shape, form, function and manner of operation.

CLAIMS

1. A folding door system comprising:
 - a plurality of door panels rotatably inter-coupled for operating between a folded state and an unfolded state, the plurality of door panels comprising a first panel and a second panel forming extremities thereof;
 - a hinging means for coupling the first panel to a door frame for rotational displacement of the first panel about a first axis;
 - a track couplable adjacent a bottom surface of a top portion of the door frame and defining a path along a second axis, the second axis substantially perpendicular the first axis;
 - a roller carrier configured with the track for travel along the path;
 - a support structure comprising:
 - a first flange;
 - a second flange; and
 - a separator extending from the first flange whereto the second flange is couplable, the separator spatially disposing the first flange from the second flange for accommodating the second panel therebetween when the separator is received through an opening defined in the second panel,
 - wherein the support structure is rotatably coupled to the roller carrier for supporting at least one of the plurality of door panels from the track during travel of the roller carrier along the path when the plurality of door panels are operated between the folded state and the unfolded state.
2. The folding door system as in claim 1, the plurality of door panels being inter-coupled by at least one hinge.
3. The folding door system as in claim 1, the hinging means comprising at least one hinge rotatably coupled to the door frame.
4. The folding door system as in claim 1, at least one of the plurality of door panels being a glass panel.

5. The folding door system as in claim 1, the track defining at least one channel for receiving and locating a plurality of wheels to the path.
6. The folding door system as in claim 1, the roller carrier comprising:
 - a body having a threaded aperture whereto the support structure is rotatably coupled;
 - a support rod rotatably attached to the body; and
 - a stopper located at an end portion of the body.wherein the plurality of wheels is rotatably coupled to the body for supporting the body thereon.
7. The folding door system as in claim 1, the roller carrier providing a rolling engagement for the second panel with the door frame, wherein the roller carrier supports a vertical weight of the plurality of door panels.
8. The folding door system as in claim 1, the separator being formed with the first flange.
9. The folding door system as in claim 1, the separator enabling the second panel to be rotatable about a third axis, the third axis substantially perpendicular to the first axis and the second axis, wherein the third axis provides unimpeded movements of the plurality of door panels for operating between a folded state and an unfolded state.
10. The folding door system as in claim 6, the support rod comprising:
 - a threaded portion for attaching to the threaded aperture of the body; and
 - a support end for holding the first flange;wherein the support rod is rotatable in a clockwise and a counterclockwise direction during the operation of opening and closing of the plurality of door panels.
11. The folding door system of claim 1, the second panel comprising:
 - a planar surface having a front portion and a rear portion;

a pair of U-shaped handles;

wherein the pair of handles are detachably connected to each other at their end portions; and wherein the end portions are juxtaposed adjacent to the front portion and the rear portion of the planar surface of the first door panel.