United States Patent [19]

Walters

[11] **3,921,422**

[45] **Nov. 25, 1975**

[54] **LOCKING BAR SYSTEM**

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[73] Assignee: **BMR Security Products Corporation,** Richmond, Ky.

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[21] Appl. No.: **403,460**

[52] **U.S. Cl.** **70/97;** 70/104; 70/360

[51] **Int. Cl.²** **E05B 63/00**

[58] **Field of Search** 70/90, 91, 100, 128, 134, 70/185, 360, 2–13, 97, 101, 102, 104, 80; 16/144, 147

[56] **References Cited**

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Attorney, Agent, or Firm—Allan Ratner

[57] **ABSTRACT**

A locking bar system having a lock assembly insertable within the bores of aligned lug members. One of the lug members has a passage of predetermined contour formed within an inner wall. The lock assembly includes a lock plug insertable within a locking tube. A locking pin is rigidly secured to and is immovable with respect to the lock plug and passes through a channel formed in a sidewall of the locking tube. The locking pin extends into the passage formed in the lug member with the position of the locking pin within the passage determining whether the system is locked or unlocked. The lock plug is prevented by means of the locking pin from axial movement with respect to the locking tube.

10 Claims, 9 Drawing Figures

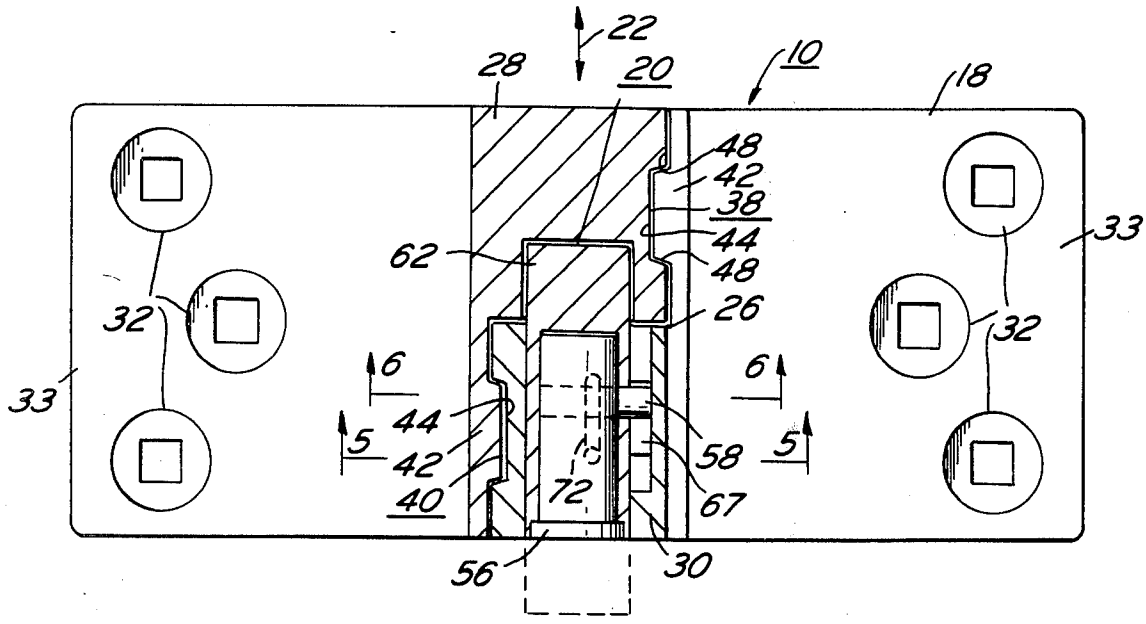


FIG. 1

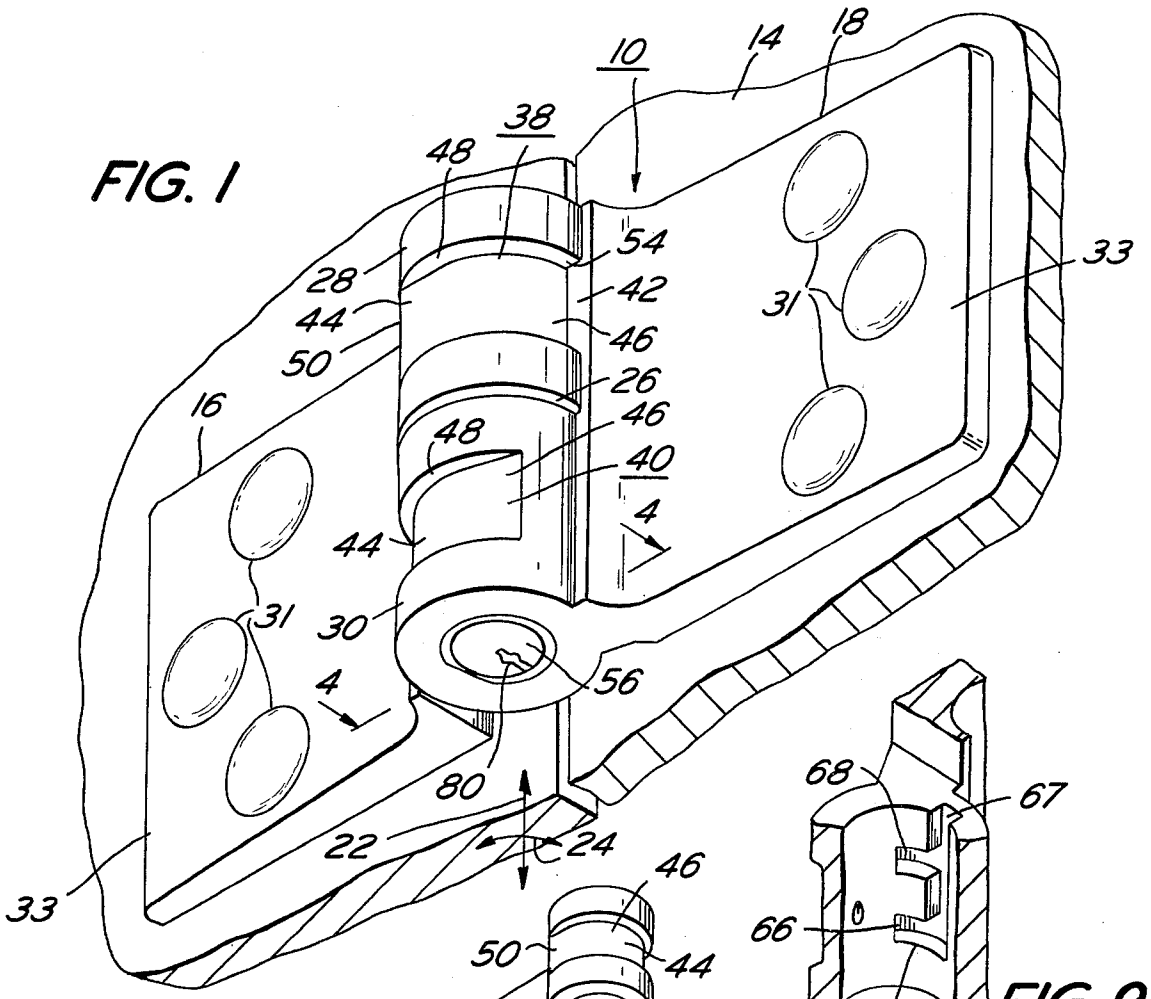


FIG. 9

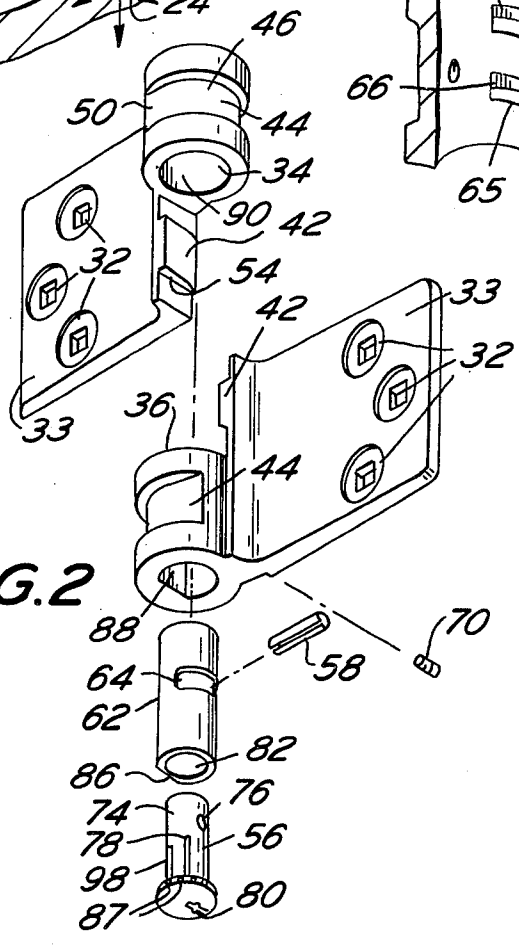


FIG. 2

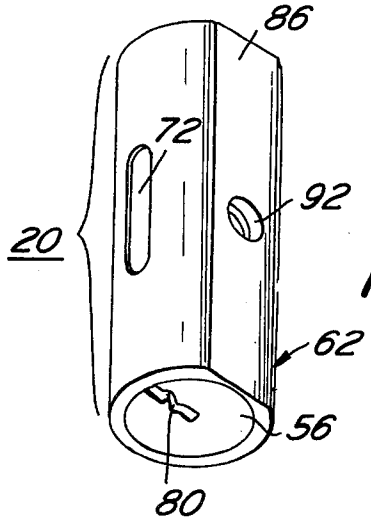


FIG. 3

FIG. 4

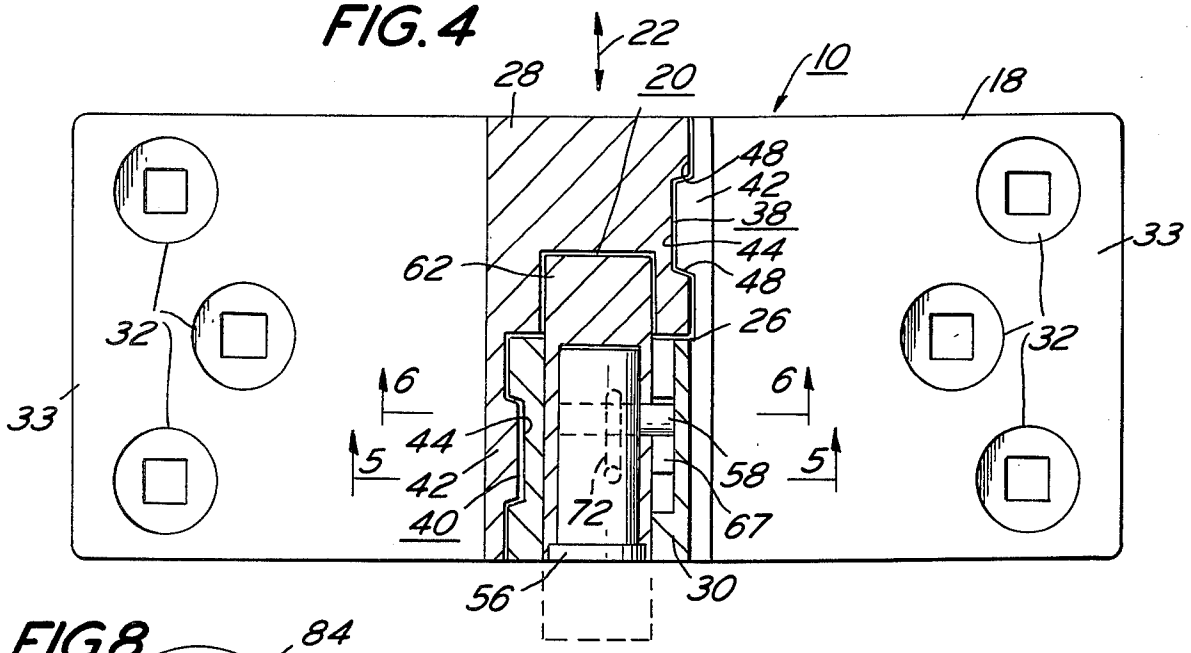
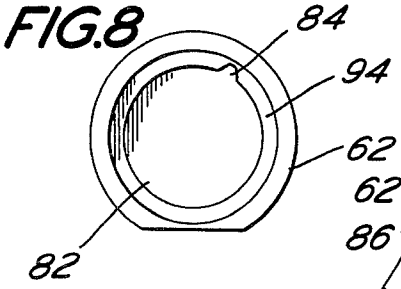


FIG. 8



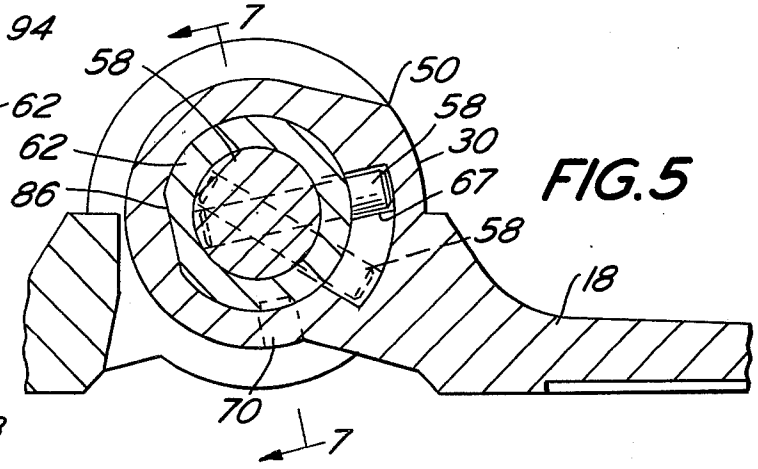
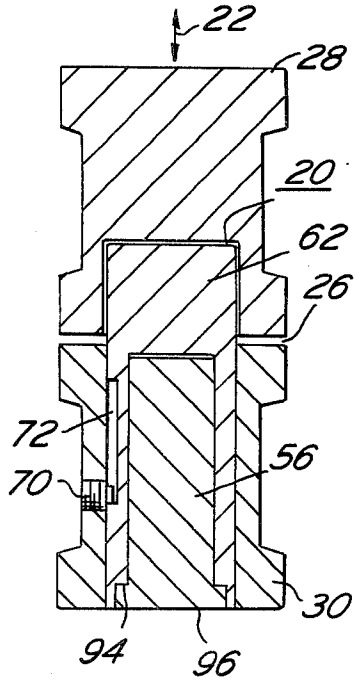


FIG. 5

FIG. 7



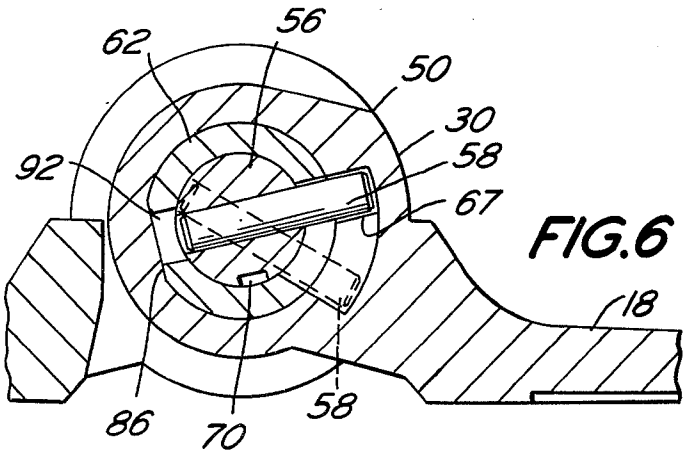


FIG. 6

LOCKING BAR SYSTEM

BACKGROUND OF THE INVENTION

A. Field of the Invention

This invention pertains to the field of locking systems.

B. Prior Art

Locking bar systems having cylinder locks insertable within bores of aligned lug members are known in the art. However, in some cylinder locks, the lock plug is secured to the locking tube by a retainer which passes between the sidewalls of the plug and tube. A wheel puller may be inserted between the walls of the plug and tube to break the retainer element and release the plug from the locking tube. Once the retainer is broken, the plug may be removed from the locking tube and the lock easily opened.

In other prior locking systems, the locking tube is sometimes rotatable within the bores of the aligned lugs. Such prior systems maintain the locking tube within the bores through a set screw inserted within a groove formed in a side-wall of the locking tube. By applying torque to the lock assembly mechanism in prior systems, the set screw may be destroyed thus releasing the locking tube within the bores for removal of the lock assembly from the lug members.

In some other prior locking systems, the locking tube is not formed of hardened steel having a shoulder to protect the inserted lock plug from external drilling. Such prior systems permit a drill to bore through an external wall of the locking tube and destroy the lock plug side bar which secures the lock plug to the locking tube. In such an event, the lock plug may be removed from the locking tube thus opening the lock system.

SUMMARY OF THE INVENTION

A bar lock system having at least one strike plate with a bore opening having an inner wall. A passage of predetermined contour is formed within the inner wall. A locking tube is insertable within the bore opening with at least one opening passing through the side wall thereof. Lock means is disposed within and is rotatable with respect to the locking tube. A locking pin is rigidly secured to and immovable with respect to the lock means. The locking pin extends through the side wall opening and into the passage so that the lock means is partially rotatable for moving the locking pin within the passage. It is in this way that the lock means is prevented, by means of the locking pin, from axial movement with respect to the locking tube.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the locking bar system showing a lock assembly mechanism inserted within aligned lug members formed on a pair of strike plates;

FIG. 2 is an exploded perspective view of the locking bar system;

FIG. 3 is a perspective view of the lock assembly mechanism;

FIG. 4 is a cross-section of the locking bar system taken along the section lines 4—4 of FIG. 1;

FIG. 5 is a cross-section of a portion of the locking bar system taken along the section lines 5—5 of FIG. 4;

FIG. 6 is a cross-section of a portion of the locking bar system taken along the section lines 6—6 of FIG. 4;

FIG. 7 is a cross-section of a portion of the locking bar system taken along the section lines 7—7 of FIG. 5;

FIG. 8 is an elevational view of the locking tube; and

FIG. 9 is a cut-away view of a lug showing the passage for the locking pin.

DETAILED DESCRIPTION

Referring now to FIGS. 1–7, there is shown locking bar system **10** which provides a mechanism for constraining opposing movable section elements or door members **12** and **14** each to the other as shown in FIG. **1.** This improved locking bar system is similar to the locking assemblies described in my U.S. Pat. No. 3,711,894, Locking Bar Assembly and my copending patent applications Ser. No. 277, 565, filed Aug. 3, 1972 now U.S. Pat. No. 3,827,266 and Ser. No. 365,099, filed June 5, 1973. As will be shown and described, the improvement of system **10** includes the concepts of providing additional shear loading force constraints for the locking mechanism as well as to additionally protect the lock when mounted in system **10** in order to increase imperviousness to external attack.

In general, locking bar system **10** includes a pair of strike plates **16, 18** having lug members **28, 30** formed thereon as shown in FIG. **1.** Each strike plate **16, 18** is secured to a respective door member **12, 14** in a manner such that lugs **28, 30** can be aligned in a predetermined direction, substantially that direction being defined by longitudinally directed arrow **22.** Lock assembly **20** is then insertable through aligned lug members **28, 30** in order to maintain an immovable relation between door members **12** and **14.**

Each of strike plates **16, 18** may be mounted to respective movable section elements **12, 14** through a plurality of bolts **31** inserted through openings **32** (shown in FIG. **2**) and attached to doors **12, 14.** As shown in FIG. **2,** strike plates **16, 18** are formed in an "L" shaped configuration and operationally positioned in a manner to permit alignment between lug members **28** and **30** in the direction substantially defined by the orientation of arrow **22.** When lug members **28** and **30** are thus aligned, bore openings **34** and **36** are in themselves aligned each with respect to the other. Thus, geometrically, each of strike plates **16** and **18** may be formed in one piece construction with lugs **28** and **30** forming a base element of the overall L configuration and longitudinally directed frame **33** forming the vertical element.

In general, lock assembly **20** includes cylinder lock or lock plug **56** insertable within locking tube **62** as is seen in FIGS. **2, 3** and **4.** Assembly **20** has locking pin **58** of constant extension therefrom to be movably actuated within passage **65** formed within an inner wall defined by bore **36** of lug member **30.**

Lock plug **56** may be of standard construction and well known in the prior art. One of such lock plugs **56** used successfully is produced by Medico Lock Co. and includes a longitudinally extended housing or frame **74.** Locking pin opening **76** is formed through a sidewall of housing **74** to secure locking pin **58.** Pin opening **76** has a diameter slightly less than the relaxed external diameter of locking pin **58** in order that a force fit between the inserted pin **58** and housing **74** may be formed. In general, opening **76** passes through housing or frame **74** in order that locking pin **58** may be forceably removed if necessary. Locking pin **58** passes through channel **64** and prevents longitudinal removal of plug **56** from tube **62.** Pin **58** may be a C shaped roll pin formed of steel and providing high shear strength between plug **56** and tube **62.** In tests run, over four tons

of force were required to be exerted before pin **58** was sheared and plug **56** removed from tube **62.**

In other modes of construction, locking pin **58** may be fixedly mounted to lock plug **56** through welding, bolting or other like techniques, the important criteria being that locking pin **58** be securely fastened and immovable with respect to plug **56.**

In operation, and as is standard, lock plug **56** includes side bar **78** which extends throughout a portion of the longitudinal length of housing **74.** Side bar **78** further extends above the surface of a sidewall of housing **74** and is locked in that position when a key (not shown) is not inserted within key insert opening **80.** Upon insertion of a key side bar **78** becomes movable in a direction radial to the axis of plug **56** and may be forced flush with the sidewall when the key is turned thereby turning the plug.

Lock plug **56** is insertable within locking tube bore **82** in a manner such that side bar **78** is received by locking tube groove **84.** Locking tube or lock shell **62** is formed of hardened steel or some like material to protect the inserted lock plug **56** from external attack. Thus side bar **78** is inserted and sits within a groove **84** formed in hardened steel and is thus protected from external drilling. Further protection for side bar **78** may be accomplished by the insertion of hardened pin elements **87** on a front end face of lock plug **56.**

With plug **56** in tube **62,** side bar **78** is received fully by locking tube groove **84.** When no key is inserted within insert opening **80,** side bar **78** is locked into groove **84** and plug **56** is rotatably immovable. When a key having the correct combination is inserted within opening **80,** side bar **78** is released from a locked position. As the key is rotated, lock plug **56** is correspondingly rotated and side bar **78** no longer sits within groove **84.**

As shown in FIGS. **7** & **8,** tube **62** has a shoulder **94** with groove **84** formed within the shoulder as shown. Plug **56** mates with shoulder **94.** If face **96** is drilled, in an attempt to drill out the shoulder around groove **84,** the drill would likely snap or break on the hardened steel wall of shoulder **94.**

Tube or lock shell **62** is insertable within bore openings **36** and **34** of lug members **28** and **30.** Locking pin **58** is fixedly secured within locking pin opening **76** and extends through tube channel **64.** Channel **64** includes a width slightly in excess of the outer diameter of pin **58** in order to permit pin movement. Additionally, channel **64** has an angular length sufficient to permit rotation of pin **58** through a distance substantially equal to the length of first and second passage extensions **66** and **68** of passage **65.** This angular dimension of channel **64** may vary in accordance with dimensional design parameters, however, in practice channel **64** has approximated 40° of the total angular circumference of tube **62** in a number of successful systems. Thus, with plug **56** within shell **62,** pin **58** extends through channel **64** and is partially rotatable with respect to tube **62** within channel **64** as the key is turned.

Tube **62** is substantially cylindrical, however, as shown in FIG. **3,** tube **62** includes flattened sidewall **86** extending in longitudinal direction **22.** Bores **36** and **34** include flattened wall sections **88** and **90** which mate and interface with sidewall **86** of tube **62.** In this manner when tube **62** is inserted within bores **36** and **34,** it is fixedly secured with respect to rotational movement. Thus, due to flattened sidewalls **86, 88** and **90,** tube **62** may be moved in longitudinal direction **22** within bores **34** and **36** but is rotationally immovable with respect thereto.

Tube surface **86** may include lock pin release opening **92** as shown in FIG. **3.** Opening **92** passes through the wall of tube **62** in so that it is aligned with roll pin **58** when roll pin **58** is positioned within longitudinal groove **67.** Pin **58** does not extend into opening **92** thereby allowing angular movement of roll pin **58** within locking tube channel **64.** In order to remove pin **58** from housing **74,** an implement may be inserted through opening **92** to forceably release pin **58** from assembly **20.** As shown in FIG. **1,** opening **92** is directed toward the rear of system **10** to further decrease any possible external access to pin **58.**

Set screw **70** passes through and threadedly engages lower lug **30.** Set screw **70** extends into groove **72** and has an external diameter slightly less than the width of groove **72.** Thus set screw **70** permits partial longitudinal movement of mechanism **20** within bores **34** and **36** but prevents lock assembly mechanism **20** from falling out of the constraining lug members. Further, the longitudinal length of groove **72** is generally equal to or greater than the longitudinal displacement between passage extensions **66** and **68.** In this manner, when mechanism **20** is forced to an uppermost position, locking pin **58** is alighed with upper passage **68** and can be rotated into it.

Pin **58** is further insertable within continuously formed passage **65** of lug **30.** Passage **65** includes a predetermined contour having a longitudinal passage groove **67** intersected by first and second extension passages **66** and **68** respectively. The contour of passage **65** is clearly shown in FIG. **9** while locking pin **58** insertion into specific extension passages is shown in FIGS. **4, 5** and **6.** The width of passage **65** throughout its contour is slightly greater than the diameter of locking pin **58** to permit free movement.

Locking bar **10** may be placed in three states of operation. When pin **58** is inserted into first passage **66,** such defines an unlocked position permitting plates **16** and **18** to be movable with respect each other. When locking pin **58** is rotated into alignment with longitudinal passage groove **67** such defines a neutral position where mechanism **20** may be moved in longitudinal direction **22** between extension passages **66** and **68.** When locking pin **58** is inserted into second extension passage **68,** this defines a locked position whereby strike plates **16** and **18** are constrained each to the other since assembly **20** is passed within both bores **34** and **36.**

In operation, in the unlocked position, mechanism **20** extends from lower lug **30** (as shown dotted in FIG. **4**) and has been removed from upper bore **34.** Locking pin **58** rests on a lower surface of passage **65** within first extension passage **66.** When pin **58** is positioned at the end of extension passage **66** farthest from groove **67,** bar **78** is positioned within tube groove **84.** With the key removed, plug **56** is rotatably immovable with respect to shell **62.** Thus assembly **20** is locked to member **30** but lugs **28** and **30** are not constrained to each other and system **10** is in an unlocked position.

Insertion of a correct key into opening **80** releases bar **78** and rotation of lock plug **56** forces side bar **78** from within groove **84.** Pin **58** is correspondingly rotated within channel **64** until pin **58** is aligned with groove **67.** This is a neutral position and assembly **20** may be moved longitudinally. As assembly **20** is moved upwardly, it enters bore **34** of lug member **28** thus con-

straining strike plates **16** and **18** to each other. Locking pin **58** within groove **67** is shown in the solid lines of FIGS. **5** and **6.**

When pin **58** is aligned with second extension **68,** the key may be rotated forcing lock plug **56** and pin **58** into extension **68.** Note that this alignment of pin **58** and passage **68** may be determined by set screw **70** contacting the lower end of set screw groove **72.** Rotation of pin **58** to the end of extension **68** shown dotted in FIGS. **5** and **6** permits side bar **78** to be inserted within tube groove **84.** The key may be removed from lock plug **56** thus locking plug **56** to lock shell **62.** In this position, lock assembly mechanism **20** is within both bores **34** and **36** and system **10** is in a locked position.

It is thus seen that locking pin **58** passes through hardened steel locking tube **62** at all times. In order to forceably remove and pull mechanism **20** from lugs **28** and **30,** locking pin **58** must be sheared through the hardened tube **62.** In successfully built systems, roll pin **58** has withstood up to four tons of shear load. Thus by making pin **58** an integral part of lock plug **56** and passing through a sidewall of tube **62** increased shear load characteristics are provided. Additionally, torque applied to locking tube **62** is taken up by flattened sidewall **86** which prevents rotation of locking tube **62** within bores **34** and **36.** Further, pins **87** inserted within front face **96** of lock plug **56** protect tumblers **98** from drilling. Where a drill is used to pass through frontal section **96** of plug **56,** it would first encounter pins **87** formed of hardened steel which would impede the drilling action. Further, pertaining to pin **58,** it will be noted that it extends into passage **65** in a direction toward door elements **12** and **14.** If a drill were used through a sidewall of lug **30** to displace or break pin **58,** the drill would first encounter hardened steel tube **62.** However, if the drill were able to pass through this obstacle and impinge on pin **58,** the drill force would only drive locking pin **58** further into passage **65** of lug member **30** thus causing more of a locking effect and not releasing system **10** from the locked position.

As has been seen, due to the fact that locking pin **58** is formed integral with lock plug **56** and passes through locking tube **62,** system **10** can absorb additional shear and torque stresses. However, further load stresses may be absorbed through releasable capturing mechanisms **38** and **40** shown in FIG. **1.** This combined element interaction serves to take up or transfer any load stresses incurred at interface **26** (from jimmying or other such attack) to strike plates **16, 18** instead of directly transmitting the load to lock assembly mechanism **20.** Each of the overall capturing mechanisms **38, 40** include first mating element or tooth **42** which is formed integral with longitudinally directed frame portion **33** of each strike plate **16** and **18.** As is seen, each tooth **42** extends in a lateral direction with respect to longitudinal direction **22** and is insertable within second mating means or channel **44.** Channel **44** is formed on a sidewall of each of lug members **28** and **30** and extends through a portion of the circumference thereof. In this manner, elements **42** interface with second mating elements **44** when bores **34** and **36** are aligned in longitudinal direction **22.**

It is to be understood, that although channels **44** are shown formed in the lug members **28** and **30** and tooth elements **42** are shown formed on frames **33,** that the formation of elements **42** and **44** may be interchanged. Such a transfer would provide for tooth elements or first mating elements **42** to be formed on the lugs **28** and **30.** Teeth **42** would then be insertable within channels or second mating elements **44** formed on frames **33.** Thus the specific construction of capturing mechanisms **38, 40** may be reversed while providing for the same load absorption results.

Channels **44** are seen to include base surfaces **46** having a substantially constant diameter throughout a portion of the lug peripheral surface area. Channel sections **44** also include opposing sidewalls **48** which provide a channel depth greater than the depth of teeth **42.** Second mating elements **44** further form a constant diameter channel base surface **46** taken with respect to the base axis. The constant diameter surface **46** extends throughout a portion of the lug **28** or **30** perimeter until channel demarcation line **50** is reached as is shown in FIGS. **1** and **2.** It is seen that either of strike plates **16** or **18** are free to rotate through a portion of the total lug circumference when bores **34** and **36** are aligned. This freedom of rotation extends to channel demarcation line **50,** however, plates **16, 18** are constrained in direction **22** as well as in rotative direction **24.**

Thus where external attacking forces are applied at interface **26** with a lever or other mechanism, there is usually applied a torqueing force which tends to move lugs **28** and **30** away from each other in a direction coincident with directional arrow **22.** In such cases, first and second mating elements **42** and **44** (whether the teeth are on the lugs **28** and **30** and the channel on frames **33** or the reverse situation) provide reaction forces when sidewalls **48** contact tooth sidewalls **54.** The force is transmitted to strike plates **16** and **18** as well as associated lug members **28, 30,** thereby substantially alleviating any force stress directly on lock assembly mechanism **20.** In this manner, additional structural integrity is provided for system **10.**

What is claimed is:

1. A bar lock system comprising:

a. a pair of strike plates having alignable lug members, each of said lug members having a bore opening defining an inner wall, at least one of said lug members having a continuously formed passage of predetermined contour formed within said inner wall;

b. lock assembly means having (1) a locking pin of constant extension therefrom and movably actuated within said passage, (2) a locking tube insertable within said bore openings of said lug members, and (3) lock means positionally located within said locking tube; said locking pin being rigidly secured to and immovable with respect to said lock means said lock means and said locking pin being rotatable with respect to said locking tube through a predetermined angular displacement, and said locking tube being fixedly secured with respect to rotational movement within said bore openings of said lug members.

2. A bar lock system comprising

at least one strike plate having a bore opening,

a locking tube insertable with said bore opening and having at least one opening passing through a sidewall thereof,

lock means disposed within and being rotatable with respect to said locking tube,

said bore opening having an inner wall, a passage of predetermined contour formed in said inner wall, and

a locking pin rigidly secured to and immovable with respect to said lock means, said locking pin extend-

ing through said sidewall opening and into said passage so that the lock means is partially rotatable for moving said locking pin within said passage but said lock means is prevented by said locking pin from axial movement with respect to the locking tube.

3. The bar lock system of claim **2** in which said locking tube is fixedly secured with respect to said bore opening to prevent rotational movement but allow axial movement of said locking tube with respect to said bore opening.

4. The bar lock system as recited in claim **3,** where said predetermined contour of said passage includes a pair of passage extensions, each joined to a longitudinally directed groove passing substantially normal to each of said extensions.

5. The bar lock system as recited in claim **4** where said locking pin is rotatably movable within each of said passage extensions responsive to a rotation of said lock means.

6. The bar lock system of claim **2** in which there are provided a pair of strike plates having alignable lug members, each of said lug members having a bore opening.

7. The bar lock system as recited in claim **6** including:

a. first mating means formed on at least one of said strike plates; and,

b. second mating means formed on a sidewall of at least one of said lug members, said first and second mating means being received one in the other.

8. The bar lock system as recited in claim **7** where said first mating means includes a tooth element insertable within a corresponding second mating means for restraining motion between said strike plates in a predetermined direction.

9. The bar lock system as recited in claim **8** where said second mating means includes a channel formed within at least one of said lugs for insertion of at least one tooth element of said first mating means.

10. The bar lock system as recited in claim **7** where said second mating means includes a tooth element insertable within a corresponding first mating means for restraining motion between said strike plates in a predetermined direction.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,921,422 Dated November 25, 1975

Inventor(s) Russell W. Walters

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

The term of this patent subsequent to June 8, 1991, has been disclaimed.

Signed and Sealed this

Sixth Day of July 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks