July 2, 1957 L. A. HAGER, JR 2,797,433

DOOR HINGES

Filed Sept. 17, 1953

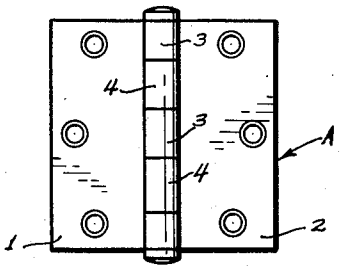


FIG. 1.

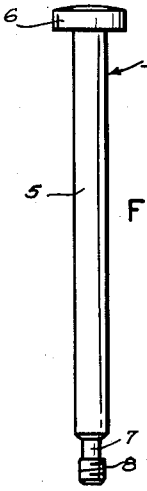


FIG. 3.

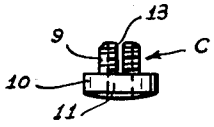


FIG. 4.

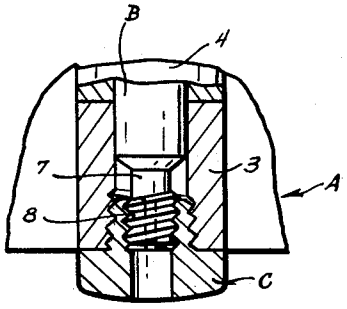


FIG. 2.

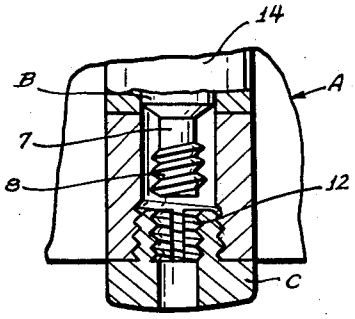


FIG. 5.

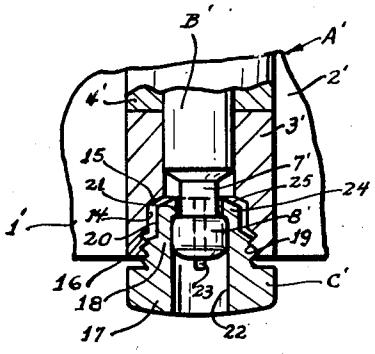


FIG. 6.

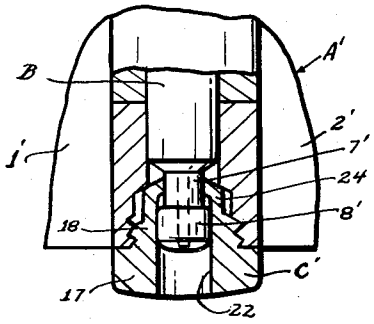


FIG. 7.

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DOOR HINGES

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Application September 17, 1953, Serial No. 380,850

8 Claims. (Cl. 16—169)

This invention relates in general to certain new and useful improvements in door hinges and, more particularly, to a non-rising hinge pin adapted for use in butt hinges and other similar types of hinges.

Butt hinges and other similar types of hinges consist of two leaves with interfitting axially aligned sets of hinge knuckles which are ordinarily secured together in swingable relation by a hinge pin which extends through the hinge knuckles. The conventional type of hinge pin will give long satisfactory service provided it is properly lubricated at appropriate intervals. As a rule, however, door hinges are rarely, if ever, lubricated and the hinge pins frequently become somewhat dry and rusty and, as a result, a small, but nevertheless appreciable, amount of additional friction is set up between the hinge pin and the hinge knuckle as the hinge leaves swing to and fro, which causes the hinge pin to work gradually upwardly or "rise," as it is called. This rising of the hinge pin is rather gradual and usually is unnoticed, so that the hinge pin will, in the course of time, work up until its lower end is entirely withdrawn from the lowermost hinge knuckle and the hinge structure will consequently become insecure. Sometimes a hinge pin will actually work itself entirely out of operative engagement and the door will fall.

It is, therefore, the primary object of the present invention to provide a butt hinge or other similar type of hinge which includes a non-rising hinge pin.

It is a further object of the present invention to provide a hinge of the type stated which is simple and economical in construction and is convenient in use and operation.

With the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawing—

Figure 1 is a front elevational view of a butt hinge constructed in accordance with and embodying the present invention;

Figure 2 is an enlarged elevational view, partly broken away and in section, showing the internal construction of the non-rising hinge pin assembly;

Figure 3 is an elevational view of the hinge pin forming a part of the present invention;

Figure 4 is an elevational view of the hinge end plug forming a part of the present invention;

Figure 5 is an enlarged fragmentary elevational view, similar to Figure 2, showing the hinge pin in disconnected position;

Figure 6 is a fragmentary elevational view, partly broken away and in section, of a modified form of hinge pin locking mechanism constructed in accordance with and embodying the present invention; and

Figure 7 is an enlarged fragmentary elevational view, similar to Figure 6, showing the modified form of hinge pin locking mechanism in fully locked position.

Referring now in more detail and by reference characters to the drawing, which illustrates practical embodiments of the present invention, A designates a butt hinge consisting of hinge plates 1, 2, respectively having axially aligned interfitting tubular knuckles, 3, 4. Provided for snug-fitting rotatable disposition within and through the knuckles 3, 4, when they are in operative axially aligned position, is a hinge pin B comprising a rod-like shaft or pintle 5 integrally provided at its upper end with a diametrally enlarged cylindrical head 6, and, at its opposite end, being diametrally reduced in the provision of a tail-piece 7 which is, in turn, provided at its lower extremity with a slightly enlarged externally threaded tip-portion 8.

Also provided for co-operation with the hinge A is an end plug C integrally including a short externally threaded shank 9 and a diametrally enlarged head 10, which is externally contoured and crowned to match the hinge pin head 6. The plug C is furthermore provided with a concentric bore hole 11, which is internally tapped for a portion of its length inwardly from the transverse end face of the shank 9 in the provision of an internally threaded socket 12 for threadedly receiving the tip portion 8 of the hinge pin B. The shank 9 is furthermore provided with a pair of diametrally opposed axially extending slots 13 for imparting a limited amount of diametral compressibility to the shank 9.

Preferably, though not necessarily, the lower portion of the lowermost hinge knuckle 3 is internally threaded for a short distance upwardly from its bottom end to accommodate the external thread of the end plug shank 9. In this connection, however, it should be noted that in actual practice the internal threading of the hinge knuckle 3 is not entirely necessary. Since hinges are ordinarily fabricated from relatively soft malleable steel which is appreciably ductile, the procedure of forming an external thread on the shank 9 of the end plug C will produce a certain amount of work hardening which will render the external thread of the shank 9 somewhat harder than the hinge knuckle 3 and it, therefore, becomes possible to force the end plug C into the lowermost hinge knuckle 3, so that the threads of the shank 9 will actually form a snug jammed fit. Since the end plug C, for reasons presently to be pointed out, ordinarily will not need to be removed during the life of the hinge after it has once been assembled, this jammed fit is, for most types of hinges, entirely practical and satisfactory.

With the end plug C in place and the hinge plates 1, 2, in proper alignment for assembly, the hinge pin B is inserted from the top to the intermediate position shown in Figure 5 and thence turned about its axis as it is pushed further in, so that the threads of the tip portion 8 thereof will engage the internal threads of the socket 12. Thereupon, by continued turning of the hinge pin B, the tip portion 8 will be threaded into and securely engaged by the end plug C, so that the hinge pin B will be firmly held in proper position and effectively restrained against rising. In this connection, it should be noted that the external threads of the tip portion 8 should be of such size as to provide a rather loose or easy fit within the internal threads of the socket, so that, if the end plug C is pressed rather than threaded into place and the inside diametral size of the socket 12 is slightly reduced as a result, nevertheless the tip portion 8 will not bind but will readily thread into place. It will also be noted that the tip portion 8 is relatively short and the external thread thereof is preferably a double-lead thread with the internal thread of the socket 12 matching, so that the hinge pin B will thread itself into seated position very quickly.

By virtue of the threaded engagement between the tip portion 8 of the hinge pin B and the end plug C, the hinge pin B will serve efficiently as a pintle about which the plates 1, 2, may freely swing but nevertheless will not

rise even under the most severe frictional stress. On the other hand, the hinge pin B is completely free to rotate in the conventional manner.

