

Aug. 15, 1967

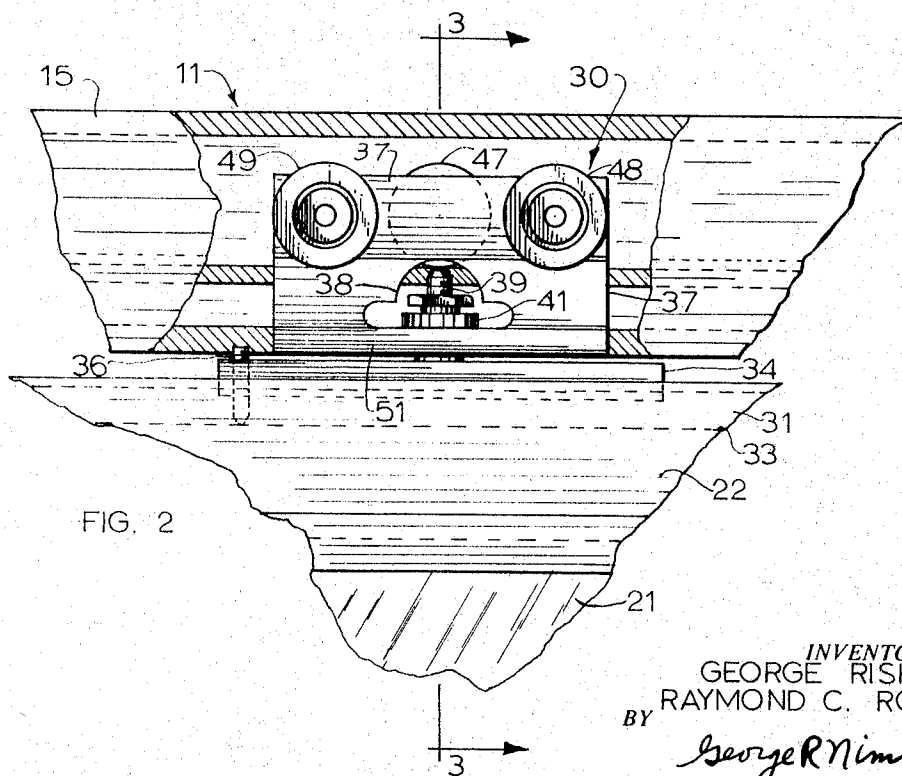
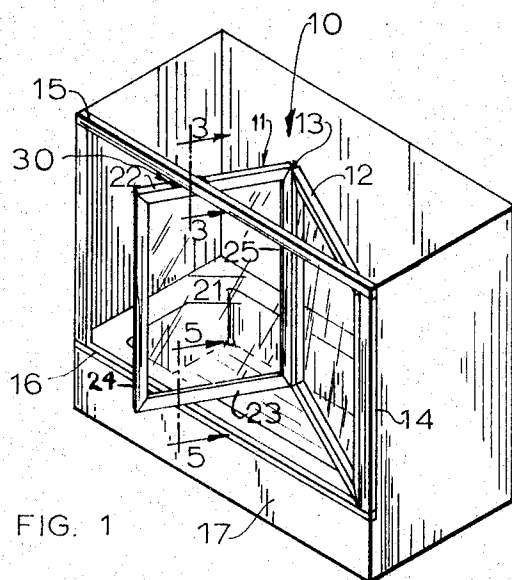
G. RISK ETAL

3,335,784

FOLDABLE SHOWER DOOR CONSTRUCTION

Filed May 19, 1965

2 Sheets-Sheet 1



INVENTORS
GEORGE RISK
BY RAYMOND C. ROOT
George R Nimmer
ATTORNEY

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2 Sheets-Sheet 2

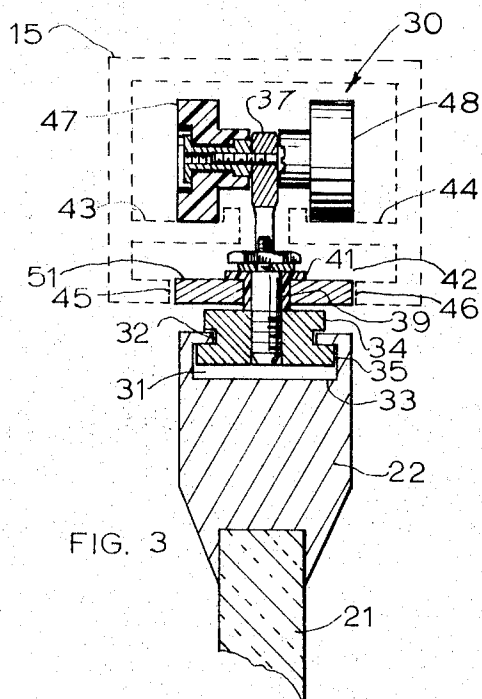


FIG. 3

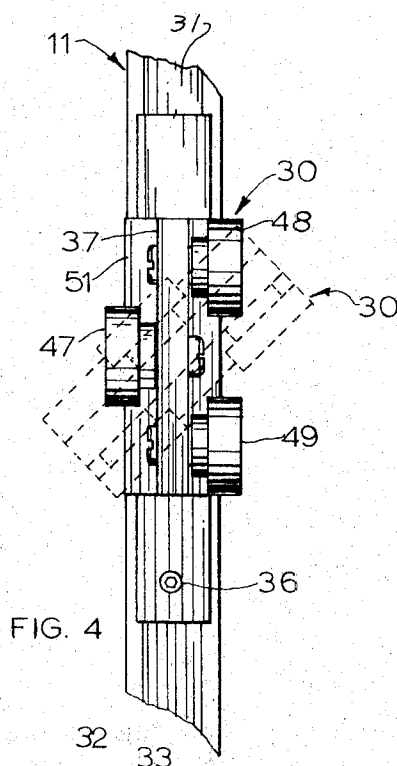


FIG. 4

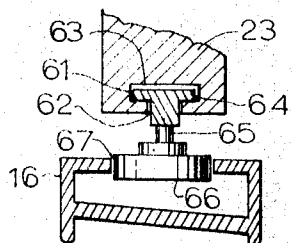


FIG. 5

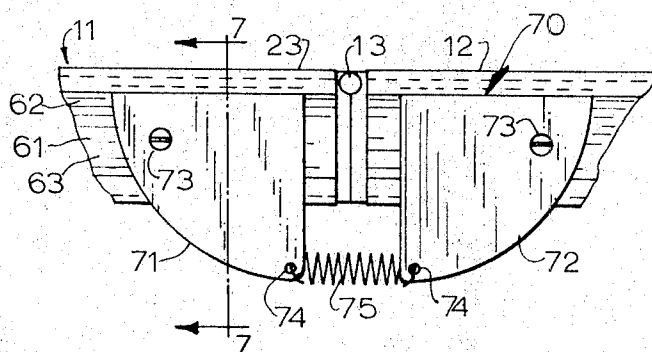


FIG. 6

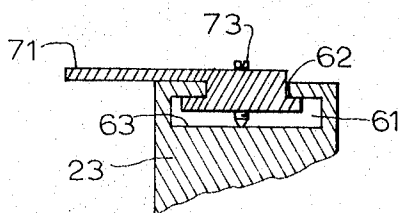


FIG. 7

INVENTORS
GEORGE RISK
RAYMOND C. ROOT
BY

George R. Nimmer

ATTORNEY

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3,335,784

FOLDABLE SHOWER DOOR CONSTRUCTION
George Risk and Raymond C. Root, Columbus, Nebr., as-
signors to Loup Engineering Company, Columbus,
Nebr., a corporation of Nebraska
Filed May 19, 1965, Ser. No. 456,908
3 Claims. (Cl. 160—199)

This invention relates to multi-partition foldable vertical shower doors for cubical tub and shower enclosures. In particular this invention relates to an improved means for pivotably and rollably supporting the multi-partition shower door between a pair of parallel opposed horizontal support rails, and to an improved means for stabilizing the door longitudinally between said horizontal support rails.

Foldable vertical doors comprising a plurality of rectangular vertical partitions connected together with vertical hinge means are employed in the prior art for cubical tub and shower enclosures. Commonly, the outermost partition of these foldable shower doors is pivotably and rollably supported between a pair of horizontal support rails. Further, there is normally some type of spring means to resist foldability and which serves to longitudinally stabilize and align the partitions when the door is closed. As this common type door is progressively foldably opened, the several mutually foldable partitions become increasingly oblique to the horizontal support rails and the center of gravity of the foldable shower door shifts towards the interior of the tub and shower enclosure. The prior art foldable shower doors are invariably complex in manufacture and installation and tend to bind between the horizontal support rails due to the inwardly shifting center of gravity as the door is opened. Further, in the prior art structures the spring resistance means is cumbersome to install and difficult to adjust for various sizes and weights of foldable partitions.

Therefore, it is an object of the present invention to provide an improved means for pivotably and rollably supporting the multi-partition foldable shower door between the parallel horizontal support rails so that the door will not bind between the rails while being opened or closed.

It is another object of the present invention to provide pivotal and rollable support means that are simple to manufacture and to install within a folding shower door construction.

It is another object of the present invention to provide an improved spring resistance means for longitudinally stabilizing and aligning the several partitions when the foldable door is in the closed position.

It is yet another object to provide a spring resistance means that is simple to install within a folding shower door construction, and that may be readily and incrementally adjusted in tension so as to accommodate various door sizes and weights.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

In the drawing, wherein like numbers indicate like parts in the several views, and in which:

FIGURE 1 is a perspective view of the foldable shower door construction of the present invention.

FIGURE 2 is a side elevational detail view of the foldable shower door to show the adjustably positionable pivotal roller support portion thereof. Portions of the

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overlying support rail are broken away to show its interior configuration.

FIGURE 3 is a sectional view of the adjustable pivotal roller support taken along lines 3—3 of FIGURES 1 and 2.

FIGURE 4 is a top plan view of the adjustable pivotal roller support shown in FIGURE 2.

FIGURE 5 is a sectional view of the lower region of the foldable shower door taken along line 5—5 of FIGURE 1 to show the lower floating roller thereof.

FIGURE 6 is a bottom plan view of the foldable shower door construction taken at the juncture of two hingeably attached partitions to illustrate a novel spring type closure means.

FIGURE 7 is a sectional view taken along line 7—7 of FIGURE 6.

As can be seen in the FIGURE 1 perspective view, the foldable shower door construction for a cubical shower stall comprises a rectangular vertical door 10 having a plurality of rectangular vertical partitions 11 and 12 connected together by vertical hinge means 13 so that the multi-partition vertical door 10 is foldable along the longitudinal length thereof toward an upright jamb support 14. The inward vertical partition 12 is directly pivotably connected, as with a vertical hinge, to an upright stationary jamb 14. The outward vertical partition 11 is pivotably connected between an overlying horizontal rail 15 and an underlying horizontal rail 16, said parallel horizontal rails being rigidly attached perpendicularly to the upper and lower termini of upright stationary jamb 14. It can be seen that the underlying horizontal rail 16 is substantially coextensive with the top edge of the bottom sump, e.g. tub 17, of the cubical shower stall.

While any type of foldable shower door having a plurality of hingeably attached rectangular partitions may be adapted to the teachings of the present invention, it is preferred that translucent rectangular partitions be employed: In its most common commercial form, each translucent partition within a folding shower door comprises a thin rectangular translucent pane securely bound by four channelled rail frames. Thus, for example, outward partition 11 preferably comprises a thin translucent rectangular pane 21 securely bound by four interconnected channelled rail frames including an upper horizontal frame 22, a lower horizontal frame 23, an outward terminal vertical frame 24, and an inward vertical frame 25 to which hinge means 13 are attached. It is manifest from FIGURE 1 that as foldable vertical door 10 is opened (outward terminal vertical frame 24 of partition 11 is moved toward upright jamb 14), every partition e.g. partitions 11 and 12, becomes increasingly oblique to stationary horizontal rails 15 and 16, and the hinged connection 13 between the partitions 11 and 12 moves progressively further into the shower stall interior. Simultaneously, the center of gravity of the shower door 10 moves progressively farther into the shower stall interior.

As can best be seen in FIGURES 2—4 inclusively, the pivotal connection between outward partition 11 and overlying horizontal rail 15 is accomplished with an adjustably positionable pivotal roller support 30. Pivotal roller support 30 is securely attached to the upper horizontal partition frame 22 of outward partition 11 and is by means of wheels 47, 48, and 49, supported or suspended by overlying stationary rail 15. Upper horizontal partition frame 22 is provided with an inwardly flared longitudinal groove 31 along the top-exposed edge of outward partition 11, commencing at the outward vertical frame 24. The upper opening 32 of groove 31 is narrower than the lower flared base 33 thereof; base 33 of groove 31 is linearly generated and is preferably flat.

The preferable cross-sectional shape for longitudinal groove 31 is the inverted T as shown in FIGURE 3.

Adjustably positionable pivotal roller support 30 comprises an elongate key member 34 having a flared cross-section lower portion 35 for slidable and vertically restrained mating engagement along flared groove 31. If groove 31 is to be of the preferred inverted T cross-sectional shape, the cross-sectional shape of lower portion 35 should be of a similar cross-sectional shape. The height of key lower portion 35 must be less than the height of flared groove 31. Elongate key member 34 is attached to any selected position along groove 31 by means of a vertical screw 36 passing through and threadedly engaged with key member 34. Vertical screw 36 bears against and preferably penetrates lower base 33 of longitudinal groove 31 so as to maintain lower portion 35 of key member 34 elevated above groove base 33.

Above the elongated key member 34 and pivotably attached thereto is the elongated shank 37 of pivotal roller support 30. Pivotal shank 37 has a laterally flanged lower portion 51 and has a medial transverse central opening 38. Elongate shank 37 may be pivotably attached to key member 34 in a variety of ways. However, the preferred pivotal connection, as best shown in FIGURE 3 is as follows: The threaded lower end of a vertical pivot or stud 39 is fixedly engaged by key member 34, the upper portion of stud 39 passing through a vertical hole of elongate shank 37 and terminating within transverse shank opening 38. A plastic spacer-sleeve or grommet 41 fits snugly within the vertical hole of elongate shank 37 and revolvably surrounds the upper portion of stud 39. Finally a threaded nut 42 is in threaded engagement with the uppermost portion of stud 39 so as to maintain elongate shank 37 in pivotal attachment with key member 34.

There are at least three rotatable wheels extending laterally from the upper portion of elongate shank 37, at least one wheel being positioned on each lateral side of shank 37. As previously mentioned, the adjustably positionable pivotal unit 30 is supported from overlying horizontal rail 15 by means of the wheels rolling internally along said rail 15. Overlying horizontal support rail 15 is of uniform cross-sectional shape along the linear length thereof and has a continuous slot like opening 42 along the lower side adjacent to said upper horizontal partition frames e.g. 22. The internal cross-sectional shape of support rail 15 includes a pair of continuous tracks, herein as planar tracks 43 and 44, one track on each side of slot 42, upon which the two groups of wheels are adapted to roll. Preferably, the planar tracks 43 and 44 are of substantially equal elevation above the slot-like opening 42. Further, the internal cross-section of support rail 15 includes side walls 45 and 46 for slot 42 of appropriate spacing and contour to guide therebetween the flanged lower portion 51 of shank 37.

Various arrays of laterally extending rotatable wheels may be attached to the upper portion of elongate shank 37 so long as the internally disposed tracks of overlying horizontal rail 15 stably support shank 37 vertically through the lower slot 42. For example, non-vertical oblique rollers are appropriate in that situation wherein non-horizontal oblique internal tracks are employed. Further, the wheel diameters may vary from either lateral side of elongate shank 37 in that situation wherein the two respective tracks are of different elevation from lower slot 42. Moreover, the total number of wheels may be greater than three provided the collection of wheels employed vertically and stably supports the elongate shank 37.

The economically preferred wheel grouping is three wheels as shown in FIGURES 2-4 and described as follows. All wheels are of equal diameter, and each wheel is rotationally mounted about a laterally extending horizontal axle. The centers of the three axles are in alignment along the upper portion of elongate shank 37, and equally elevated from key member 34. The horizontal

axle for the intermediate wheel 47 (which is isolated on one side of shank 37) is in vertical alignment with vertical stud pin 39. The axles for the two terminal wheels 48 and 49 (which are grouped on the other side of shank 37) are spaced on either side of intermediate wheel 47, and preferably in equidistant spacial relationship thereto.

In similar fashion to upper horizontal partition frame 22, the lower horizontal partition frame 23 is provided with an inwardly flared longitudinal groove 61 along the lower edge of outward partition 11, commencing at the vertical outward frame 24. As can be seen in FIGURE 5, the opening 62 of groove 61 is narrower than the flared base 63 thereof; base 63 is linearly generated and is preferably flat. The preferable cross-sectional configuration for longitudinal groove 61 is the T-shape shown in FIGURE 5. There is a lug member 64 of inwardly flared cross sectional shape slidably fitting along and vertically restrained by groove 61. If groove 61 is to be of the preferred T cross-sectional shape, the cross-sectional shape of lug member 64 should be similar for mating engagement. Lug member 64 is integrally provided with a single vertical axle 65 to which a horizontally disposed wheel 66 is rotatably attached.

Underlying horizontal support rail 16 is of uniform channelled cross-sectional shape along the linear length thereof and has a slot-like constricted opening 67 along its upper side adjacent to said lower horizontal partition frames e.g. 23. The vertical axle 65 is of appropriate length so that horizontal wheel 66 is disposed within constriction 67. Constriction 67 is at least $\frac{1}{8}$ " wider than the diameter of wheel 66.

As can be seen in FIGURES 6 and 7, there are novel novel spring means 70 connected across the bottom of vertical hinge 13 so as to normally resist the folding motion or movement between outward partition 11 and its adjacent partition 12. Such spring means serve to linearly align the several partitions when the foldable shower door 10 is placed in the closed position i.e. outward terminal vertical frame 24 is moved away from upright jamb 14. The novel spring means 70 comprise a pair of ears 71 and 72, each of which is in normally slidable mating engagement within a longitudinal flared groove of a lower horizontal frame of a partition. Specifically, ear 71 is in mating engagement with T-shaped flared groove 61 while ear 72 is in mating engagement with a similarly flared longitudinal groove along the bottom of partition 12. Each ear is provided with a perforation 74 that is laterally offset oppositely from the pivot point of hinge 13; a tension spring 75 is connected between offset perforations 74. Each ear is provided with a vertical set screw that bears against the groove base e.g. 63, to appropriately position the ears 71 and 72 along the mating grooves in accordance with the weight of partitions 11 and 12 and with the tension of spring 75.

Operation of the foldable shower door construction is as follows. As the foldable multi-partition shower door is opened, every partition e.g. 11 and 12, becomes increasingly oblique to stationary horizontal rails 15 and 16, and the vertical hinge 13 between partitions 11 and 12 moves progressively further into the shower stall interior. As can best be seen in FIGURE 4, as the foldable shower door 10 is so opened, elongate vertical shank 37 pivots with respect to key member 34, said shank 37 rolling with wheels 47, 48, and 49 internally along horizontal support rail 15. As the center of gravity of partitions 11 and 12 so shifts towards the shower stall interior, the lower horizontal wheel 66 accordingly moves laterally within constriction 67. Concurrently, tension spring 75 at the lower end of vertical hinge 13 resists this foldable opening of shower door 10 and tends to realign the partitions linearly when it is subsequently desired to close shower door 10.

From the foregoing, the construction and operation of the foldable shower door construction will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and

changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the appended claims.

We claim:

1. A foldable shower door construction comprising in combination:

(A) A rectangular vertical door comprising a plurality of rectangular vertical partitions connected together with vertical hinge means so that the multi-partition vertical door is foldable along the longitudinal length thereof toward an upright jamb support, each partition comprising a thin rectangular translucent pane securely bound by four interconnected frame elements including an upper horizontal partition frame element and a lower horizontal partition frame element, the first inward partition being directly pivotably attached to the upright jamb that is immediately adjacent thereto, the upper horizontal edge of the outward partition having a groove of T-shaped cross-section along the longitudinal length thereof, said T-shaped groove commencing at the outward edge of the outward partition, the upper opening of said groove being narrower than the broad lower base thereof,

(B) A linear horizontal support rail overlying the upper horizontal partition frame elements of said multi-partition foldable vertical door, said horizontal support rail having a uniform cross-sectional shape along the length thereof and having a continuous linear slot opening along the lower side thereof adjacent to said upper horizontal partition frame element, said slot having vertical sidewalls, said overlying horizontal support rail including a pair of internally disposed planar tracks of substantially equal elevation on each side of said lower slot, and

(C) An adjustably positionable roller support for the multi-partition foldable vertical door, said adjustably positionable roller support comprising:

(i) An elongated key member having a lower portion of T-shape cross-section slidably fitting within said upper horizontal edge T-shaped groove, said key member being adjustably positionable at any desired point along the longitudinal length of said upper horizontal edge groove by means of a vertical screw passing through and threadedly engaged with said elongate key member, the height of the key member lower portion being slightly less than the height of the T-shaped groove, said vertical screw bearing into the broad lower base of the T-shaped groove so as to maintain the key member elevated above the broad lower base of the T-shaped groove,

(ii) A vertically disposed elongated shank attached over said T-shaped key member, said vertical elongated shank having a laterally flanged lower portion and a medial transverse opening therethrough, the medial portion of said overlying elongated shank being pivotably attached to said T-shaped key member by means of a vertical stud pin that is fixedly attached to the key member and that passes through a vertical hole in the elongated shank and terminates within the transverse central opening of the elongated shank, that portion of the vertical stud passing through the elongated shank being surrounded by a bearing sleeve, the terminus of said stud having a threaded nut to hold the

elongated shank onto the key member, said elongate shank being of shorter length than the key member and said vertical stud pin being located a sufficient distance from said vertical screw so that said screw will not interfere with the pivotal movement of the elongated shank, and

(iii) Three vertically disposed wheels of substantially equal diameters attached by means of horizontal axles to the upper portion of said vertical elongated shank, the centers of said three rotatable wheels being in alignment along the elongated shank upper portion, the center of the intermediate wheel being in alignment with the vertical stud pin, said intermediate wheel laterally extending from one side of the elongated shank, the two terminal wheels laterally extending from the other side of the elongated shank, said three rotatable wheels being rollably supported along the internally disposed planar tracks of said overlying horizontal rail, said elongated shank member extending vertically downwards through the lower open slot of said overlying horizontal rail, the vertical sidewalls of the lower slot of the overlying horizontal rail providing a guidance channel for the flanged lower portion of the shank member.

2. The combination of claim 1 wherein the lower horizontal edge of the outward partition is provided with a groove of inwardly flared cross-section along the longitudinal length thereof, said flared groove commencing at the outward edge of the outward partition, and wherein the horizontal support rail underlying the lower horizontal partition frame elements of said multi-partition foldable vertical door is provided with a slot-like constriction along the longitudinal length thereof adjacent to said lower horizontal partition frame element, an elongated lug slidably engaged along the lower flared groove of the outward partition, said lug being provided with a vertical axle having a horizontal wheel rotatably attached thereto, said horizontal wheel being loosely disposed within the slot-like construction of the underlying horizontal support rail.

3. The foldable shower door construction of claim 2 wherein there are tension spring means connected across the vertical hinge between the outward partition and its adjacent partition, said spring means comprising a pair of ears, each ear being in mating engagement with a flared longitudinal groove of the lower horizontal edge of the respective partitions, each ear being affixed along its longitudinal groove with a set screw, each ear having a perforation that is laterally offset opposite to said vertical hinge, and a tension spring being connected between the perforate portions of said ears, said tension spring tending to resist the pivotal folding of said outward partitions of the normally foldable shower door and to longitudinally linearly align the partitions.

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DAVID J. WILLIAMOWSKY, *Primary Examiner.*

HARRISON R. MOSELEY, *Examiner.*

D. L. TAYLOR, *Assistant Examiner.*