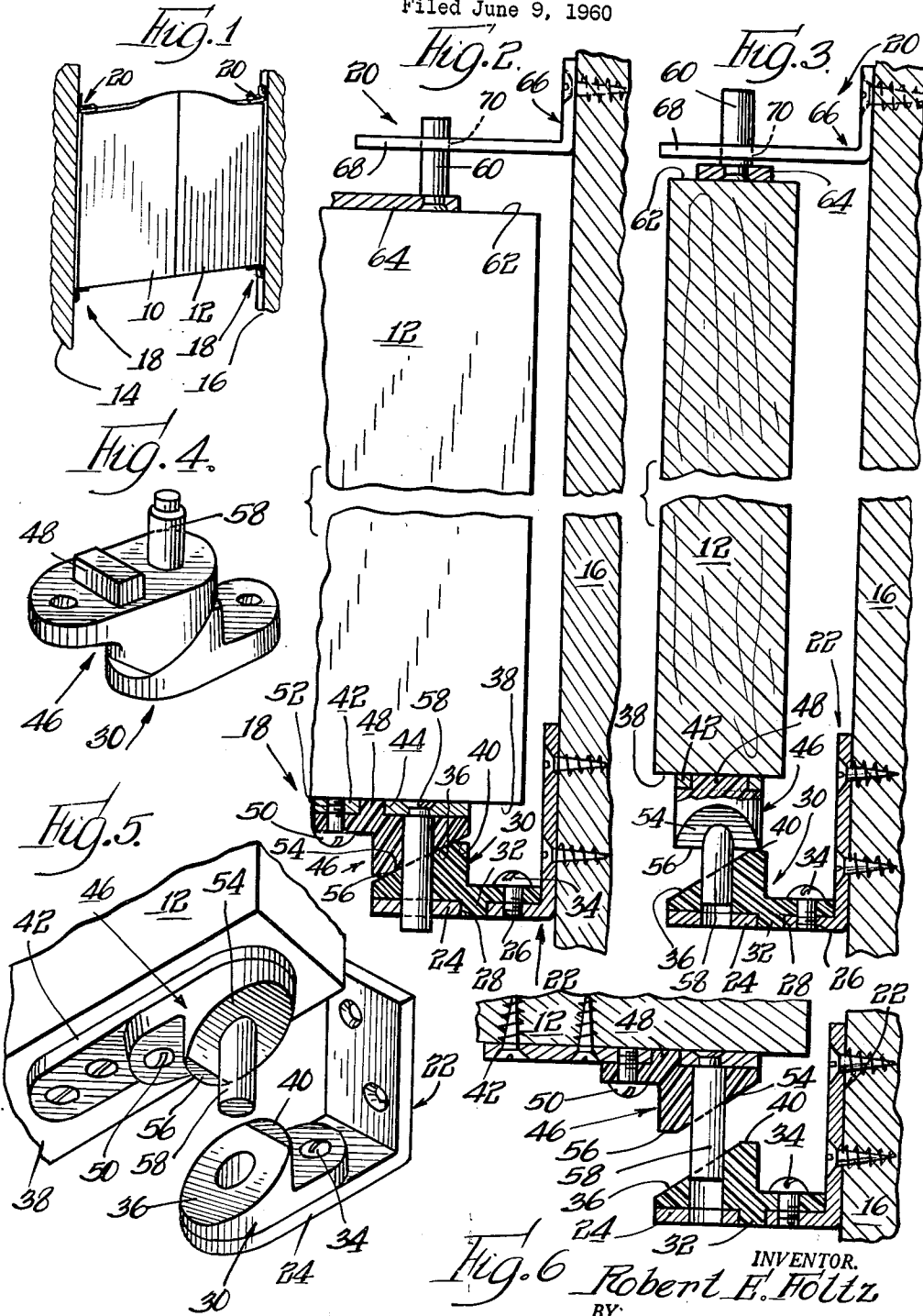


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SWINGING DOOR HINGE

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SWINGING DOOR HINGE

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This invention relates generally to swinging door hinges and more particularly to swinging door hinges of the exposed, pivot-type.

As is well known, a swinging door must be installed in such a manner as to be spaced apart from its frame. If this relationship is not properly established and maintained, portions of the door edges will encounter the doorframe and bind, thereby obstructing free operation of the door in its normal arcuate travel, ordinarily an arcuate travel on the order of 220°. Moreover, the difficulties involved in establishing and maintaining the proper spatial orientation of a swinging door are compounded when two such doors are to be operated in a single framed opening. Under such circumstances, the opportunity for original misalignment and resultant binding is multiplied; and it has been a common practice to correct misalignment by trimming the edges of swinging doors after they have been installed. Frequently, rather substantial trimming has been required; and this, in turn, has led to visually apparent and objectionable destruction of the symmetry of a given door, especially where louvered doors or those with contoured top edges are involved.

Prior art hinges which have been constructed for use with swinging doors have not offered satisfactory solutions to this installation problem; or where they have offered a solution, it has been accompanied by one or more offsetting disadvantages. Leaf-type, swinging door hinges, while susceptible to installation by the efficient procedure common to butt or leaf-type hinges, restrict swinging of the door to only one direction, i.e. restrict the arcuate travel to approximately 110°.

Concealed, pivot-type hinges have been devised to improve the appearance of a swinging door installation by situating the hinge elements within the body of the door. These concealed, pivot-type hinges commonly incorporate helical cam surfaces as well as coil spring door return mechanisms. Moreover, it is common to install such an arrangement at both the top and bottom of the door. This type of swinging door hinge is characterized by a very complicated installation; and great skill must be exercised in establishing and maintaining the proper spatial orientation of the doors.

Exposed, pivot-type hinges, on the other hand, require disposition of the door pivot axis outside of the body of the door. Accordingly, liberal spacing between the door and the side jamb is necessary. Exposed, pivot-type hinges for swinging doors are customarily used with outdoor gates where misalignment can be compensated for by generous spacing of the gate from its gate-posts and where excessive spacing is not objectionable.

Therefore, a general object of the present invention is to provide a new and improved hinge for swinging doors.

A more specific object of the invention is to provide a swinging door hinge of the exposed, pivot-type which is amenable to minimal spacing between the door and the doorframe and to indoor use.

Another object of the invention is to provide a swinging door hinge which facilitates easy installation of the door.

Yet another object of the invention is to provide a swinging door hinge which is gravitationally self-centering of the door to its closed position.

Still another object of the invention is to provide a swinging door hinge which permits a fixed positioning of the swinging door in either of the two open positions.

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Additional objects and features of the invention pertain to the particular structure and arrangements whereby the above objects are attained.

A swinging door hinge in accord with the invention includes a first pivot element adapted to be fastened to the bottom edge of a door, the pivot element being cut off to define a plane surface disposed at an acute angle with respect to the bottom edge of the door, the plane surface terminating in a horizontal shelf at its lower extremity; a second pivot element adapted to be fastened to one side jamb of a doorframe spaced apart therefrom and aligned beneath the first pivot element in supporting relationship, the second pivot element being cut off to define a plane surface arranged to be in substantially full contact with the plane surface of the first pivot element when the door assumes its position closing the doorframe, the plane surface of the second pivot element terminating in a horizontal shelf at its upper extremity; and pintle means entering aligned vertical bores in the pivot elements maintaining axial alignment thereof by being fixed with respect to one of the elements, partial opening of the door causing a vertical dislocation of the pivot elements, the first pivot element riding on the second pivot element with line contact therebetween, the dislocation situating the door in an unstable position from which gravity tends to return it to its position closing the doorframe, engagement of the shelves at the extreme positions of the arcuate travel of the door establishing two stable, open positions of the door.

In order that the principle of the invention may be readily understood, a single embodiment thereof applied to cafe-type swinging doors, but to which the application is not to be restricted, is shown in the accompanying drawing wherein:

FIG. 1 is a view showing two cafe-type swinging doors installed in a single doorframe utilizing hinges constructed in compliance with the present invention.

FIG. 2 is an enlarged, cross-sectional view taken in front elevation of a portion of the door installation of FIG. 1 showing, in particular, the hinge arrangement of the invention, the swinging door being illustrated in its position closing the doorframe;

FIG. 3 is a view similar to that of FIG. 2 but showing the swinging door in an open position;

FIG. 4 is an enlarged, perspective view of the pivot elements used in the door hinge of the invention;

FIG. 5 is an exploded perspective view of the pivot elements illustrating the manner in which the elements are cut off to define plane surfaces, further illustrating the pintle means; and

FIG. 6 is an enlarged, cross-sectional view showing the pintle means entering the bore in the lower pivot element as would be realized in installation.

Referring now in detail to the drawing, specifically to FIG. 1, a pair of cafe-type swinging doors 10 and 12 will be seen mounted to the side jambs 14 and 16 respectively of a framed door opening. Each of the doors is mounted to its respective side jamb by means of a pivot arrangement 18 and a pin arrangement 20.

Turning to FIGS. 2 and 3, the pivot arrangement 18 is shown to comprise an L-shaped bracket 22 which is secured to side jamb 16 by flathead screws or other suitable fasteners. The horizontally extending plate portion 24 of bracket 22 is provided with a round aperture 26 and a rectangular aperture 28. A pivot element 30 is secured to the bracket 22 by means of a rectangular tongue portion 32 which is adapted to enter the aperture 28 and by means of a screw 34 which passes through a bore in the pivot element 30 to engage the aperture 26 threadedly. Pivot element 30 is cut off to define a plane surface 36 which is disposed at an acute angle with respect to the bottom edge 38 of door 12 when the door

closes the door opening. In addition, the plane surface 36 terminates in a horizontal shelf 40 at its upper extremity.

To the bottom edge 38 of door 12, there is affixed a mounting plate 42; and as will be seen in FIG. 5, plate 42 is secured to the bottom edge 38 by means of flathead screws or other suitable fasteners. The plate 42 is provided with a rectangular aperture 44. A pivot element 46 is positively positioned with respect to the plate 42 by means of a rectangular tongue 48 snugly entering aperture 44 and by a screw 50 which passes through a bore in the element 46 to engage threadedly a round aperture 52 in the plate 42.

The pivot element 46 is cut off to define a plane surface 54 which is disposed at an acute angle with respect to the bottom edge 38 of door 12. Surface 54 is arranged to be in substantially full contact with surface 36 when door 12 assumes its position closing the door opening. Moreover, plane surface 54 terminates in a horizontal shelf 56 at its lower extremity.

For purposes of establishing and maintaining proper alignment of the elements 30 and 46, a pintle 58 is arranged to pass through aligned vertical bores in plate 42, element 46, element 30 and plate portion 24, pintle 58 being fixed relative one of the pivot elements, as by a press fit or swaging in the bore of plate 42, and being slidable relative to the other pivot element.

As will become apparent, door 12 is spaced apart from the side jamb 16 by virtue of the spaced positioning of the element 30 and the alignment of elements 30 and 46. It will also be recognized that the weight of door 12 is supported on the bracket 22; and since element 46 is intended to move relative to the element 30, elements 30 and 46 are advantageously fabricated from a material displaying a low coefficient of friction. In one specific embodiment, elements 30 and 46 have been usefully fabricated from the polyamide resin commonly known by the trade name "nylon."

The pin arrangement 20 cooperates with pintle 58 in establishing a pivot axis for door 12; and in compliance with the invention, this pivot axis is arranged to pass through the body of the door. Specifically, pin arrangement 20 includes an upstanding pin 60 which is mounted to the top edge 62 of door 12 by means of a mounting plate 64 to which the pin 60 is secured as by a press fit or other means. The plate 64 is fastened to the top edge 62 by means of flathead screws or other fasteners, not shown. An L-shaped bracket 66 is suitably secured to the side jamb 16 extending a horizontal plate portion 68 above the top edge 62 of door 12. Plate portion 68 is provided with an aperture 70 which slidably receives the pin 60.

Having thus described one construction of the invention, it is important now to state how the illustrated embodiment operates. Assuming that the door 12 is at rest in its position closing the door opening, the various elements will be situated as they are generally shown in FIG. 2. In particular, the plane surface 54 will be in substantially full contact with the plane surface 36 and the weight of the door 12 will be transmitted from pivot element 46 to the pivot element 30 and thereby to the bracket 22. To open the door 12, it is only necessary to push manually on the door 12 generally adjacent its juncture with the door 10. The force thus applied will be realized as a torque imposed about the pivot axis defined by the pin 60 and the pintle 58; and this torque will tend to cause an edge of surface 54 to ride on the surface 36 while door 12 is vertically dislocated. This vertical dislocation of the door 12 is associated with the door being opened and is permitted by the spacing achieved between the top edge 62 of the door and the plate portion 68 of bracket 66. Accordingly, as the door 12 is vertically dislocated, pin 60 will rise through the aperture 70 while pintle 58 is rising in the cooperating aperture in pivot element 30.

If the door 12 is turned to either end of its normal arcuate travel, the horizontal surface 56 of pivot element 46 will become engaged with the horizontal surface 40 of pivot element 30. This position is illustrated in FIG. 3. As will be recognized, engagement of the shelf 56 with the shelf 40 establishes a stable configuration of the door wherein its weight is not borne on the inclined plane surface 36. Such a configuration of the door 12 exists at either end of its arcuate travel, thus establishing two stable, open positions of the door.

However, if the torque imposed on the door 12 in opening the door is not sufficient to cause shelf 56 to engage shelf 40, release of the opening force, while an edge of surface 54 is riding on the surface 36, will result in gravitational forces taking over tending to return the door to its closed configuration illustrated in FIG. 2. It is to be pointed out that return of the door 12 to its closed configuration is achieved without the use of a return spring or biasing means other than gravity alone.

It is to be pointed out that a swinging door such as the door 12 may be readily installed by affixing the bracket 22 to the side jamb at a suitable location. The mounting plate 42 with pivot element 46 attached will then be secured to the bottom edge 38 of door 12 an appropriate distance from the corner of the door; and then the door will be raised into position with the pintle 58 entering the bore in element 30, surface 54 being placed in substantially full contact with surface 36. Thereafter, mounting plate 64 can be secured to the top edge 62, the plate 66 being positioned thereover with pin 60 entering bore 70 while the door 12 is being supported in proper spatial relationship within the framed door opening. Finally, bracket 66 will be secured to the side jamb 16 a suitable distance above the top edge 62. It is to be observed that, once bracket 22 is properly located on side jamb 16, completion of the installation is quickly and easily achieved, the meshing of the flat surfaces 36 and 54 determining a guide for proper spatial orientation of the door.

The specific example herein shown and described is intended to be illustrative only. Various changes in structure are contemplated; and these changes are to be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A swinging door hinge comprising: a first pivot element adapted to be fastened to the bottom edge of a door, said element having a pintle accommodating bore and being truncated to define a flat surface disposed at an angle with respect to said bottom edge, said surface defining a plane that intersects the plane of said bottom edge, said bore passing centrally through said flat surface, said surface terminating in a horizontal shelf at its lower extremity; a second pivot element adapted to be fastened adjacent one side jamb of a doorframe spaced apart therefrom and aligned beneath said first pivot element in supporting relationship, said second pivot element having a pintle accommodating bore vertically aligned with the pintle accommodating bore of said first pivot element and being truncated to define a flat surface arranged to be in substantially full contact with the flat surface of said first pivot element when said door assumes its position closing said doorframe, the bore of said second pivot element passing centrally through the flat surface thereof, the flat surface of said second pivot element terminating in a horizontal shelf at its upper extremity; and pintle means fixed with respect to one of said elements and adapted to enter said bores for maintaining axial alignment of said elements, whereby partial opening of said door causes a vertical dislocation of said pivot elements, said first pivot element riding on said second pivot element with line contact therebetween, said dislocation situating said door in an unstable position from which gravity tends to return said door to its posi-

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tion closing said doorframe and whereby engagement of said shelves at the extreme positions of the arcuate travel of said door establishes two stable, open positions of said door.

2. A swinging door hinge as claimed in claim 1, wherein each pivot element is provide with a tongue projecting from the mounting surface thereof adapted for attachment of the first pivot element to the bottom edge of a door and of the second pivot element to a side jamb of a door frame.

3. A swinging door hinge as claimed in claim 1, wherein there are provided mounting plate portions adapted for attachment respectively to the bottom edge of a door and the side jamb of a door frame and to which the first and second pivot elements are respectively attached to interlocking means therebetween.

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4. A swinging door hinge according to claim 1 wherein said pivot elements are fabricated from a polyamide resin.

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