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**NON-LOOSENING HINGE**

Lloyd R. Anderson, Bethesda, Md.

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The present invention relates to building hardware and more particularly to a hinge construction of general utility such as used on doors.

Although hinges have been used for many years and with all types of door closers, door stops, and door holders, hinges heretofore used have not been entirely satisfactory because the attaching screws have come loose, particularly the attaching screws for the jamb leaf of the top hinge. The screws for the top hinge of doors repeatedly come loose due to the tension on the screws caused by the weight of the door as well as the reaction produced by the door stops, door holders, or door closers.

In doors equipped with a door stop or door holder reacting against the top edge of the door close to the top hinge for preventing the door from opening too far, additional strain is produced on the screws securing the jamb leaf of the top hinge to the hinge jamb of the door frame. The repeated stress and strain causes the screws to pull out resulting in sagging doors requiring much expensive maintenance to keep the door operative.

An object of the present invention is to provide a hinge structure which will overcome the problem of screws becoming loose.

Another object is to provide a hinge structure which will distribute the stress and strain sufficiently to limit the stress to sufficiently small loads on each fastening element that the fastening elements will remain secure without attention.

Another object is to provide a structure which will always have some of the fastening elements in shear stress thereby reducing the tensile stress on the fastening elements.

Still another object is to provide hinge structure which receives a large part of its support from mortised mountings in the door jamb and door.

A further object of the invention is to provide attachment means for conventional hinges which will provide anchoring for the jamb leaf to the jamb and lintel of a door frame.

A further object is to provide means to positively retain the jamb leaf of the top hinge of a door against the pulling out of the fastening screws.

Other and further objects will become apparent as the description proceeds and upon reference to the accompanying drawing wherein:

Figure 1 is a perspective of a top portion of a door and door frame equipped with a conventional overhead door stop and the non-loosening hinge of the present invention;

Figure 2 is an elevation of the hinge in closed condition as viewed from the side thereof opposite the hinge pin;

Figure 3 is an elevation with parts broken away and parts in section taken substantially on line 3—3 of Figure 2 of the hinge as viewed from the jamb side thereof;

Figure 4 is a plan view of the hinge in partially open condition with portions of the anchoring straps broken away; and,

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Figure 5 is a plan view of a modified form of the hinge in which the pivot pin shown in section is located inwardly from the heel of the door and also spaced from the door face.

5 Upon more detailed reference to the drawing a hinge jamb 10 and a head jamb or lintel 11 of a conventional door frame support a jamb plate 12 of a butt hinge having three knuckles 13, 14, and 15. The jamb plate 12 is secured to the hinge jamb 10 by means of conventional screws 16 passing through countersunk holes 17. The jamb leaf is received in a mortise recess 18 in the hinge jamb in a more or less conventional manner so that the exposed surface of the jamb leaf is substantially flush with the inner surface of the hinge jamb 10 of a door frame.

15 An anchoring member 19 in the form of a strap or plate is secured at one end to the top end of the jamb leaf or plate 12 as by being integral therewith, attached thereto by welding or the like, or otherwise fixed. Such strap or plate extends at substantially right angles to the jamb leaf 12 and is mortised into the lintel 11 in mortised recess 20 thereby providing a flush relation between the lower surface of the anchoring plate or strap and the lower surface of the lintel so that the strap 19 is hidden when the door is closed. The strap 19 is made of sufficient length and is provided with screws 21 or other fastening means passing through countersunk holes 22 into the lintel 11 thereby securely maintaining the strap in position and preventing rocking of the jamb leaf 12 even though screws 16 become loose.

20 A door hinge leaf or plate 23 having two knuckles 24 and 25 is received in a mortised recess 26 in the heel or hinge edge of a door 27 and extends from the bottom of the leaf 23 to the top edge of the door. The door leaf 23 is secured by means of flat head screws 28 passing through countersunk holes 29 and screwed into the door thereby maintaining the hinge leaf 23 in fixed operative position. An anchoring member 30 in the form of a strap or plate extends from the upper edge of hinge leaf or plate 23 and is received in a mortised recess 31 in the top of the door. The strap 30 is secured in position by means of screws 32 passing through countersunk holes 33 maintaining the strap in the mortised recess 31. It will be understood that the anchoring strap 30 may be of a length to extend completely from the heel or hinge edge of the door to the lock edge of the door to reinforce the entire upper portion of the door, or the strap may be made of an intermediate length for securing the hinge stile of the door to the central portion of the door. The mortised recess 31 extending to the hinge edge of the door permits water collecting in the mortise recess to drain from the heel edge of the door reducing danger of rotting. Since the water may drain from the hinge edge, weep holes which might mar the appearance of the door face are unnecessary.

35 It will be apparent that the door is supported by other hinges which may be of the conventional types located at the bottom of the door or intermediate the top and bottom or at both locations. The anchoring strap on the jamb leaf and the door leaf may be the same length if desired. For some uses the door leaf strap may be omitted entirely or may be relatively short to permit use of door stops or door holders which are mortised in the top edge of the door.

40 The invention includes the combination with a door frame having a hinge jamb 10 and a head jamb 11 with a door 27 mounted on and received in nested position in the door frame for swinging movement from a closed nested position within the door frame to an open position as shown. A hinge comprising a jamb hinge leaf includes a jamb plate 12 received in a mortised recess

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in the top portion of the inner surface of the hinge jamb 10, which mortised recess abuts the head jamb or lintel with the exposed surface of the hinge jamb plate 12 substantially flush with the inner surface of the hinge jamb. Said jamb leaf also includes a head jamb plate 19 fixed to the upper end of the hinge jamb plate 12 and extending at substantially the same angle as the angle between the hinge jamb 10 and the head jamb 11 of the door frame with the head jamb plate 19 received in a mortised recess in the head jamb of the door frame with the exposed surface of the head jamb plate substantially flush with the inner surface of the head jamb, said jamb plates substantially abutting the edges of the mortised recesses. A door hinge leaf includes a heel edge door plate 23 received in a mortised recess in the top portion of the heel edge of the door 27, said door leaf also including a top door plate 30 received in a mortised recess in the top edge of the door with the exposed surface of the heel edge door plate and the top door plate being substantially flush with the heel edge and the top door edge respectively. Said door hinge leaf including said door plates forms a door leaf dihedral angle nested within a dihedral angle formed by said jamb leaf plates in the closed door position. Said door leaf is pivotally mounted on said jamb leaf for pivotal movement about an axis close to the outer surface of the door and the door jamb, said pivotal mounting including a plurality of knuckles and a pivot pin. The door leaf is secured to the hinge and top edges of the door by screws 28 and 32 and the jamb leaf is secured to the jambs of the door frame by screws 16 and 21 whereby the door 27 is supported by said hinge and may swing from a nested position within the dihedral angle formed by the jamb plates 12 and 19 and the jambs 10 and 11 of the door frame to a position outwardly therefrom as shown.

It will be evident that the jamb leaf may be provided with a single knuckle and that the door leaf may be provided with a single knuckle and the advantages of the present invention will be obtained with a suitable connecting pivot pin.

The jamb hinge leaf including plates 12 and 19 which form a dihedral angle are pivotally connected to the door leaf including door plates 23 and 30 which form a dihedral angle which is received in nested relation within the dihedral angle of the jamb hinge leaf and such hinge leaves are pivotally connected together by means of pivot pin 34 having an ornamental knob 35 fixed thereto and such pivot pin may be secured in operative relation to the hinge knuckles 13, 14, 15, 24, and 25 by means of a set screw 36 threaded into one of the knuckles such as center knuckle 14 and extending into a recess 37 in the pin 34 thereby retaining the pin in operative position and permitting the pin to be inserted from the top or bottom of the hinge making the hinge adaptable for use where some obstruction such as conventional door trim may prevent insertion of the pin from one end. The top and bottom knuckles may be internally threaded at 38 for receiving an ornamental knob 39 which is correspondingly threaded for use either at the top or bottom of the hinge depending upon which end the pivot pin has been inserted from. The threads 38 may be omitted and the knob held in place by friction or other means.

The hinge described above is particularly adaptable for use with doors equipped with upper door stops or door holders such as that shown in Figure 1 wherein a rod 40 pivotally connected to a stud 41 on the lintel at one end has its other end connected to a slide 42 mounted for movement in a guideway 43. Upon extreme opening movement of the door 27, the slide strikes a stop in the hinge end of the guideway preventing further opening movement of the door and resulting in a severe strain on the hinge tending to pull out screws 16 from the hinge jamb. Door holders are also provided with means to maintain the door in open position and when the door is closed there is a reaction against the rod 40 of a door

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holder resulting in a reaction tending to pull out screws 28 of the door leaf 23 and producing a shear action on screws 16 of the jamb leaf. Consequently there is a serious problem in building maintenance due to the loosening of screws in the door hinges. With the present invention the reaction which tends to pull out jamb screws 16 is received by the anchor strap 19 against the edges of the mortised recess 20 and such mortised recess and particularly the end adjacent the lock jamb will have the effect of taking the reaction and the screws 21 will also take the reaction in shear rather than in tension. Similarly the reaction of the hinge leaf 23 will be taken at least in part by the screws 32 in shear and also by the edges of the mortised recess 31.

Referring to Figure 5, the jamb hinge leaf has a rectangular plane portion 44 and a curved portion 45 extending from one long edge of rectangular portion 44 and bent from the plane of said rectangular portion to extend toward the lock jamb and terminating in knuckles and the door hinge leaf has a rectangular portion 46 and a curved portion 47 terminating in cooperating knuckles. A pivot pin 48 connects the hinge leaves in pivoted relation. Anchor strap members 49 and 50 fixed to the jamb leaf and door leaf respectively correspond to straps 19 and 30 respectively of the first modification. The axis of pivot pin 48 is located in front of the door and spaced away from the hinge jamb toward the lock jamb a suitable distance for use with hinges having such a location for the axis of pivotal movement of the door. This form of hinge may be used, for example, with the construction in which the pivotal axis is located  $\frac{3}{4}$  inch from the hinge edge of the door and  $\frac{3}{4}$  inch in front of the surface of the door, and may be designed for other offsets as required.

The hinge may be of the simple type in which the abutting edges of the hinge knuckles serve as bearings, but additional bearings 51 are shown between the knuckles for reducing friction between the knuckles and such bearings may be of the ball bearing type or conventional "oilite" bearings.

It will be noted that the jamb leaf plate 12 is appreciably larger than the door leaf plate 23 by an amount providing for the thickness of anchor plates 19 and 30 as well as the clearance between the anchor plates as shown in Figs. 2 and 3. The clearance is preferably the conventional clearance provided between the door and the door jamb. Regardless of whether the jamb leaf plate 12 is considered to include as part of its length the thickness of the anchor plate 19 or not, at least a portion of the integral jamb dihedral angle member extends up into the head jamb or lintel of the door frame and such portion positively maintains the jamb leaf 12 of the hinge in fixed relation to the door frame.

Although the hinge has been described for use at the upper corner of a door it will be apparent that the hinge may be used at the lower corner or may be used for many other uses where additional strength is desired and where the screws pull out. This hinge saves much expensive construction which is now considered necessary to provide door stops. Present conventional hinge construction is inadequate for use with overhead door holders particularly where doors are subject to high stresses due to winds and drafts. In some building construction architects design specially built walls to prevent doors from opening beyond approximately 90 degrees to forestall damage to the doors, hinges, door closers etc. Such construction is extremely expensive. By using the anchor hinge of the present invention a relatively inexpensive overhead door stop and holder may perform the function of the expensive specially built walls or structural abutments.

Having thus described the invention it will be apparent that changes may be made within the scope and spirit of the invention in accordance with the definition of the invention as claimed.

I claim:

1. In combination with a door frame having a hinge jamb and a head jamb and a door adapted to be mounted on and received in nested position in the door frame for swinging movement from a closed nested position within the door frame to an open position, a hinge comprising a jamb hinge leaf including a hinge jamb plate received in a mortised recess in the inner surface of the hinge jamb which abuts the head jamb with the exposed surface of the hinge jamb plate substantially flush with the inner surface of the hinge jamb, said jamb hinge leaf also including a head jamb plate fixed to the head jamb end of the hinge jamb plate and extending at substantially the same angle as the angle between the hinge jamb and head jamb of the door frame and received in a mortised recess in the head jamb of the door frame with the exposed surface portion of the head jamb plate substantially flush with the inner surface of the head jamb, said jamb plates substantially abutting the edges of the mortised recesses, a door hinge leaf including a door plate pivotally mounted on said jamb hinge leaf for pivotal movement about an axis close to the outer surface of the door and door jamb, said pivotal mounting including knuckle means and a pivot pin, said door hinge leaf being secured to the hinge edge of the door, and said jamb hinge leaf being secured to the jambs of the door frame whereby the door supported by said hinge may swing from a nested position within the dihedral angle formed by the jamb plates of the jamb hinge leaf and the jambs of the door frame to a position outwardly therefrom, the width of the door hinge leaf from the pivot axis being approximately the width of the hinge jamb plate and being of a length whereby the door leaf nests within the dihedral angle formed by the head jamb and the hinge jamb with the door in closed position.

2. The invention according to claim 1 in which each hinge leaf has a plurality of knuckles and a hinge pin connects the knuckles of the jamb hinge leaf to the knuckles of the door hinge leaf.

3. The invention according to claim 1 in which the pivot pin is removable by axial movement in a direction substantially parallel to the hinge jamb plate and door plate in a direction away from the head jamb plate.

4. In combination with a door frame having a hinge jamb and a head jamb and a door adapted to be mounted on and received in nested position in the door frame for swinging movement from a closed nested position within the door frame to an open position, a hinge comprising a jamb hinge leaf including a hinge jamb plate received in a mortised recess in the inner surface of the hinge jamb which abuts the head jamb with the exposed surface of the hinge jamb plate substantially flush with the inner surface of the hinge jamb, said jamb hinge leaf also including a head jamb plate fixed to the head jamb end of the hinge jamb plate and extending at substantially the same angle as the angle between the hinge jamb and head jamb of the door frame and received in a mortised recess in the head jamb of a door frame with the exposed surface portion of the head jamb plate substantially flush with the inner surface of the head jamb, said jamb plates substantially abutting the edges of the mortised recesses, a door hinge leaf including a door plate pivotally mounted on said jamb hinge leaf for pivotal movement about an axis close to the outer surface of the door and door jamb, the pivotal connection between the jamb hinge leaf and the door leaf being located inwardly from the hinge jamb and the hinge jamb plate in a direction toward the free end of the head jamb plate to thereby offset the pivotal connection toward the lock edge of the door, said pivotal mounting including knuckle means and a pivot pin, said door hinge leaf being secured to the hinge edge of the door, and said jamb hinge leaf being secured to the jambs of the door frame whereby the door supported by said hinge may swing from a nested position within the dihedral

angle formed by the jamb plates and the jambs of the door frame to a position outwardly therefrom, the width of the door hinge leaf from the pivot axis being approximately the width of the hinge jamb plate and being of a length whereby the door leaf nests within the dihedral angle formed by the head jamb and the hinge jamb with the door in closed position.

5. The invention according to claim 4 in which each hinge leaf has a plurality of knuckles and a hinge pin connects the knuckles of the jamb hinge leaf to the knuckles of the door hinge leaf.

6. The invention according to claim 4 in which the door hinge leaf includes a heel door plate secured to the heel edge of the door, and a head door plate fixed to the head end of the heel door plate and secured to the head end of the door, the dihedral angle formed by the heel door plate and the head door plate corresponding to the angle between the heel edge of the door and the head end of the door.

7. The invention according to claim 6 in which the door hinge leaf is received in a mortised recess in the door.

8. The invention according to claim 4 in which the pivot pin is removable by axial movement in a direction substantially parallel to the hinge jamb plate and door plate in a direction away from the head jamb plate.

9. In combination with a door frame having a hinge jamb and a head jamb and a door adapted to be mounted on and received in nested position in the door frame for swinging movement from a closed nested position within the door frame to an open position, a hinge comprising a jamb hinge leaf including a hinge jamb plate received in a mortised recess in the inner surface of the hinge jamb which abuts the head jamb with the exposed surface of the hinge jamb plate substantially flush with the inner surface of the hinge jamb, said jamb leaf also including a head jamb plate fixed to the head jamb end of the hinge jamb plate and extending at substantially the same angle as the angle between the hinge jamb and head jamb of the door frame and received in a mortised recess in the head jamb of a door frame with the exposed surface portion of the head jamb plate substantially flush with the inner surface of the head jamb, said jamb plates substantially abutting the edges of the mortised recesses, a door hinge leaf including a heel edge door plate for securement against the heel edge of a door, said door leaf also including a head door plate for securement on the head edge of the door, said door hinge leaf including said door plates forming a door hinge leaf dihedral angle nested within the dihedral angle formed by said jamb plates in the closed door position, said door hinge leaf being pivotally mounted on said jamb hinge leaf for pivotal movement about an axis close to the outer surface of the door and door jamb, said pivotal mounting including knuckle means and a pivot pin, said door leaf being secured to the heel and head edges of the door, and said jamb hinge leaf being secured to the jambs of the door frame whereby the door supported by said hinge may swing from a nested position within the dihedral angle formed by the jamb plates and the jambs of the door frame to a position outwardly therefrom.

10. The invention according to claim 9 in which each hinge leaf has a plurality of knuckles and a hinge pin connects the knuckles of the jamb hinge leaf to the knuckles of the door hinge leaf.

11. The invention according to claim 9 in which the door leaf is received in a mortised recess in the door.

12. The invention according to claim 9 in which the pivot pin is removable by axial movement in a direction substantially parallel to the hinge jamb plate and the heel edge door plate in a direction away from the head jamb plate and the head door plate.

2,853,747

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References Cited in the file of this patent

UNITED STATES PATENTS  
26,375 Richardson ----- Dec. 6, 1859  
480,238 Ranker ----- Aug. 2, 1892  
1,052,701 Watters ----- Feb. 11, 1913  
1,076,689 McKinney ----- Oct. 28, 1913

1,141,303  
1,532,239  
2,497,288

5

340,618

8

Bennett et al. ----- June 1, 1915  
Fauser ----- Apr. 7, 1925  
Bissell et al. ----- Feb. 14, 1950

FOREIGN PATENTS

France ----- May 17, 1904