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3,605,853

FOLDING-DOOR CONSTRUCTIONS AND INSTALLATIONS

Filed April 1, 1969

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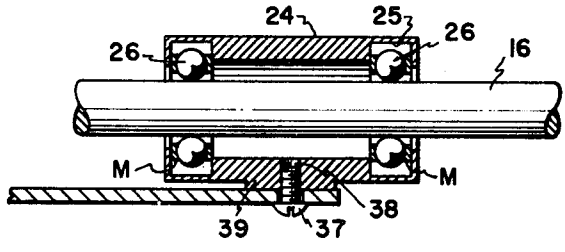
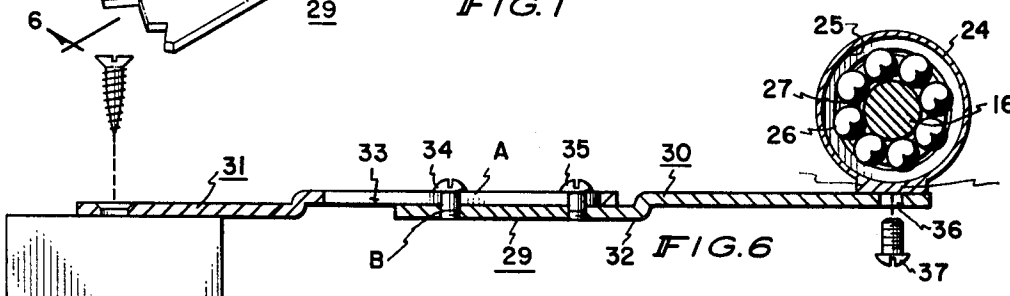
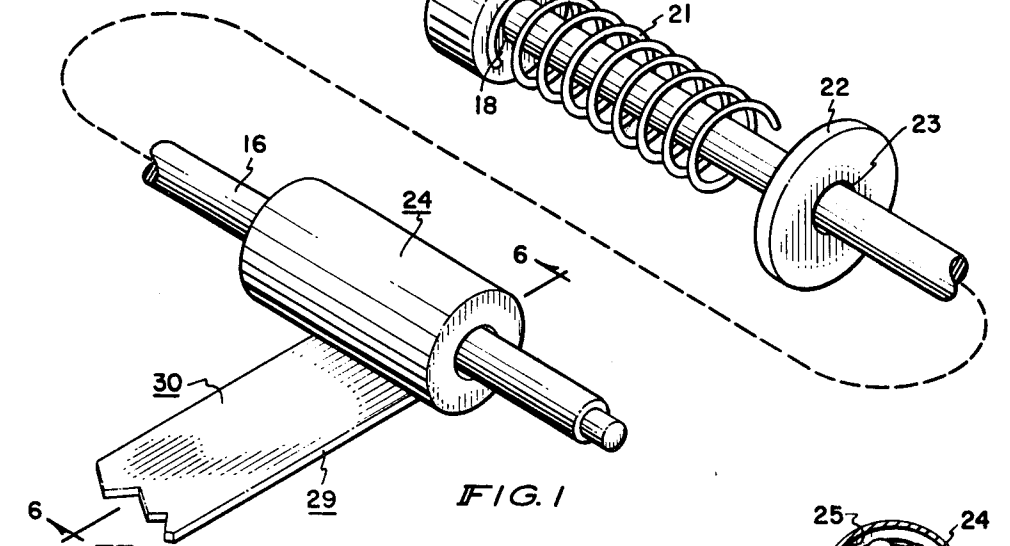
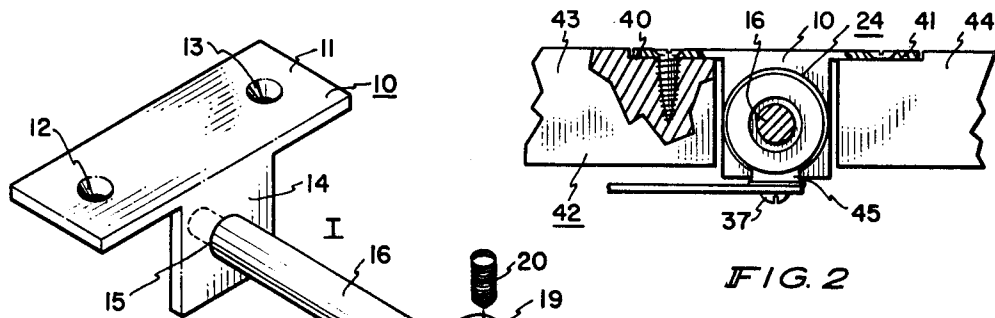


FIG. 5

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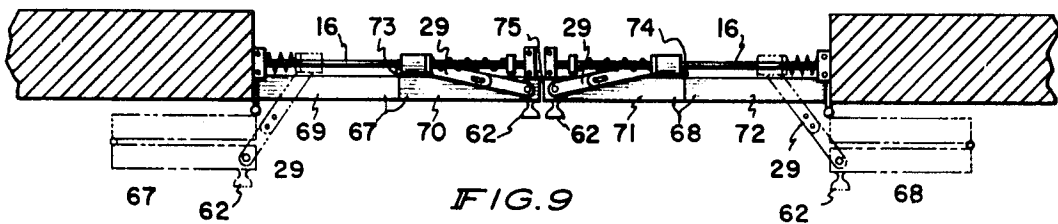
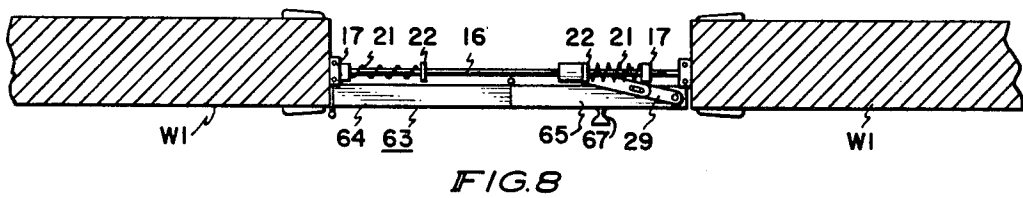
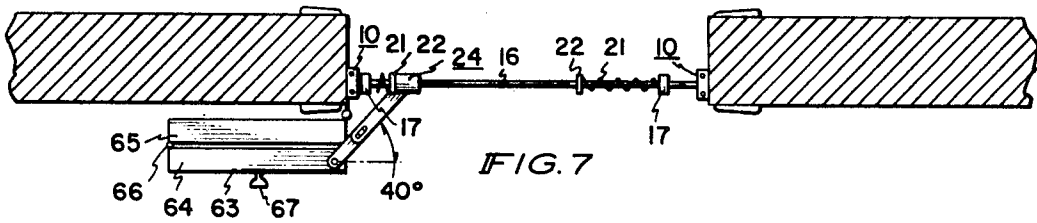
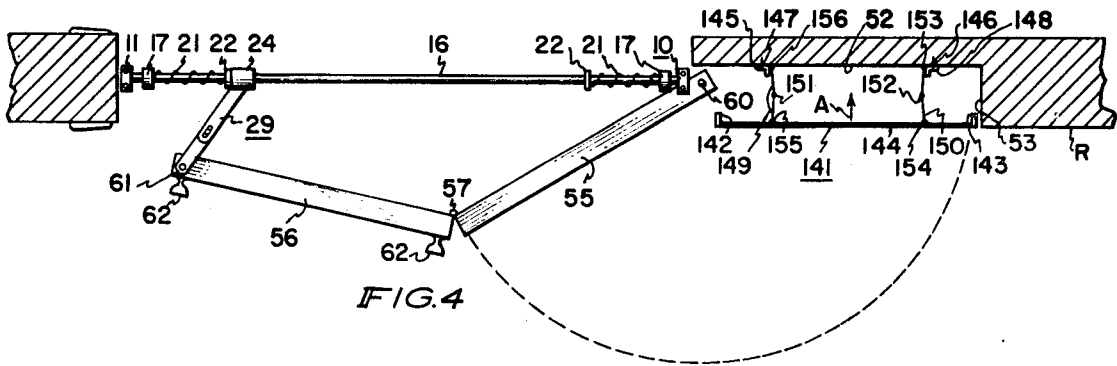
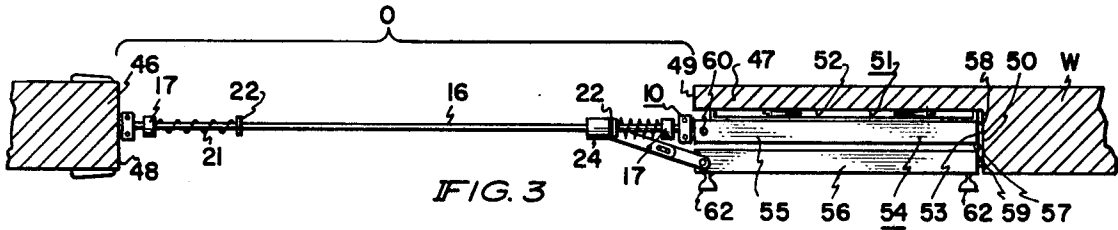
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FOLDING-DOOR CONSTRUCTIONS AND INSTALLATIONS

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4 Sheets-Sheet 2



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FOLDING-DOOR CONSTRUCTIONS AND INSTALLATIONS

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4 Sheets-Sheet 3

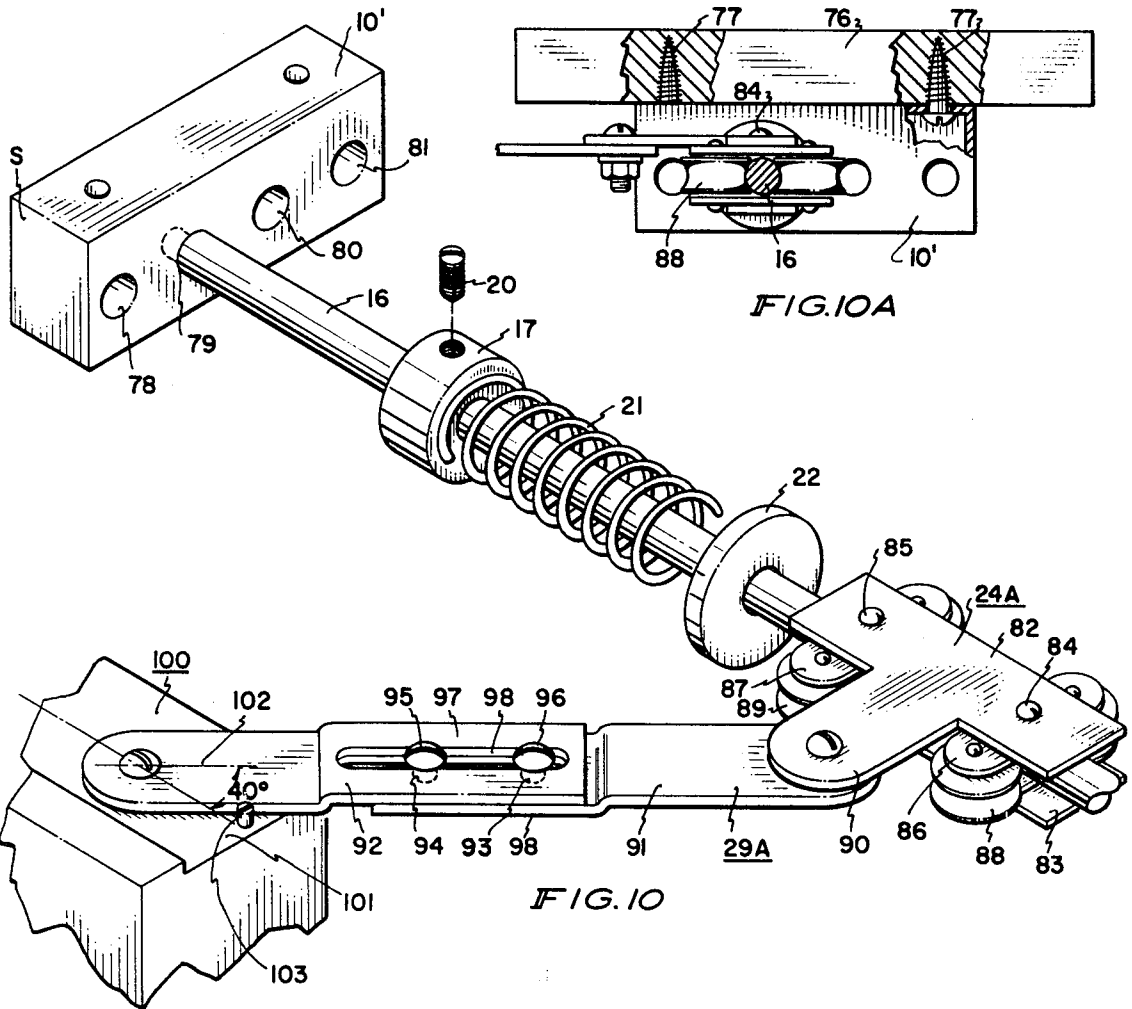


FIG. 10A

FIG. 10

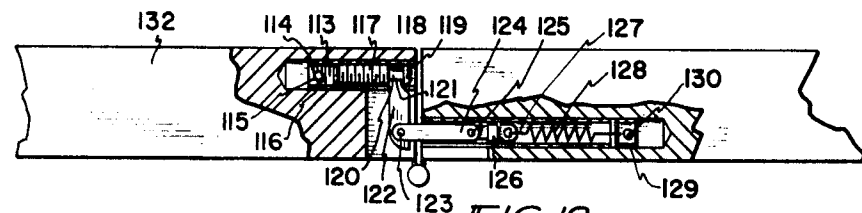


FIG. 12

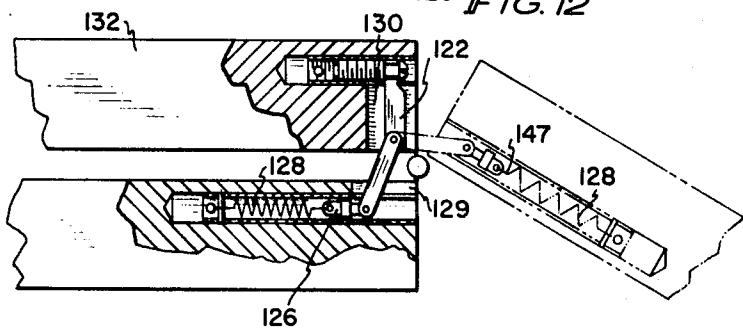


FIG. 13

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FOLDING-DOOR CONSTRUCTIONS AND INSTALLATIONS

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4 Sheets-Sheet 4

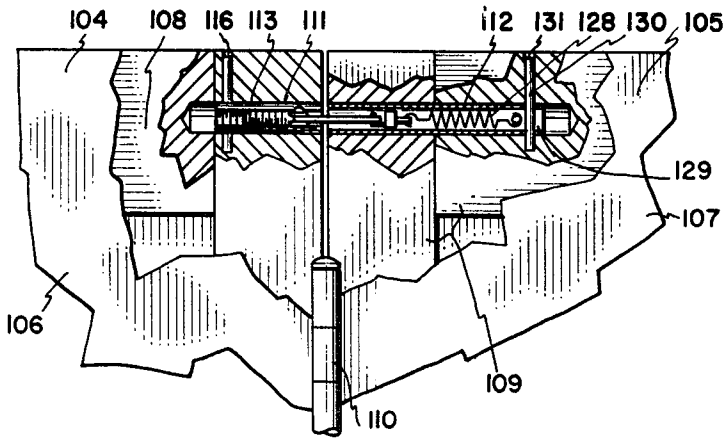


FIG. 11

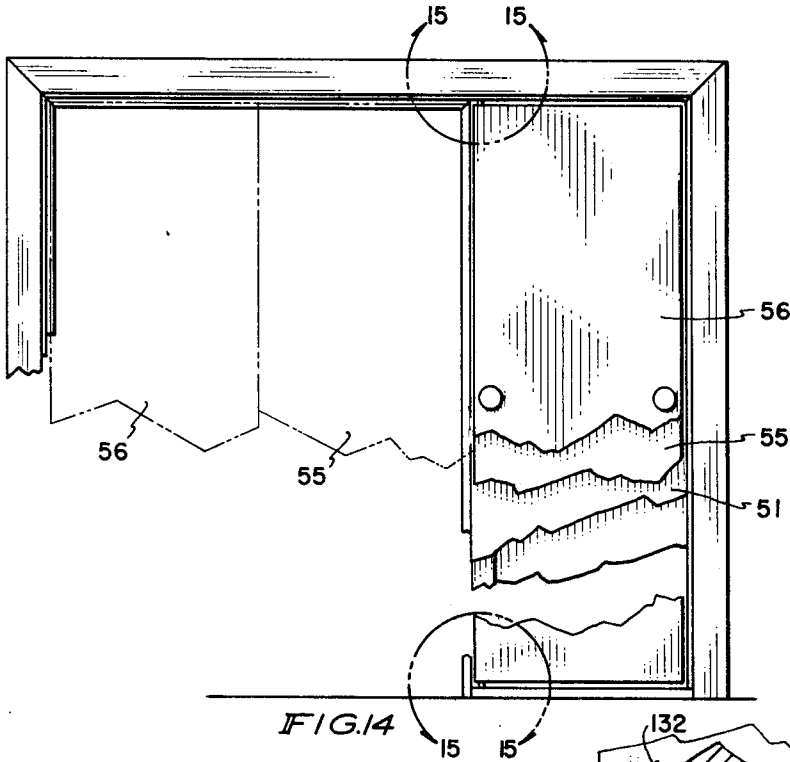


FIG. 14

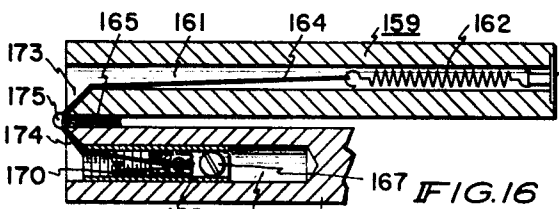


FIG. 16

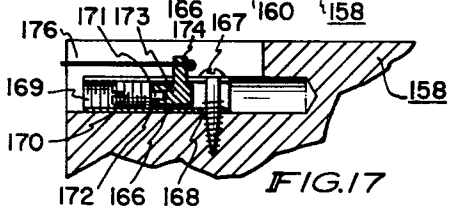


FIG. 17

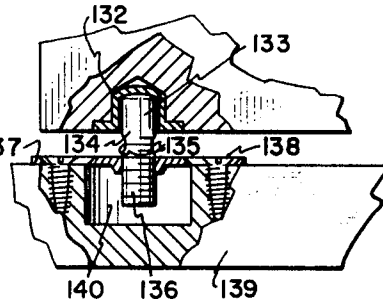


FIG. 15

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1

3,605,853
**FOLDING-DOOR CONSTRUCTIONS AND
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U.S. Cl. 160—229R

1 Claim

ABSTRACT OF THE DISCLOSURE

The present invention comprises specific improvements in constructions and installations of folding doors. The folding door itself is preferably spring-loaded by a spring-biased linkage at its hinged area and jamb connection to facilitate self-closing of the door. A support and travel guide assembly is included and is designed to accommodate a number of sizes of door openings to be covered by the folding-door construction. A bearing member is uniquely disposed upon a travel rod of the guide assembly in a manner so that no possibility of binding exists as the bearing member travels along its rod in accordance with door movement. Linkage between the door and the bearing member is made adjustable and extensible to accommodate various types and sizes of installations. The door itself is installed such that it does not interfere with the central door opening itself and, in a preferred form of the invention, is collapsible in a side-cavity on the adjacent wall section.

The present invention relates to folding doors and, more particularly, to improvements in folding doors as to construction and installation thereof.

In the past a number of different types of folding-door constructions and installations have been devised. Those of which the inventor is aware, and these are fairly numerous, appear to be deficient in one or more respects. In the first place, travel guide supports for the folding doors are often cumbersome, unsightly, and take up much space in the door opening. The guides often bind in travel so as to cause the door to stick or jump in its traverse. Often door travel is jerky and does not handle well. Conventional doors for the most part do not include any means for automatically closing the door at the hinged portion of the door construction. Most doors are built and installed such that they encumber or protrude into the door opening in which they are installed. Many cannot be completely folded out of the way so as to permit the door opening to achieve its maximum girth. There is the ever-present problem of having to provide many different sized kits or packages for door hangers operating in the field, this to be able to install doors in several types and sizes of openings.

The present invention obviates the above difficulties in most if not all respects. This is accomplished in a very direct and inexpensive manner, accommodating pre-hung constructions or installations in new homes and buildings and also adapted for use by workmen in the field for remodeling and other purposes.

Accordingly, a principal object of the present invention is to provide a new and improved folding-door installation.

A further object is to provide in a folding-door construction and/or installation spring-loaded elongate means to enable the door to self-close at a given point in travel.

A further object is to provide a folding door construction which can be mounted relative to a door opening such that a door may be folded and disposed out of the way when desired, leaving the complete opening essentially unobstructed.

2

A further object is to provide a folding door installation such that an exterior wall pocket or recess receives the door when folded, thus preventing the door from projecting either into a room area or within the door opening proper.

A further object is to provide a spring-biased, collapsible, false wall cooperative with the pocket of the immediately previous object.

An additional object is to provide a travel assembly for folding doors wherein the traveling member or bearing means linked to the folding door will not bind during its traverse along the assembly rod.

A further object is to provide a travel assembly which is adjustable as to linkage, spring position, and reaction stop, thereby enabling the assembly to accommodate a number of sizes of door openings as well as a number of different types of installations.

A further object is to provide, in a travel assembly of a folding-door construction, a bearing assembly designed in the manner such that it will not bind during its traverse along the rod of the travel assembly.

A further object is to provide a folding-door construction wherein the same can be mounted or installed in such manner that little if any of the door or wall opening is obstructed.

A further object is to provide a folding-door construction which is spring-loaded at its hinged juncture and/or jamb connection such that by suitable spring-loaded linkage provided, the door structure may be closed at desirable intervals in an easy manner.

In accordance with the present invention a tension or compression, spring-biased linkage is employed between adjacent hinged panels of the folding-door construction. The latter may be either hinged, pinned, or journaled upon trunnions or pivots proximate the door opening. A like configuration may also be employed to connect the folding-door construction to the side jamb. In a preferred form of the invention the wall is recessed proximate its jamb such that there is an exposed or exposable pocket for receiving the folding-door construction. The travel rod assembly supporting and guiding the folding door is constructed such that it may accommodate a number of sizes of door or wall openings without necessitating elongation or shortening of the travel rod. Rather, suitable brackets are provided for securing either to the door jamb or to the header jamb, preferably to the latter. Reaction members are adjustably disposed upon the rod and back compression springs. A bearing member is translationally disposed on the rod and is connected to the upper portion of the outermost panel of the door, this so as to link the door to travel of the bearing member upon its rod. To accommodate various types of constructions and various sizes of door openings, the linkage between the bearing member and the folding door may be adjusted as to length. Linkage is pre-positioned so that an optimum "feel" of door openings and closing can be achieved. In all constructions it is possible to mount the door, as hereinafter illustrated, such that the door opening is not obstructed. The travel assembly may be conveniently mounted between a header split-jamb construction, or simply disposed proximate the header jamb. Mounting members may be designed to accommodate lateral adjustment in installation of the travel rod so as to accommodate various thicknesses of folding doors.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claim. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings in which:

3

FIG. 1 is an enlarged fragmentary exploded view of the major portion of the travel rod assembly utilized in the present invention.

FIG. 2 is a fragmentary transverse elevation, partially in section, illustrating a portion of the structure of FIG. 1 when the same is installed between a header split-jamb.

FIG. 3 is a top plan of a folding door construction utilizing the travel rod assembly of FIG. 1; in FIG. 3 an exposed or exposable side pocket or recess is provided in an adjacent wall, in part forming the door opening such that a folding door when folded will slip in a flush manner into the recess or opening provided.

FIG. 4 is a view similar to FIG. 3 and illustrates the folded door of FIG. 3 in an extended position, this illustrating the operation of the traveling rod assembly.

FIG. 5 is a longitudinal vertical section of the bearing member employed in the present invention and disposed upon the travel rod thereof; for convenience of illustration the structure of FIG. 5 is shown in fragmentary view.

FIG. 6 is an enlarged section taken along the lines 6—6 in FIG. 1, illustrating in cross-section the bearing member and also the extension of the arm connected thereto and to a fore-panel of the door at its opposite extremity.

FIG. 7 is a plan view of another type of construction and installation in accordance with the present invention, wherein the same basic travel rod is employed in connection with the folding door construction that is intended for disposition to the side of one of the walls forming the opening.

FIG. 8 is a view similar to FIG. 7, illustrating the folding-door construction of FIG. 7 as being closed across the opening between the illustrated walls.

FIG. 9 is a plan view of another type of installation of two-panel folding doors. The structure mounted to the travel rod is simply doubled and as illustrated operates in identical manners relative to opposite directions of travel.

FIG. 10 is an enlarged perspective view of an optional embodiment of travel rod assembly which may be used in the present invention and corresponds in essential operation to that shown in FIG. 1.

FIG. 10A is an elevation of the mounting of the structure shown in FIG. 10.

FIG. 11 is a fragmentary side elevation, cut away and shown principally in section, of the folded door construction in an embodiment of the present invention wherein spring-biased linkage means is used so as to accomplish, essentially self-door-closing at a particular point in travel of the door.

FIGS. 12 and 13 are top views, are partially cut away for convenience of illustration, and illustrate the door as being closed in FIG. 12 and as being opened in FIG. 13, this to illustrate a movement of the linkage and its co-action with the tension spring means shown therein.

FIG. 14 is an elevation of the door of the present invention, illustrating what manner in which it may be pivoted as to installation, this without use of hinge means relative to the side wall forming one side of the door opening.

FIG. 15 is an enlarged representative detail of pivot structure illustrated in and taken along the lines 15—15 in FIG. 14.

FIG. 16 is an enlarged fragmentary plan, illustrated in section, of a certain hinged construction representing an alternate embodiment of one portion of the present invention.

FIG. 17 is a vertical section taken along the section 17—17 in FIG. 16.

In FIG. 1 travel rod assembly T includes end brackets 10 (one of which is shown), each having a mounting flange 11 provided with mounting apertures 12 and 13. Depending from flange 11 is a vertical flange 14. The same is integral with horizontal flange 11 and completes the construction of bracket 10. Flange 14 includes an aperture 15 which receives shouldered elongate rod 16. A collar 17

4

is provided with a central aperture 18 and includes a radial threaded aperture 19 for receiving set screw 20. Set screw 20 is used to position collar 17 in a desired location upon rod 16. Compression spring 21 is centrally disposed over the rod 16, backs one side of collar 17, and is adapted for engagement with nylon washer 22. The latter includes aperture 23 which provides a loose fit relative to the rod upon which the washer 22 is mounted; thus, nylon washer 22 is free to move along shaft 16 in accordance with the operation of the equipment. The continuation of rod 16, as shown in the lower left-hand portion of FIG. 1, receives a bearing member 24. The latter is detailed in FIG. 6 and is shown to include end recesses 25, and respective pluralities of ball bearings 26 which are secured in place, in a customary manner, in bearing cage or mount 27. The ball bearings 26 receive shaft 16 and journal the same for reciprocating movement. Elongate arm 29, see FIG. 6, includes arm members 30 and 31 which are respectively off-set at 32 and 33, and arm 31 is provided with slotted aperture A. Arm member 30 includes threaded apertures B which receive screws 34 and 35. It will be noted that the over-all length of arm 29 may be adjusted by loosening screws 34 and 35, re-positioning the arm members, and then re-tightening the screws. This length adjustment is generally necessary and very convenient as will be hereinafter described. Arm member 32 includes an end aperture 36 receiving screw 37 which threads into aperture 38 of the lower portion 39 of bearing member 24.

FIG. 2 illustrates the manner of securement of the construction illustrated in FIGS. 1 and 5. It is seen that bracket 10 may be disposed in edge recesses 40 and 41 of the header, top split jamb 42. The latter is shown to devise a pair of halves 43 and 44 as seen in FIG. 2. It is noted in FIG. 2 that bearing member 24 may be provided with a depending boss 45 for receiving the mounting screw 37. See FIGS. 1, 2, 5 and 6 in this regard.

FIGS. 3 and 4 illustrate a first embodiment or usage of the structure shown in FIGS. 1, 2, 5 and 6. Door opening O includes side jambs 46 and 47 defining opening surfaces 48 and 49, respectively. The door jamb on the right-hand side of the opening, see FIGS. 3 and 4, is an off-set jamb construction, including not only the jamb 47 but also the jamb 50. Note the off-set recess 51 defined by surfaces 52 and 53 in FIG. 3. Area 51 may also be defined as a side or exteriorly disposed recess for the folding door 54 comprising solid or hollow-core panels 55 and 56. Folding door 54 may, in general, be constructed in the usual manner, having connecting hinge 57 opposite halves 58 of which are screwed or otherwise secured to the cooperating edges of panels 55 and 56. Pivot 60 journals door panel 55 to support structure in a conventional manner.

Secured to the upper, outer end 61 of panel 56 is arm 29 as seen in FIGS. 1, 5 and 6. Bearing member 24, of course, is disposed on rod 16 in the manner shown in FIGS. 1 and 4. Spring 21 is provided in FIG. 4 in the manner illustrated in FIG. 1. The bracket 11 is secured in place in FIG. 4 in the manner shown in FIG. 3.

FIG. 3 illustrates a configuration of door 54 when the latter is folded within the exterior of the pocket area or recess 51. Note that the door is dimensioned such that a smooth rectangular construction is maintained relative to the wall, jamb, and door when in folding position. When the door is to be closed, then suitable handle means 62 and conventional construction may be provided as desired.

It will be noted that the right portion of the structure is similar, including an additional washer 22, an additional spring 21, an additional collar 17 pinned or keyed in place to rod 16 and the support bracket 10.

It will be observed that there is a large expanse of travel for the bearing member 24. This is amply provided for by rod 16. Note is to be made that bearing member 24 is elongate and provided with plural spaced

bearing means M such that there will exist no binding upon the rod as bearing member 24 is moved to the right and to the left. This would not be true in the case of the normal close-fit bushing were it used. An important feature of the invention hence, is to provide suitable bearing means which is not going to bind on the rod 16 during its traverse to the left and to the right. The spaced, ball-bearing means within the bearing member 24 amply serves its function.

Note also is to be made that there is a smooth rectilinear configuration of the folded door and wall on the right side of the construction, see wall W in FIG. 3, when the door is folded and tucked away in place.

Special note is to be made as to the cooperation of the selectively expandable arm 29, spring 21, and collar 17. It may be desirable to reduce the extent of travel along rod 16 of bearing member 24, this is for purposes of reducing wear, travel-sound, and so on. This can be accommodated by approximate travel-rod assembly adjustment. More important, and referring again to FIGS. 3 and 4, it will be observed that the opening O may be one of several sizes such as from two feet to four feet, at established intervals therebetween. The problem for the installer on the job is to have a universal travel-rod assembly package such that the rod 16 need come in only one length to accommodate not merely one size of door opening, but rather several sizes of door openings within a given range. Thus, were the door opening larger than shown in FIG. 3, rod 16 would have its ends spaced from the jambs of the opening. However, the rod will not have to be altered as to length or replaced by a longer rod. Instead, the opposite ends of the rod would be simply spaced from the side jambs of the door opening and the brackets 11 likewise would be spaced apart from the surfaces 48 and 49. This would not alter the operative effectiveness of the structure or its installation since the brackets 10 are in any event mounted to and between the upper split header of the door opening. The rod can be either pressed into the aperture provided in the brackets, pinched to or otherwise secured to these brackets, to prevent longitudinal movement of the rod.

However, for larger door openings larger panels 55 and 56 will, of course, be used. In order to accommodate such larger panels, then the adjustable arms 29 need only be lengthened to accommodate the increased widths of the new door panels. With such lengthening, an appropriate adjustment as to the relative position of collars 17 on rod 16 may have to be adjusted. Finally, lengthwise adjustment of arm 29 may have to be made to accommodate other types of door installations such as those shown in FIGS. 7, 8 and 9.

It follows, of course, that the brackets 10 in FIGS. 1, 3 and 4 may be attached to a split header of any type of header for over-head door casing, i.e. regardless of the particular type of mounting of the brackets 10. What is important is that a package unit can be supplied which will accommodate a large number of door openings without necessitating replacement or substitution or working in the field of the rods 16 in the packages.

FIGS. 7 and 8 illustrate a slight modification of the invention wherein this time the folding door 63 includes panels or halves 64 and 65 which are hinged together at 66 in the usual manner. Handle 67 may be supplied centrally of panel 63.

Again, in FIG. 7 rod 16 is supplied with its usual mounting brackets 10, see FIG. 1. Again the brackets need not be mounted immediately adjacent the side jambs of the opening. Rather they can be spaced inwardly from the respective right and left jamb surfaces and the rod 16 may remain its manufactured length regardless of slight enlargement of the door opening in question. Springs 21 will be pre-installed upon rod 16 as will also bearing member 24, washers 22, and the reaction collar 17. It is noted in FIG. 7 that two reaction collars are provided. The remaining collar 17 may be used adjacent

the left-hand side of left-hand spring 21 if desired. Of course, spring 21 may directly abut bracket 10 if desired. Washer 22, backed by its own spring 21, forms a resilient stop, in effect, for bearing member 24 to permit the same to alter its movement in response to the final closing of door 63. This door closing is illustrated in FIG. 8. Thus, FIG. 8 illustrates a second operative construction in connection with folding doors to close the opening between adjacent walls W1 and W1.

FIG. 9 is another type of construction similar to that shown in FIGS. 7 and 8 but wherein a pair of hinged or pivoted doors are used. In the construction shown in FIG. 9, doors 67 and 68 include respective panels 69, 70, 71 and 72 which are hinged together as shown by hinges 73 and 74. The inner edges of the composite doors are adjacent at area 75. At this point special note is to be made that the size of the opening is not at all reduced relative to the door opening. Rather, the door is either folded completely out of the way and disposed in a recessed opening as is seen in FIG. 3, or the door is hinged such that it may be disposed completely out of the way as illustrated in FIGS. 7-9. Note the use of two rods 16 and accessories.

Arms 29, of course, may be adjusted as to lengthwise dimension such that the particular door or door opening in question may be accommodated. The arms associated with the doors 67 and 68 are shown in their retracted condition in FIG. 9, whereas the extended arms are illustrated in the central portion of FIG. 9 wherein the doors are closed. Note is to be made that in a preferred form of the invention the composite arms 29, as pivoted to their respective door panel and bearing member 24, will remain a constant length for an existing door for construction. This length may be altered in accordance with the size of the opening, of course, and the size of the door panels to be used in the door construction. Also, rod 16 may be Teflon-coated.

FIG. 10 illustrates another type of construction wherein mounting means 10', corresponding to bracket 10 in FIG. 1, are this time used in an open form of construction. This is to say, the structure shown in FIG. 10 will be used where a split header or split upper jamb is not used in the construction. In such event, member 10A may be used for mounting to the upper jamb or header 76, and a screw 77 may be employed to mount the mounting member 10' in place as illustrated in FIG. 11. A plurality of apertures 78, 79, 80 and 81 may be provided in the oppositely disposed mounting members to provide optional securement of rod 16 thereon. Collar 17 again is adjustable upon rod 17 in FIG. 10 and set screw 20 is provided to fix the collar in place. Collar 17 again serves as a reaction member for spring 21, and the latter is backed by nylon washer 22. This time, bearing member 24A includes opposite plates 82 and 83 which are spaced and riveted or otherwise secured together by suitable attachments 84 and 85. Attachments 84 and 85 may likewise provide for a pair of cross-members at 86 and 87, respectively, and between which pulley wheels or internal V-slotted wheels 88 and 89 are mounted. These may be used to roll up and down the rod 16 without chancing the effects of binding of the bearing member relative to rod 16. Upstanding portion 90 of mounting member 24A is pivoted to extensible arm 29A, the latter comprising arm member 91 and arm member 92. A pair of threaded apertures 93 and 94 may be constructed to receive threaded bolts or screws 95 and 96. The offset portion 97 of arm member 92 may be slotted at 98 so that adjustment is possible. Accordingly, the loosening of screws 95 and 96 will permit the lengthwise adjustment of composite arm 29A. Offset portions 97 and 98 facilitate a planar alignment of the respective portions 91 and 92 of composite arm 29A.

It is important to note that in normal construction work basic, folding-door installations accommodate for installing 1½", 1¾" thickness doors. By use of a plurality of apertures 78-81 in the present invention, various thick-

nesses of doors may be accommodated. It is noted therefore that notwithstanding the installation of the structure in a door opening as seen in FIGS. 10 and 11, closing the door will completely hide the door closing structure. A portion of the door 100 is shown recessed at 101 to accommodate the forward portion 102 of composite arm 29A. When the hinged door 100 is closed, the opposite panel not shown actually abuts against mounting member 10' proximate the surface S. When such closure is completed, it is seen that the entire opening will be closed and the door-closing structure obstructed from view relative to a forward area facing the structure of FIG. 10.

Therefore, it is of interest to note that the surface S in FIG. 10 serves as a door stop when the door is closed; no separate stop strip or other member need be provided on the side jamb or header jamb.

As to door 100 the recess 101 will be of sufficient length to permit the door to close completely in a direction to the right relative to FIG. 10.

In all installations it is preferred that there be a stop screw or other member 103 as in FIG. 10. This is to pre-align composite arm 29 in FIG. 1 and 29A in FIG. 10, this in order that an angle of approximately 40 degrees relative to the plane of the door is achieved as to the longitudinal axis of the composite arms 29 and 29A. Thus, an angle of 50 degrees relative to the longitudinal axis of the composite arm 29 and 29A and the direction normal to the surface of the door as at N, see FIG. 7, is desired in order that a proper, non-sticking action of door closing be attained. A divergence of perhaps 4 degrees from the 40-50 degree angular relationship is permissible without detracting from the desired opening and closing action of the door.

In FIG. 11 door panel 104 and door panel 105 are of hollow door construction having exterior skins 106 and 107, respectively, and interior framing 108 and 109. The two are hinged together in the usual manner by hinges 110. Drilled within the framing 108 and 109 are a pair of apertures 111 and 112, and secured therein as to door 104 is a cylinder 113, see also FIG. 12, which is interiorly threaded at 114 throughout the interior length of cylinder 113. A pair of aligned apertures 115 are provided in this cylinder 113, these apertures receiving position pin 116 which is inserted through hole 117 drilled within the door 104. This positions the cylinder securely in place. Threaded into cylinder 113 is a threaded plug 117, the latter having an internal bore 118 which receives machine screw 119. The shank 120 of the latter journals collar 121 of arm 122. Arm 122 is pinned at 123 by suitable means too. Of course, if desired the threaded plug 117 may itself include a turn-down shank upon which arm 122 will be free to rotate. A nut retain or other means may be used to secure arm 122 to plug 117. Arm 122 is pinned to link 124 by pin 123, and link 124 is itself supplied with a pivot pin 125 connecting to a connecting member 126. Connecting member 126 may take the form of an arm or link or even movable plug or pin to which the forward end 127 of spring 128 is connected. The forward end of connecting member 126 is pinned by the means 125 to link 124. Spring 128 is itself secured to cylindrical member 129, the latter being pinned in place by a pin 130 implanted in aperture 131. The doors in FIGS. 12 and 13 will be slotted at 129 and 130 to provide the later action of links 122 and 124. The action of these two links is illustrated in FIG. 13 wherein the door is completely folded over in a stored condition—also when the door is extended outwardly preparatory to closing as seen in FIG. 13.

The action of the structure in FIGS. 11-13 is to provide a spring-closing type of door action. In this regard spring 128 serves to apply tension to the combination of member 124 and member 126, thereby tending to align the axes of these two members and urge the door in the direction illustrated by the arrow X in FIG. 13. Thus, once the door has been urged half-way closed, the spring action of spring 128 in FIGS. 12 and 13 serve to further urge

the door to obtain a more obtuse configuration such that a flat, planar closed condition is achieved.

It is of interest to note that a complete self-closing action can be achieved, if desired, where the structure of FIGS. 12 and 13 is employed not only between adjacent door panels but also between the door jamb and that door panel adjacent thereto. In this regard the member 132 in FIGS. 12 and 13 is understood to be either that door panel nearly adjacent the door jamb or actually the door jamb and framing itself. In this connection, reference is made to FIG. 11 wherein the tension spring construction is duplicated (see FIG. 13) at both the door panel juncture area and also the area between the jamb and that panel adjacent thereto.

FIG. 14 illustrates that in the case of the side-type pocket of construction as is seen in FIGS. 3 and 4, there may be used, in lieu of hinges, simply journal pivots. These are illustrated in FIGS. 14 and 15, and may be employed at both the top and bottom of the folding door constructions. In FIG. 15, by way of example, there is provided an interior journal receptacle 132 which receives journal portion 133 of pin 134. The latter may be provided with wrench flats 135 or other suitable means for turning the lower threaded portion 136 thereof into mounting plate 137. The latter is secured by attachments 138 through slotted alignment apertures 138' to the floor or other base support 139. Base support 139 is preferably provided with an opening 140 for admitting the lower extremity 136 of journal member 134. An identical construction may be had at both top and bottom areas of FIG. 14. It is of interest to note that the wrench flats provided serve ideally to adjust the door not only for vertical height adjustment but also for proper clearance as between the journal sockets and the heads of the respective journal hinges.

There are, of course, innumerable ways of pivoting a door to adjacent structure other than by hinges or conventional pins. FIG. 15 illustrates one way, of course, in which the door may be journalled upon protruding pin members. Suitable means for alignments such as slotted hole attachments and other means may be provided for properly aligning vertically the axis of the respective pivot pins of the top or the bottom of the door.

In practicing the invention there are additional improvements in the form of structural features that can be incorporated. By way of example, see FIGS. 3 and 4, a false wall surface or vertical panel 141 which may be used, the same including a flanged lip 142 and an inwardly turned flanged shoe 143. The principal surface 144 of vertical panel 141 may be finished to have the same appearance as the surface R of the wall containing recess 51. Stop angles 145 and 146 are secured by suitable attachments 147 and 148 to surface 52. Jackknife compression springs 149 and 150 each include central torsion pivots 151 and 152, of conventional design, and are pivoted at their opposite ends 153, 154, 155 and 156 by conventional pivot means at these points.

In operation, vertical panel 141 will be disposed outwardly to have the appearance of the continuation of surface R of the wall. Flange lip 142 will serve to essentially obstruct vision into the interior of the wall recess. When the door is closed in the manner illustrated in FIG. 3, then vertical panel 141 is urged generally in the direction of the arrow A in FIG. 4 so as to compress, i.e. tend to close the jackknife compression springs 149 and 150. In FIG. 3 the compression springs mentioned are entirely compressed and the door tucked away in the recess. The weight of the doors, and friction at the door pivot mounts, and function of arm 29 at its associated structure in general will be sufficient to retain the folded door against vertical panel member 141. Of course, as conventional spring-loaded ball catch 59, or equivalent means, may be employed if desired as a releasable detent between jamb surface 59 and the adjacent edge of door panel 56 (see FIGS. 3 and 4). Stop angles 145 and 146 may be used when the door is being closed over the opening so as to

stop the progression of the jackknife springs 149 and 150 to a slight dogleg configuration as illustrated in FIG. 4. Likewise, the jackknife springs permit a depression, first, of the left-hand side of vertical panel 141 as the door is being closed to its folded position as shown in FIG. 3.

In FIG. 16 members 158 and 159 may be either door panel and wall, wall and door panel, or a pair of door panels, respectively. Members 158 and 159 are each provided with bores 160 and 161, the latter receiving spring 162 which is secured to an anchor button 163 in FIG. 16. Member 164 may comprise a cable spring wire or other elongate member. Hinge 165, of course, hinges members 158 and 159 together. Disposed within bore 160 is a cylinder 166, the latter being secured in place by screw 167 passing through aperture 168 of the former. Cylinder 166 is internally threaded at 169 and receives plug 170 and threaded engagement therewith. Plug 170 includes an abutment pin 171 which is received in socket 172 of follower 173. Follower 173 includes a finger 174, the latter retaining the remaining end of elongate member 164 as shown in FIG. 17. It is seen that the tensioning of tension spring 162 may be adjusted by the appropriate turning of plug 170 within cylinder 166.

It is to be noted that, contiguous with the respective bores 161 and 160 there are, for the elongate cable or other means provided, outwardly angulated relief slots 173 and 174. These release slots reduce that portion of the cable or elongate member which is disposed outwardly of the juncture of the two members 159 and 160 and, in addition, aid the frictional forces present in hinge 175 in retaining the door in folded condition as shown in FIG. 16. Alternatively, when the door is closed in a straight position as in the case of the structure of FIG. 4, by way of example, then the elongate member 164 and spring 162 aid in self-closing the members 159 and 158 to an essentially co-planar configuration.

In the structure of member 158 there may be included an upper vertical slot 176 contiguous with bore 160 and receiving elongate member 164 and finger 174 movable therewithin. This slot likewise provides for admission of screw 167 to retain cylinder 166 in place.

In operation, then, as to FIGS. 16 and 17, the illustrated structure provides means shunting the hinged juncture of the construction such that self-closing and folded-retention of the door construction or, alternatively, door and wall construction is achieved. Additionally, spring tension may be adjusted through appropriate adjustment of plug 170. The folded construction is maintained, hence,

when the structure is positioned in the manner illustrated in FIG. 16. Where closing is commenced, however, the operation of the spring and elongate member 64 will be such as to tend to complete the closing or co-planar orientation of the structure.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects.

I claim:

1. A folding-door construction including, in combination
 - a pair of panels;
 - hinge means connecting adjacent edges of said panels at a common juncture;
 - recesses extending through said adjacent edges and into the panels, said recesses being in substantially opposed alignment;
 - fixed anchor means secured in one of said recesses;
 - adjustable anchor means secured in the other of said recesses, said adjustable anchor means comprising a housing having an open end accessible through the recess, a follower reciprocally guided for sliding movement within said housing and having attachment means thereon, and threaded adjustment means offset with respect to the attachment means and accessible for turning from the open end of the housing; and
 - biasing means, including a spring, fixed between the fixed anchor means and the attachment means of the follower, whereby turning of said threaded adjustment means when said biasing means is under tension changes the tension of the biasing means tending to swing the panels such that their adjacent edges are in substantial abutment.

References Cited

UNITED STATES PATENTS

801,694	10/1905	Sheppard	16—72X
926,365	6/1909	Therriault	16—180
1,367,414	1/1921	Matlick	16—72
1,381,744	6/1921	Riggs	160—199
2,677,420	5/1954	Kuyper	160—199X

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