If desired, a modified form of hinge may be provided, as shown at A' in Figures 6 and 7. The modified form of hinge A' comprises hinge plates 1', 2', respectively having hinge knuckles 3', 4', substantially similar to the corresponding elements of the previously described hinge A. The lowermost hinge knuckle 3' is counter-bored at its bottom end in the provision of a diametrally enlarged recess 14 which is provided at its inner end with an inwardly and upwardly sloping angular bottom wall or shoulder 15 and at its other end with an internal thread 16. Provided for disposition within the hinge knuckles 3', 4', is a hinge pin B' having a diametrally reduced tail-piece 7' and an enlarged smooth-surfaced tip portion 8' at its lower end. Also provided for removable disposition within the lowermost hinge knuckle 3' is an end plug C', which is similar to the previously described end plug C and integrally includes a head portion 17 and a shank portion 18, the latter being provided with an externally threaded portion 19 and a diametrally reduced portion 20 having an external diametral size which is slightly smaller than the internal diametral size of the recess 14 but substantially larger than the internal diametral size of the main bore of the hinge knuckle 3'. The shank 18 is furthermore concentrically drilled in the provision of a bore 21, which is, in turn, counter-bored, as at 22, and provided with a plurality of axially extending slots 23 in the formation of a series of inwardly shouldered prongs 24. The end portion 20 of the end plug C' is angularly faced off at its end in the provision of an inclined shoulder 25 for bearing in camwise fashion against the shoulder 15 of the recess 14.

In assembling the hinge A', the end plug C' is threaded part way into the recess 14 to approximately the position shown in Figure 6 and the hinge pin B' inserted through the hinge knuckles 3', 4'. As the hinge pin B' approaches its lowermost or fully seated position, the enlarged tip portion 8' will snap past the prongs 24 and be retentively engaged thereby. Thereupon, the end plug C' is threaded further into the hinge knuckle 3' to the position shown in Figure 7. In the course of movement into this latter position, the shoulders 25 of the prongs 24 will slide against the shoulders 15 and the prongs 24 will be cammed inwardly, so that the bore 21 is substantially smaller in diametral size than the tip portion 8' and the prongs 24 are held against outward springing movement, thereby securely retaining the hinge pin B' against removal. In this connection, it should be noted that the outside diametral sizes of the tip portion 8' and the tail-piece 7' are very slightly smaller than the diametral sizes of the bore 21 and counter-bore 22, so that the hinge pin B' will not be bound against rotation.

Hinges constructed in accordance with the present invention furthermore may be plated as a fully assembled unit, that is to say, with the two plates, the hinge pin, and end plug all in place. Heretofore, it has been conventional practice to plate the four parts of the hinge separately and assemble them later, or, as is more frequently the practice, to assemble the plates and hinge pin only and plate the hinge in this partially assembled form, plating the end plug separately and inserting it into the hinge subsequent to the plating operations. This was found to be necessary in order that the acidic plating solution which might be trapped within the hinge knuckles and around the hinge pin could drain freely. Otherwise, a small amount of plating solution frequently would remain inside the hinge knuckles and around the hinge pin to cause rusting, staining, and discoloration. Hinges constructed in accordance with the present invention, however, in addition to the other advantages above discussed, have the further desirable characteristic that the end plug, being concentrically bored and slotted, will permit free and complete drainage of the plating solution from the interior of the hinge and consequently the entire hinge can be plated in completely assembled form, thereby improving the finished appearance of the hinge and effecting substantial economies in the costs of the assembly and plating operations.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the door hinge may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A hinge comprising a pair of plates interfitting axially aligned knuckles, a hinge pin operatively mounted in said knuckles, and a plug mounted in the endmost knuckle, said plug having an axially bored tubular sleeve portion which extends up into said endmost knuckle and is provided with diametrally opposite axial slots for imparting spring-like resiliency to the sleeve, said sleeve being further provided on its inner end with diametrally reduced elements for retentive engagement with the lower end of the hinge pin, and means within said endmost knuckle for locking said diametrally reduced elements in hinge pin retaining position.

2. A hinge comprising a pair of plates having interfitting axially aligned knuckles, a hinge pin extending rotatably through said knuckles, said hinge pin being provided at one end with a head abutting against the outer transverse face of one of the endmost knuckles and being provided at its other end with a diametrally reduced tail portion which is, in turn, provided at its end with a somewhat bulbous end portion located wholly within the other endmost knuckle, and an end plug mounted axially in said other endmost knuckle, said plug having axially extending means adapted for snap-fitted engagement with the end portion of the hinge pin, and means within said other endmost knuckle for locking said axially extending means in hinge pin retaining position.

3. A hinge comprising a pair of plates having interfitting axially aligned knuckles, a hinge pin extending rotatably through said knuckles, said hinge pin being provided at one end with a head abutting against the outer transverse face of one of the endmost knuckles and being provided at its other end with a diametrally reduced tail portion which is, in turn, provided at its end with a somewhat bulbous end portion located wholly within the other endmost knuckle, an end plug mounted axially in said other endmost knuckle, said plug having a plurality of axially projecting prongs adapted for snap-fitted engagement with the end portion of the hinge pin, and means within said other endmost knuckle for locking said prongs in hinge pin retaining position.

4. A hinge comprising a pair of plates having interfitting axially aligned knuckles, a hinge pin extending rotatably through said knuckles, said hinge pin being provided at one end with a head abutting against the outer transverse face of one of the endmost knuckles and being provided at its other end with a diametrally reduced tail portion which is, in turn, provided at its end with a somewhat bulbous end portion located wholly within the other endmost knuckle, an end plug mounted axially in said other endmost knuckle, said plug having a plurality of axially projecting prongs adapted for snap-fitted engagement with the end portion of the hinge pin, and means within said other endmost knuckle for locking said prongs in hinge pin retaining position when said plug is shifted axially inwardly within said other endmost knuckle.

5. A hinge comprising a pair of plates having interfitting axially aligned knuckles, a hinge pin extending rotatably through said knuckles, said hinge pin being provided at one end with a head abutting against the outer transverse face of one of the endmost knuckles and being provided at its other end with a diametrally reduced tail portion which is, in turn, provided at its end with a somewhat bulbous end portion located wholly with-

in the other endmost knuckle, an end plug threaded axially in said other endmost knuckle, said plug having a plurality of axially projecting prongs adapted for snap-fitted engagement with the end portion of the hinge pin, and means within said other endmost knuckle for locking said prongs in hinge pin retaining position when said plug is threaded axially inwardly within said other endmost knuckle.

6. A hinge comprising a pair of plates having interfitting axially aligned knuckles, a hinge pin extending rotatably through said knuckles, said hinge pin being provided at one end with a head abutting against the outer transverse face of one of the endmost knuckles and being provided at its other end with a diametrally reduced tail portion which is, in turn, provided at its end with a somewhat bulbous end portion located wholly within the other endmost knuckle, an end plug mounted axially in said other endmost knuckle, said plug having a plurality of axially projecting prongs adapted for snap-fitted engagement with the end portion of the hinge pin, and camming means within said other endmost knuckle for locking said prongs in hinge pin retaining position when said plug is shifted axially inwardly within said other endmost knuckle.

7. A hinge comprising a pair of plates having interfitting axially aligned knuckles, a hinge pin extending rotatably through said knuckles, said hinge pin being provided at one end with a head abutting against the outer transverse face of one of the endmost knuckles and being provided at its other end with a diametrally reduced tail portion which is, in turn, provided at its end with a somewhat bulbous end portion located wholly within the other endmost knuckle, an end plug mounted axially in

said other endmost knuckle, said plug having a plurality of axially projecting prongs adapted for snap-fitted engagement with the end portion of the hinge pin, and a camming surface within said other endmost knuckle adapted to bear against and lock said prongs in hinge pin retaining position when said plug is shifted axially inwardly within said other endmost knuckle.

8. A hinge comprising a pair of plates having interfitting axially aligned knuckles, a hinge pin extending rotatably through said knuckles, said hinge pin being provided at one end with a head abutting against the outer transverse face of one of the endmost knuckles and being provided at its other end with a diametrally reduced tail portion which is, in turn, provided at its end with a somewhat bulbous end portion located wholly within the other endmost knuckle, said endmost knuckle being provided with an inclined bottom wall, an end plug mounted axially in said other endmost knuckle, said plug having a plurality of axially projecting prongs adapted for snap-fitted engagement with the end portion of the hinge pin, said plug, furthermore, having an inclined shoulder formed on its end portion and adapted to engage said inclined bottom wall, whereby said prongs are locked in hinge pin retaining position when said plug is shifted axially inwardly within said other endmost knuckle.

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