

Jan. 24, 1961

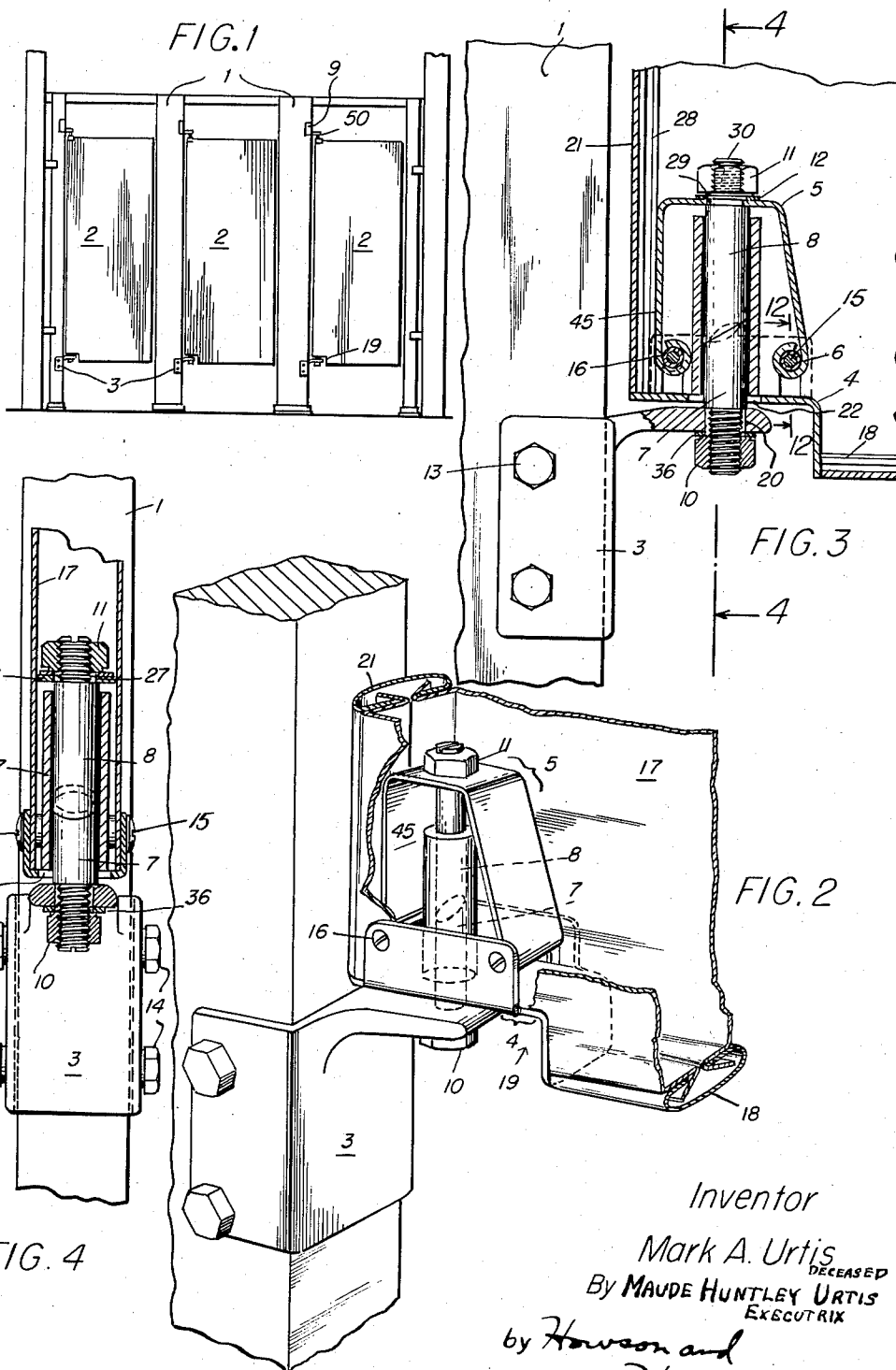
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2,968,830

GRAVITY DOOR HINGE ASSEMBLY

Filed Feb. 20, 1958

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 15

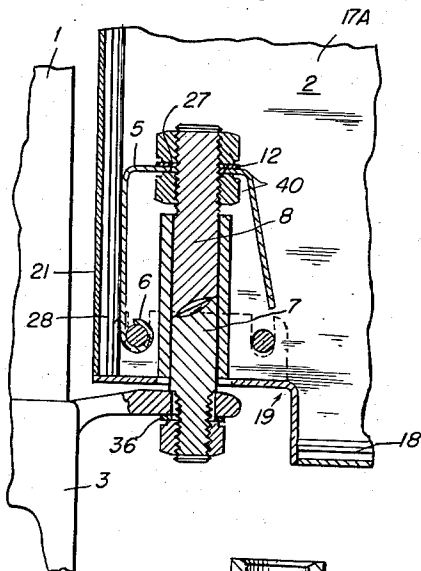


FIG. 5

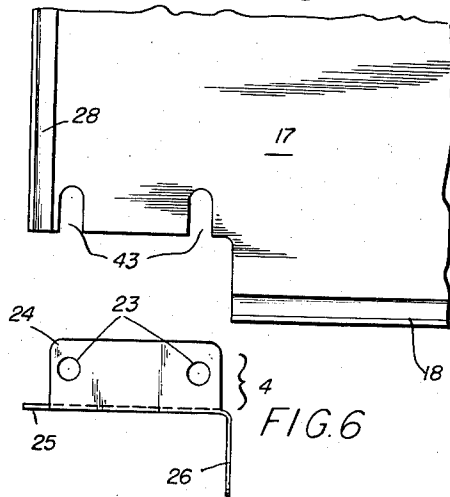


FIG. 6

FIG. 13

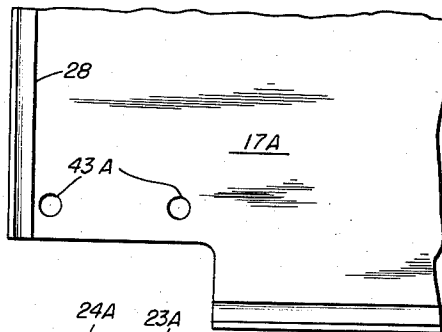


FIG. 14

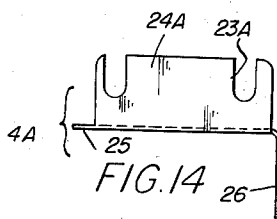


FIG. 12

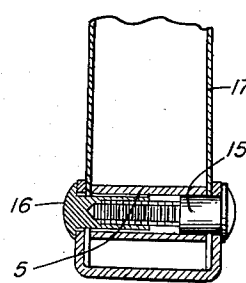


FIG. 9

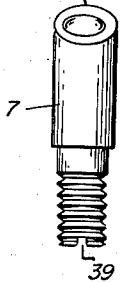


FIG. 10

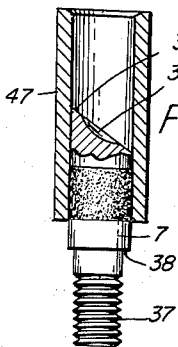


FIG. 11

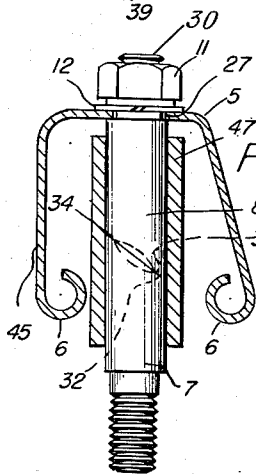


FIG. 7

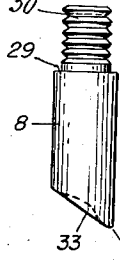
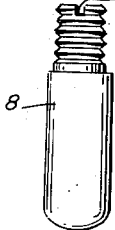


FIG. 8



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GRAVITY DOOR HINGE ASSEMBLY

Mark A. Urtis, deceased, late of Dallas Township, Luzerne County, Pa., by Maude Huntley Urtis, executrix, De Land, Fla., assignor, by mesne assignments, to Robert Partitions, Inc., Wilkes-Barre, Pa., a corporation of Pennsylvania

Filed Feb. 20, 1958, Ser. No. 716,353

4 Claims. (Cl. 16—153)

This invention relates to a gravity door hinge assembly and more particularly one of the concealed gravity type. The invention will be shown and described as the bottom hinge assembly for doors supplied with metal partitions utilized as toilet or shower stalls. The function of such gravity hinges is automatically to return a door to either an open, closed or slightly open position, as desired, when the door is released by the user of the compartment or from a bolt or latch. One object of the invention is to produce a gravity-type hinge which is concealed flush inside the door and which can be easily adjusted to any desired setting of the door without removing it from the door. It must also be installed or removed easily.

In the drawings Figure 1 is a front view of a typical series of three compartments with metal doors in which the novel hinge assembly is concealed in each door as the bottom hinge.

Figure 2 is a perspective view of a preferred embodiment of the invention showing a bracket and one corner of the door broken away to reveal the hinge assembly.

Figure 3 is a view in side elevation of the embodiment of Figure 2, the hinge assembly being shown in a section taken parallel to the plane of the door.

Figure 4 is a view in vertical section through the center line of the hinge assembly of Figure 3 on the line 4—4 of that figure, the section being taken in a plane at right angles to the plane of the door.

Figure 5 is a side view of one corner of a side panel of a door of the embodiment of Figures 2 to 4 showing the slots for the bolts which hold the bottom closure.

Figure 6 is a side view of a bottom closure suitable for use with the side panel of Figure 5.

Figure 7 is a view of the upper cam of the embodiment of Figures 1 to 6 showing the bevel of the contact or cam surface at the lower end.

Figure 8 is a view similar to Figure 7 with the cam turned 90° showing the slot or kerf at the upper end to adjust the cam rotatively.

Figure 9 is a view of a lower cam suitable for coaction with the upper cam of Figures 7 and 8, the bevel facing the observer and showing the kerf at the lower end for adjusting the cam, and for indicating adjusted position of the door when at rest.

Figure 10 is a view similar to Figure 9 with the cam turned 90° and a sleeve shown in section fastened outside the cam to align the upper cam.

Figure 11 is a view in section of the parts of Figure 10 with the upper cam and its supporting strap assembled therewith.

Figure 12 is a view in vertical section taken on the line 12—12 of Figure 3 through one of the bolts holding the assembly.

Figure 13 is a view similar to Figure 5 of one corner of a modified form of door side panel showing holes instead of slots to hold the bolts.

Figure 14 is a view similar to Figure 6 of a bottom

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closure suitable for use with the modified panel of Figure 13.

Figure 15 is a view in side elevation similar to Figure 3 of a modified form of hinge assembly with the panel and closure of Figures 13 and 14, the assembly being in section.

Doors for metal toilet or shower partitions must be able to return to a predetermined position of rest after their release from human hands or from restraint by a mechanical check such as a bolt or latch. The predetermined position may be an open or a closed one or a partly open position. The gravity hinge assembly herein shown and described instigates, permits and guides the rising or lifting of the door above the position it assumes when at rest. This stores potential energy in the form of gravitational force because of the door's raised position and mass. The energy is dissipated in bringing the door back to its position of rest when the restraining means is removed.

The form of gravity hinge herein shown and described has the advantage that the door can open in either a clockwise or counterclockwise direction whether mounted on right or left hand pilasters (posts) without requiring any change in design, fabrication or assembly of the various parts. It can be mounted in currently available brackets.

The hinge assembly is intended for mounting at the bottom of a door while another pilaster bracket and a pivot type hinge is used at the top of the door.

In the embodiment shown in Figures 1 to 12 the doors 2 are mounted on posts, i.e., pilasters 1 by means of lower brackets 3 and upper brackets 9 (Figure 1). The brackets are fastened on the pilasters by screws 13 and nuts 14.

The gravity hinge assembly is carried on the arm of the lower pilaster bracket 3. In the example shown in Figure 1 the pilasters 1 are on the left hand of the doors 2 and the latter open clockwise toward the observer. Obviously the assembly can be used equally well where right-hand pilasters are used or where the doors are to open counterclockwise. Any bracket can be used which can be properly fitted to the lower cam as hereinafter described.

This hinge assembly is intended for mounting at the bottom of a door, in order to develop and utilize the potential energy previously described. A top bracket 9 and a pivoting type hinge 50 are shown at the top of the door. This top hinge is mounted so its pivot is in alignment with the axis of the cams of the lower hinge. There must be sufficient distance between the top hinge 50 and the top bracket 9 or other form of attachment at the top of the door to permit the maximum required rising or lifting of the door as initiated by the cams of the bottom hinge.

Referring to the lower hinge assembly, this raising or lifting of the door is achieved by two cylindrical cams—the lower cam 7 and the upper cam 8. In the example shown in the drawings, the lower cam 7 is non-rotatively fastened to the pilaster bracket 3 while the upper cam 8, together with the remaining principal parts of the assembly, rotate or oscillate with the door 2. Each of the cams has an oblique surface, the inclination of which is at a predetermined angle to the vertical axis of the cylinder. These surfaces mate, i.e., are complementary to each other, and are indicated in the drawings by the numbers 32 and 33. They are in complete contact when the door is in its neutral or rest position. At this position they define what may be called their contact plane 34. The upper cam 8 has a rounded point 42 at its tip which moves up the oblique surface 32 of the lower cam 7, thus causing the door to rise. The cams are designed to provide a gradual rise or lift of the door through a full 180° arc of

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travel. Since the turning of the door is always less than 180° , it is possible to set the cams to ensure return of the door to any position of rest from any position in the arc of travel of the door.

After the force or means which moved or restrained the door is removed, the potential energy developed by the lifting of the door causes the point 42 of the upper cam 8 to slide down the inclined surface 32 of the lower cam 7, returning the door to its desired position of rest.

The upper cam 8 is fastened to a column strap or support 5 which acts as a supporting member for this cam. This supporting member is mounted inside the door and is flush with the rest of the door. The door is hollow, having metal side panels 17 and horizontal and vertical molding strips 18, 21, but this is only one type door in which the gravity hinge assembly may be concealed. The edges of the side panels 17 are turned in and reversely bent as can be seen in Figure 2. The edges of the molding strips 18 and 21 are also turned in to engage the reversely bent edges of the panels as shown and thereby hold the two side panels together. The door illustrated has a notch 19 cut out of its lower corner at the side where hinged. This notch enables the pilaster bracket to be above the bottom line of the door when the latter is at rest. This arrangement presents a neat appearance. A bottom closure 4 is provided as shown in Figures 3 and 6 to close the edge opening in the door resulting from the fabrication of the notch 19. This closure is provided with vertical sides 24 properly dimensioned to fit outside of the side panels 17 of the door (see Figures 4 and 12). This closure also serves as part of the hinge assembly. It is united to the rest of the door by fastening members which are shown as sex bolts 15 and tubular rivets 16 in holes 23 in the closure. Other fastening members could be employed. The side panels 17 have open-ended slots 43 to receive the fastening members as the closure is pushed into position in the notch 19. When in position the sex bolts 15 are tightened and the assembly is complete.

The column strap or support 5 and how it is coordinated with the other parts will now be described. This element serves as the locating, supporting and driving member for the upper cam 8. For this purpose the member 5 is a strap in the form of an inverted U with the upper cam connected at the top of the inverted U. There is an opening 27 in the strap by means of which the threaded upper end 30 of the upper cam is placed and fastened by a nut 11 and lock washer 12 (see Figure 11). The two legs of the strap extend downwardly to the sex bolts 15 and their curled ends 6 are wrapped around the bolts 15 and hollow rivets 16. The ends thus provide cylindrical openings for locating and fastening the hinge assembly together and to the door. One leg of the strap is vertical. It is identified by the number 45. This leg is purposely related dimensionally to the opening 27 in the strap and the curled ends 6 to ensure that the leg abuts against the inner face of intumed flanges 28 of door side panels 17 for providing additional rigidity to the hinge structure. Furthermore, the width of the strap or column support 5 is purposely made to a predetermined dimension corresponding to the space or depth inside the side panels of the door. In this way the side panels are held on the inside by the column support member 5 and on the outside by the upturned sides 24 of the closure 4 and gripped therebetween. This rigidity prevents buckling of the side panels at the location where the horizontal molding strip 18 is not effective due to the cut-out notch 19.

The strap is clamped against a shoulder 29 on the upper end of the cam 8 by the washer 12 and nut 11. On the projecting upper end of the cam is a slot or kerf 31. This is aligned with the point 42 of the oblique surface 33 and assists in locating the cam 8 during assem-

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bly of the parts. It also indicates the position of the point 42 of the oblique cam surface.

To prevent point contact between the outer peripheries of oblique surfaces 32 and 33 when the door is moved from its position of rest, it is intended that the outer edge of surface 33 on upper cam 8 shall have its sharp corner removed by means of a radius. This radius extends for a sufficient distance in both directions from point 42 to ensure the avoidance of said point contact, thus reducing wear on the load-bearing surfaces and providing longer service life.

Lower cam 7 is a cylindrical member, fabricated with an oblique surface 32, the inclination of which is at a predetermined angle to the axis of the cylinder, and which, in conjunction with the similar oblique surface 33 of upper cam 8, instigates the desired rising or lifting of the door, and subsequent return of the door to a desired position of rest, by means of the forces previously described. The mating or complementary oblique surfaces of lower cam 7 and upper cam 8 are indicated on the drawings at 34 in the position these surfaces assume when the door is at rest.

The lower cam 7 has a threaded lower end 37 projecting through hole 20 in the arm of the pilaster bracket 3. Here it is locked against rotation by a nut 10 and lock washer 36. A slot or kerf 39 is provided on the threaded end of the cam 7, aligned with a point 44 on the oblique surface 32 of the cam to locate the cam 7 properly during installation in the door, and for indicating the position of point 44 when the hinge is concealed inside the door. This provides means by which the originally installed "at rest" position of the door can be changed without any special tools. The cam 7 has a shoulder 38 above its threaded portion and which rests on the pilaster bracket 3.

Lower cam 7 and upper cam 8 are purposely fabricated with machined dimples or indentations 35 in the center of oblique surfaces 32 and 33. These dimples provide a small reservoir into which lubricant may be inserted during assembly. There is gradual utilization of this lubricant on the contacting oblique surfaces as the door is opened and closed.

A tube or sleeve 47 fitted around the two cams 7 and 8 to keep them aligned is provided. It is brazed to one cam (in the drawings it is the lower cam 7) but the other cam 8 slides freely up and down inside the sleeve.

It will be noted that when the door is turned, and therefore rises, the sleeve 47 must pass through the horizontal portion of the closure 4. For this purpose a hole 22 of adequate size is provided. There also is a horizontal lip 25 on the closure 4 underlying the vertical edge of the door adjacent the pilaster and a vertical lip 26 closing the vertical side of the notch 19 in the door.

It will be seen that the construction can be easily adjusted for any rest position of the door without removing door or hinge parts. The hinge assembly can be installed in or removed from the door as a unit. The operating mechanism is completely enclosed inside and flush with the door. The construction is simple, braces the door structure and has no springs.

An alternate closure construction and method of assembly is shown in Figures 13, 14 and 15. In this case the vertical sides 24A of the closure 4A are provided with open-ended slots 23A instead of holes and the side panels 17A have holes 43A instead of slots. Except for this reversal of the slots and holes, the construction is the same as before. This construction does not permit installation or removal of the hinge assembly from the door as an assembled unit as was possible with the construction of Figures 5 and 6 as shown assembled in Figure 3.

It will be noted that there is illustrated in Figure 15 the use of two lock nuts 40 to attach the upper cam 8 to the supporting member 5, one nut above and one nut below the member 5. This alternate construction permits some vertical adjustment of column strap 5 during

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assembly of the hinge parts, when it is necessary to compensate for certain dimensional variations of door length or bracket location.

What is claimed is:

1. A gravity door hinge assembly for a hollow panel door, having a supporting member inside the panel of the door, an upper cylindrical cam carried by said member and projecting through same from the bottom, locking means associated with said cam to lock it on the supporting member with the cam in the desired rotary position about its vertical axis, said locking means comprising a shoulder on the upper cam adapted to engage the lower side of the supporting member, a kerf in the upper end of the upper cam and a nut threaded on the upper end of the cam above the supporting member to adjust the neutral position of the upper cam with relation to the door, a lower cylindrical cam, a sleeve adapted to keep the two cams axially aligned, said cams having complementary cam surfaces oblique to the vertical, a closure for the edge of the door underlying the cams and having an opening to permit vertical movement of the sleeve and cams through the closure, and a pilaster bracket attached to the lower cam and supporting it; in combination with a similar shoulder, nut and kerf on the lower end of the lower cam with the kerf below the pilaster bracket; whereby the neutral position of the door can be easily adjusted by the kerfs.

2. A gravity door hinge assembly for a hollow panel door according to claim 1 in which, in the said locking means for the upper and lower cams, the said shoulders

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on the cams engage the lower side of the supporting member and the upper side of the bracket respectively, and each nut is on the opposite side of the supporting member and bracket from the respective cam; whereby the two cams can be locked adjustably in the rotary direction with relation to each other.

3. A gravity door hinge assembly according to claim 1 in which there are two side panels enclosing the assembly, fastening members for the panels, and the supporting member spans the space between the two side panels, the supporting member being a strap in the form of an inverted U with the upper cam connected at the top of the inverted U and the lower ends of the two legs of the U embracing the fastening members and spacing the two door panels at points spaced from each other; whereby the hinge assembly makes the door rigid at the corner where it is located.

4. A gravity door hinge assembly according to claim 3 wherein the fastening means are bolts embracing the closure, the panels of the door and the downwardly depending legs of the supporting member; in combination with a horizontal molding strip spacing the two side panels except where the panels have cut out notches to receive the hinge assembly.

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