March 3, 1970 E. J. McFADDEN 3,497,906

HINGE PIN RETAINER

Filed July 10, 1968

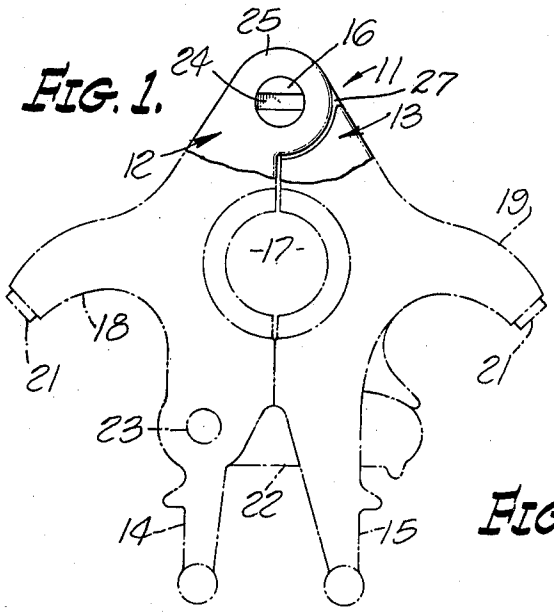


FIG. 1.

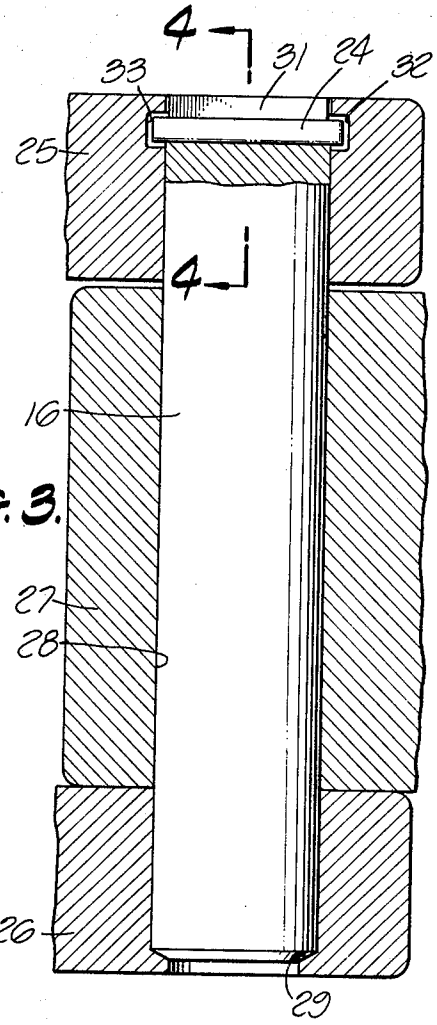


FIG. 3.

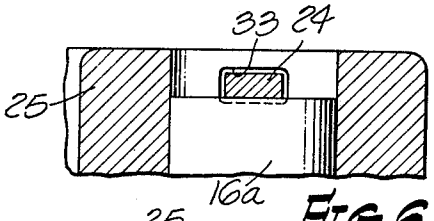


FIG. 6.

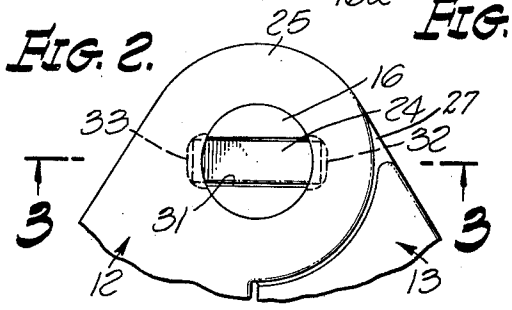


FIG. 2.

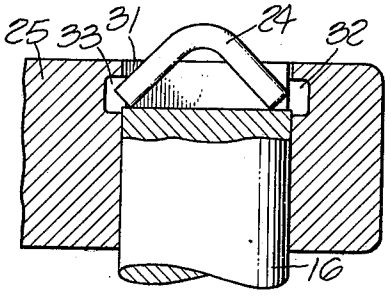


FIG. 5.

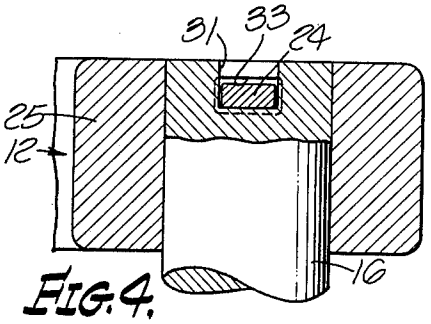


FIG. 4.

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HINGE PIN RETAINER

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U.S. Cl. 16—169 5 Claims

ABSTRACT OF THE DISCLOSURE

A retainer for a hinge pin for a hinged device such as a center latch or gate-type elevator, wherein a lock-bar greater in length than the diameter of the pin is positioned chord-like in a slot across the end of the hinge pin, with the lock-bar extending into recesses located on opposite sides of the hinge pin bore and extending radially outward from such bore; also, a method of forming such retainer by placing the ends of a bent lock-bar adjacent to such recesses and straightening the lock-bar to cause the ends thereof to enter such recesses.

BACKGROUND OF THE INVENTION

This invention has to do with means retaining a hinge pin in a hinge pin bore; also, the method used to accomplish such means. The arrangement is particularly advantageous for retaining hinge pins in heavy duty tools, such as "center latch" elevators for handling pipe in oil wells wherein a positive, non-displaceable, retaining means is essential for safety and rugged operation. Elevators, for example, are used in the oil well drilling industry to handle extremely heavy strings of drill pipe and drill tools in which thousands, sometimes hundreds of thousands, of pounds of weight must be securely held and raised, lowered, or otherwise manipulated, and wherein a displaced hinge pin could cause the drill string to drop, with possible serious or fatal injuries to the operators and extensive damage to the equipment, the well bore, etc. Such hinge pins may be subjected to heavy blows or jars tending to displace or damage them.

Heretofore it has been the practice to hold the hinge pin in position in the pin bore by various means, such as riveting the hinge pin in place, upsetting the surrounding portion of the hinge pin bore, enlarging the end of the hinge pin by heating and peening, threading a closure plug into the end of the hinge pin bore above the hinge pin, threading the hinge pin and bore and passing a cotter pin through the hinge pin and adjacent hinge element to prevent unthreading the hinge pin, extending a hinge pin entirely through the hinge pin bore and placing a nut or other retaining means on the end thereof, or otherwise.

There are many objections to these above-mentioned means of holding the hinge pin in the hinge pin bore. For example, due to the high tensile strength and hardness of the hinge material (the boss of the elevator body through which the hinge pin passes) and the hinge pin material, threading or perforating thereof is a difficult and expensive operation. Heating the hinge pin or the surrounding hinge material for peening into position is undesirable because of the deleterious effect on the materials involved. Nuts have a tendency to work loose, and cotter pins wear through or are sheared off. Heavy blows or jars may loosen such fastening means or other fastening means. Thus, in the past, a fully satisfactory and safe method of retaining the hinge pin in the bore has not been available. Various prior art constructions disclosing such deficient hinge pin arrangements are shown, for example, in U.S. Patents Nos. 2,164,843; 2,183,582; 2,195,445; 2,211,016; 2,257,120; 2,392,462; 2,425,753, and in other prior art.

Fatalities and injuries have in the past occurred due to the hinge pin coming out of its seat because of failure of the retaining means, heavy strings of drill pipe and drill tools have been dropped into the borehole with damage thereto, and extensive expenses have been incurred because of delays incurred by such failure of the hinge pin to remain properly positioned in the hinge pin bore.

SUMMARY OF THE INVENTION

While the present invention is disclosed with respect to the so-called "center latch" type elevators, it is intended primarily for illustrative purposes. The advantages, however, of the disclosed hinge pin improvements with respect to other types of elevators or related similar heavy duty equipment, are obvious. However, it is not intended to limit the application of the invention to such "center latch" elevators, except as may be required by the prior art and the claim coverage.

It is an object of the present invention to disclose an improved hinge pin retaining means which is simple to manufacture, relatively inexpensive, and adaptable to heavy duty equipment. In this connection, it is the purpose to provide a means retaining a hinge pin in a hinge pin bore, such that said means cannot be inadvertently released and allow the hinge pin to fall or otherwise be displaced from the hinge pin bore.

It is a further object to provide an arrangement wherein the means holding the hinge pin in the hinge pin bore is protected from the danger of damage or displacement, such as by the retaining means being sheared off due to a blow or jar received by the hinge or hinge pin.

It is also an object to provide an arrangement wherein the hinge pin is held against rotation with respect to one element of the elevator, such as the elevator body section. This is desirable because free rotation of the hinge pin would cause excessive wear on the hinge pin retaining means and also the adjacent body portion of the elevator, in a position where such wear is most harmful.

It is also an object to provide a modified arrangement wherein the hinge pin is free to rotate, thus allowing it to seek its own bearing surface and distribute the wear on the hinge pin and adjacent body and door portions surrounding the hinge pin door.

Other objects will become evident as the invention is described in the following detailed description along with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a plan view, partly in broken lines, showing a hinge pin assembly in solid lines, a portion of the elevator being shown schematically in broken lines;

FIG. 2 is an enlarged fragmentary plan view of the hinge pin portion of the elevator illustrated in solid lines in FIG. 1, and showing in dotted lines the lock-bar recesses with the ends of the lock-bar therein;

FIG. 3 is a fragmentary front elevational view, partially in cross-section, taken on the line 3—3 of FIG. 2, looking in the direction of the arrows;

FIG. 4 is a fragmentary cross-sectional view, taken on the line 4—4 of FIG. 3, looking in the direction of the arrows;

FIG. 5 is a fragmentary elevational view, partially in cross-section, illustrating the placement of the lock-bar before straightening it to cause the ends to enter the adjacent recesses in the boss to its locking position; and

FIG. 6 is a fragmentary view corresponding generally to FIG. 4, but wherein the hinge pin is not provided with a diametrical slot, leaving the hinge pin free to rotate

with respect to the lock-bar and adjacent elevator body and door bosses.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more in detail to the construction shown in the various figures, there is disclosed in FIG. 1, largely by broken line illustration, an elevator of the so-called "center latch" type, and illustrating in solid lines the hinge portion of the elevator incorporating the present invention. The elevator assembly **11** has an elevator body **12**, and hinged thereto an elevator door **13**. The elevator body has a handle (shown in broken lines) **14** and the door has a handle **15**, by means of which handles **14** and **15** the operator can swing the elevator open about the hinge pivot formed around a hinge pin **16**, for the reception of pipe, drill collar, or the like, the opening **17**, which opening **17** is formed of a semi-circular bore on the elevator body **12** and an opposed semi-circular bore on the elevator door **13**. Ordinarily such elevators are provided with means in connection with such opening, such as dies for gripping the pipe, or a bearing surface on which the pipe collar (not shown) is seated. Such an arrangement for holding the pipe is common to elevators of the type shown.

The elevator body **12** has upper and lower ears **18**, and the elevator door **13** is provided with upper and lower ears **19**, such ears (an upper and a lower ear forms a set) being for the reception in each such set of ears of an elevator link eye whereby the elevator is supported by links (not shown). Each set of ears is provided with link retainer means **21** whereby a link is held in each set of ears. Such elevator ears and the link retainer means **21** are disclosed only schematically or descriptively, as they form no part of the present invention.

Likewise, a latch **22**, pivoted about a pivot pin **23**, is provided for holding the elevator body and the elevator door in closed relationship in the usual well known manner. (For a more complete description of an elevator assembly of the type depicted herein, see Mullinix U.S. Patent No. 2,425,753 dated Aug. 19, 1947.)

As indicated in FIG. 1, there is provided a lock-bar **24** across the top of the hinge pin **16**, which lock-bar as hereinafter more fully described, holds the hinge pin in position.

Referring next to FIG. 3, there are illustrated as integral parts of the elevator body **12**, an upper hinge boss **25** and a lower hinge boss **26**. Located intermediate between said bosses **25** and **26** and in vertical alignment therewith, is a central hinge boss **27**, which central hinge boss is an integral part of the elevator door **13**. As will be noted from the figure, the central hinge boss **27** meshes with the upper and lower hinge bosses **25** and **26**, and each of said bosses is drilled or has formed therein in any convenient manner, a hole adapted to be aligned with the holes in the other bosses to form a bore **28** extending from what may be termed the top surface of the elevator boss **25** through the three bosses **25**, **26** and **27**. Such bore is herein sometimes referred to as the hinge pin bore **28**, and the bore holes through the bosses **25**, **27** and **26** are in alignment when the elevator is assembled. It will be noted that the boss **26** has the bore hole therethrough reduced in diameter somewhat above the bottom of the elevator body to form the radially inwardly extending annular shoulder **29**, against which the bottom end of the hinge pin **16** abuts or rests, and which shoulder **29** forms a bottom stop preventing the hinge pin **16** from dropping out the bottom of the hinge pin bore **28**. As shown in FIG. 3 in particular, the hinge pin **16** is placed in the hinge pin bore **28** from the top and extends through the bosses **25** and **27** and well into the boss **26**, and forms the pivot for the boss **27** (of the preferred embodiment of FIGS. 2 through 5, and for all of the bosses of the modified form of FIG. 6), thus completing the hinge joining the door **13** and the body **12**.

Referring to FIGS. 2, 3 and 4 in particular, in the preferred embodiment, the hinge pin **16** is provided in its upper surface with a horizontal slot **31**, here shown as extending diametrically across the hinge pin. This slot is best observed from FIG. 4 and its purposes will be referred to later herein.

As noted from FIGS. 2, 3 and 5 in particular, the upper hinge boss **25** is provided with a lock-bar receiving laterally extending recess **32** on one side of the hinge pin bore **28** and extending radially outwardly from said hinge pin bore, and a recess **33** positioned generally diametrically across on the opposite side of the hinge pin bore **28** and likewise extending radially outwardly from said hinge pin bore. These recesses **32** and **33** are located below the top of the hinge pin boss **25** of the elevator body **12**, as is most obvious from FIGS. 3 and 5, and extend only a sufficient lateral depth radially from the hinge pin bore to form a suitable seat for the lock-bar retaining means. These recesses may be formed by casting, drilling, machining, or otherwise, but it is desirable that the upper inside surface thereof be flat rather than tapering.

Located within the slot **31** of the hinge pin is the lock-bar **24** above-mentioned, which has its ends extending into and seated in the recesses **32** and **33**. Thus, this lock-bar **24** extends diametrically or chord-like across the top of the hinge pin within the hinge pin slot **31**, with one end extending well into the recess **32** and the other end into recess **33**. When the lock-bar **24** is in such position it cannot be displaced other than by distorting or destroying the lock-bar by means such as with a chisel, grinding tool or drill. The lock-bar **24**, by being recessed below the top surface of the elevator boss **25** and (in the preferred embodiment) in the slot **31** beneath the top of the hinge pin **16**, is protected from accidental blows or shearing action occasioned, for example, by other equipment hitting the elevator.

When the lock-bar **24** is in position in said slot, it not only prevents the hinge pin **16** from being inadvertently displaced but prevents it from rotating with respect to the bosses **25** and **26**. However, the center boss **27** is free to rotate about the hinge pin **16**. Ordinarily, lubricating means such as a grease fitting would be provided on the center hinge boss **27**, whereby adequate lubrication would be furnished to the assembly in the bore hole between the pin **16** and the center hinge boss **27**. Such grease fitting is not believed necessary to illustrate herein.

As is obvious from FIG. 5, applicant has provided a means of inserting the lock-bar **24** into the hinge pin bore **28** and extending the ends thereof into the adjacent recesses **32** and **33**. For the method of accomplishing this, the lock-bar **24** is bent or deformed as illustrated in FIG. 5, to where the ends thereof clear the sides of the hinge pin bore **28** and the bent lock-bar **24** is then placed with its ends down on the top of the hinge pin **16** in the slot **31** in the preferred embodiment of FIG. 5, with its ends adjacent and aligned with the recesses **32** and **33**. The lock-bar is then straightened by striking or pressing with a tool adapted for the purpose, such as a hammer, perhaps using a punch or similar device to extend the bar to its full flattened position. In this connection, if desired, the lock-bar can be further peened or hammered to cause it to elongate to take up any play or slack which might exist when the lock-bar is merely flattened. Extending the lock-bar **24** to the full depths of the recesses **32** and **33** would tend to firm up the assembly, cut down on rattle and end play, which might be objectionable.

Referring to FIG. 6, there is here shown an arrangement whereby the hinge pin **16*a*** has its entire upper surface in the same horizontal plane; that is, there is no slot provided in the upper surface of the hinge pin. In such event a shortened hinge pin is used whereby its upper surface would be sufficiently below the top surface of the elevator boss **25** to allow placement of the lock-bar **24** thereon within the hinge pin bore **28**. With this arrangement, the hinge pin **16*a*** may rotate with respect to one

or more of the bosses **25**, **26** and **27**, and also with respect to the lock-bar.

For most applications it is believed that the arrangement of FIG. 6 is not the preferred embodiment, although it does have some advantages. With the arrangement of FIG. 6 there is more likelihood of wear on the lock-bar due to rotation of the hinge pin **16***a*, and also more likelihood of wear on the shoulder **29** of the boss **26** forming a seat for the hinge pin **16***a*. Further, such arrangement would call for additional lubrication of the upper and lower bosses **25** and **26** in addition to lubrication of the boss **27**, as at present. One advantage would be that the hinge pin could find its own bearing position, facilitating the relative rotation with respect to the bosses and possibly distributing the wear over all of the surfaces instead of confining it to the area of the boss **27**. However, wear occasioned on the bosses **25** and **26** might mean that repair of the hinge would require building up the bearing surfaces of the hinge pin bore **28** in both the elevator body **12** and elevator door **13**, whereas with the preferred embodiment of FIGS. 1 through 5 it would ordinarily only be necessary to repair the hinge pin bore **28** in that portion which extends through the elevator door boss **27**.

In inserting the lock-bar **24** into the arrangement of FIG. 6, the bent lock-bar would be placed on top of the hinge pin with its ends aligned with the recesses **32** and **33**, and the bar flattened in a manner similar to that illustrated in connection with FIG. 5.

Although not shown herein, ordinarily the area above the hinge pin **16***a* and below the top surface of the boss **25**; that is (in the preferred embodiment), the upper part of the lot **31**, any unfilled space in the recess **32** and **33**, or (in the embodiment of FIG. 6) any unfilled space not occupied by the lock-bar **24** above the pin **16***a*, would be filled with a suitable plastic or soft metal to prevent accumulation of dirt, abrasives, rust, etc. In other words, the top area of the bore **28** above the upper surface of the hinge pin and the recesses **32** and **33**, insofar as it is not filled by the lock-bar **24**, is plugged with suitable material to keep out foreign matter.

While the specific details of the invention have been herein shown and described, changes and alterations may be resorted to without departing from the spirit of the invention.

I claim:

1. A hinge including intermeshing boss portions pivotable about an axis, the boss portions having a bore on said axis, a hinge pin in said bore, and means for retaining said hinge pin in said bore, wherein the improvement comprises:

(a) said hinge pin having a uniformly smooth exterior surface throughout its length and being of constant diameter so as to be axially slidable out of said bore;

(b) a portion of one end of said hinge pin being substantially flat and axially spaced from one end of said bore so as to provide a bore surface between said portion and said end of said bore;

(c) a pair of flat seats substantialy normal to said axis provided by a pair of substantially rectangular and diametrically opposed recesses extending radially outwardly from said bore surface and located axially inwardly of the end thereof,

(d) a lock-bar of uniform rectangular cross-section throughout its axial length, extending across said bore and into said recesses and providing flat sides, one of the sides abutting with said flat seats, and said portion of one end of said hinge pin abutting with the opposite of the sides, whereby the abutment of said portion of said pin with said opposite side of said lock-bar and the abutment of said one of said sides with said seats restrains said pin from axial slidable movement out of said bore; and

(e) a means adjacent to the other end of said bore providing a reduction in the size of the latter so as to restrain said pin from axial slidable movement therebeyond in the direction toward said means while permitting axial slidable movement in the opposite direction away from said means.

2. A hinge as defined in claim **1** wherein said portion of one end of said hinge pin comprises substantially said one end of said hinge pin.

3. A hinge as defined in claim **1** wherein:

(a) said portion of one end of said hinge pin defines the base of a slot, said slot having wall portions extending from said base to said one end of said pin; and

(b) said pin is restrained from rotation in said bore by the engagement of said lock-bar of uniform rectangular cross-section providing flat sides with said pair of substantially rectangular recesses extending radially outwardly from said bore surface and said wall portions of said slot.

4. A hinge as defined in claim **1** including a plug disposed in the space between said portion of one end of said hinge pin, said lock-bar and said one end of said bore.

5. A hinge as defined in claim **12** wherein said means providing a reduction in the size of the bore comprises a shoulder.

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A. V. KUNDRAT, Assistant Examiner

U.S. Cl. X.R.

287—100

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,497,906 Dated March 3, 1970

Inventor(s) Edward J. McFadden

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 17, after "like," should be --in--.
Column 5, line 31, "16a" should be --16, 16a--; line 33, "lot" should be --slot--.
Column 6, line 42 (line 1 of claim 5), "12" should be --1--.

SIGNED AND
SEALED
SEP 8 - 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents