May 19, 1970 C. A. WINTER 3,512,380

SHAFT LOCK AND KEY FOR THE SAME

Filed Nov. 21, 1967

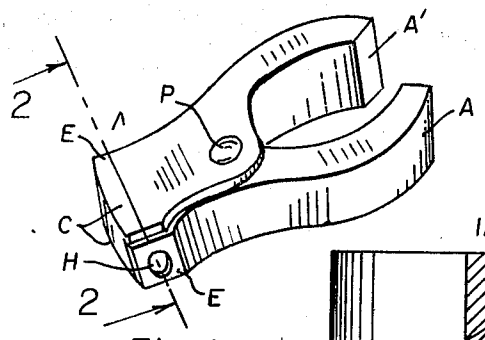


Fig. 1

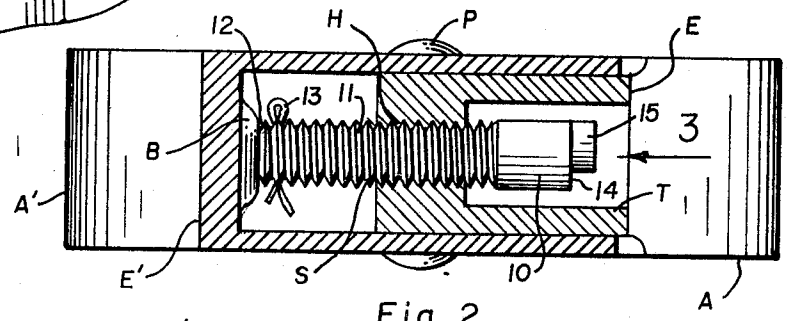


Fig. 2

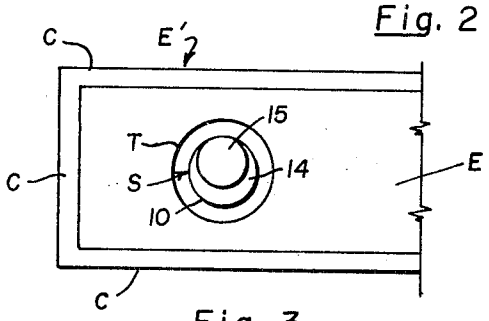


Fig. 3

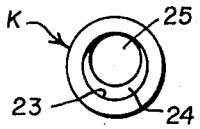


Fig. 5

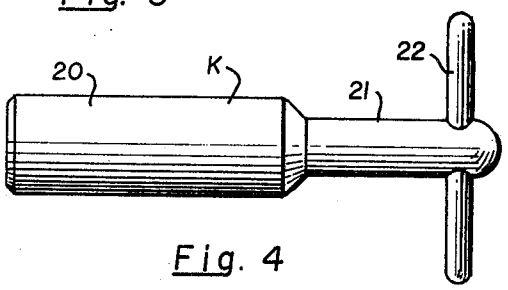


Fig. 4

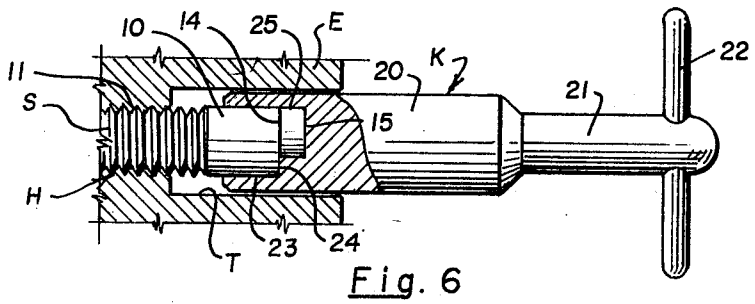


Fig. 6

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# SHAFT LOCK AND KEY FOR THE SAME

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U.S. Cl. 70—19 3 Claims

## ABSTRACT OF THE DISCLOSURE

A locking device and a key therefor, wherein the locking device includes a threaded shaft adapted to be turned into one member of the device to engage another member thereof. A key is adapted to be connected to an end of the shaft to effectuate this turning. The end of the shaft is within a socket in the body of the member. The socket is cylindrical and the end of the shaft, also cylindrical, is concentric therein. A cylindrical, eccentric stub projects beyond this shaft end. The key is adapted to be inserted into the socket, and the shaft into a central bore in the key. An inset, forming a continuation of the bore, is offset from the axis of the bore to receive the stub when the end of the shaft is within the bore.

This invention relates to locking devices of the general type which require the rotation of a shaft for their operation, and more particularly to shaft locks having a threaded extension of the shaft which is turned into a threaded socket to effectuate a positive shifting movement as part of the locking action.

A primary object of the invention is to provide a novel and improved shaft lock which is versatile in its application, but which is especially adapted to be housed within a socket restricting the accessibility of the shaft.

Another object of the invention is to provide in combination with a socket-inset shaft lock, a novel and improved key therefor which is especially difficult to duplicate.

Another object of the invention is to provide in combination with a shaft lock, a novel and improved socketed housing structure which protectively cooperates with the shaft to render the operation of the lock practically impossible without a precisely fitted key.

A further object of the invention is to provide a novel and improved shaft lock where a positive, forcible rotation of the shaft is required to forcibly engage, shift and secure clamping components of the lock.

A further object of the invention is to provide a novel and improved shaft lock, and a key therefor, which is especially adapted to be used with clamping devices such as vehicle immobilizers when the locking shaft must forcibly secure the clamps when it is being locked.

Further objects of the invention are to provide in a novel and improved shaft lock and key therefor, a construction of enhanced simplicity and reliability, and which is an easily constructed, low-cost, rugged and durable unit.

With the foregoing and other objects in view as will hereinafter further appear, my invention comprises certain constructions, combinations and arrangements of parts and elements as hereinafter described, defined in the appended claims and illustrated in preferred embodiment by the accompanying drawing in which:

FIG. 1 is a small-scale sketch of a vehicle immobilizer illustrative of a type of clamp which may incorporate a socketed lock bolt constructed in accordance with the principles of the invention.

FIG. 2 is a transverse sectional view as taken from the indicated line 2—2 at FIG. 1, but on an enlarged scale and illustrating the manner in which the end of



the clamp is formed with a socket to carry the shaft lock.

FIG. 3 is a side view of a portion of the clamp as from the indicated arrow 3 at FIG. 2, to illustrate an end view of the socket and shaft lock therein.

FIG. 4 is a side elevational view of a key for the lock.

FIG. 5 is an end view of the key.

FIG. 6 is a fragmentary, transverse, sectional view of a portion of the showing at FIG. 2 illustrating the key, shown partially in section, as being inserted into the socket to connect with the shaft.

A specific group of hinge clamps and other gate-like structures are secured to a clamping or a locking position by forcibly turning a threaded shaft into a threaded sleeve or nut portion carried upon the structure, and the present invention concerns improvements in the shaft lock structure of such devices. A common device using a shaft lock is a vehicle immobilizer, a large clamp adapted to be locked upon a wheel to immobilize an automobile. Such an immobilizer is illustrated at FIG. 1. The two clamp arms A and A′ are secured together by a pivot P near their center. The back end E of one arm is opposite to the back end E′ of the other arm and these ends must be spread apart to move the arms A and A′ together. This is accomplished by a threaded shaft S which is turned into a threaded hole H in the arm end E. This shaft S contacts an abutment B on the arm E′ illustrated at FIG. 2. A key K is adapted to grip the outer portion **10** of the shaft opposite the abutment to turn the shaft to operate the clamp.

In the present invention, the outer portion **10** of the shaft S is housed within a socket T in the arm end E with the hole H commencing at the bottom of this socket so that the end of the shaft is not accessible except from the socket opening. To further limit the accessibility of the shaft, since it is the locking element, the space between the arms E and E′ is also enclosed by cover plates C on the arm end E′ which overlap and embrace the arm E as illustrated at FIGS. 1 and 3.

The socket T is cylindrical in form, and the shaft S, when threaded into the hole H, is aligned on a common axis with the socket and is thus concentric within the socket. The major portion of the shaft is threaded as at **11**, with this threaded reach extending through the threaded hole H, with its inner end contacting the abutment B as heretofore described. This inner end of the shaft is formed with a suitable chamfer **12** to minimize wear against the abutment, and it also includes a small transverse hole adapted to carry a cotter pin **13** which prevents the shaft from being accidentally removed from the hole H. When the shaft S is threaded through the hole H, the outward end of the shaft is completely within the socket T as mentioned and preferably, the end **14** of the shaft is approximately at least one diameter within the socket T as clearly illustrated at FIG. 2 to render it difficultly accessible by any device excepting a proper key, as hereinafter described.

The outward portion **10** of the shaft is cylindrical and smooth with its end **14** being squared. A cylindrical, eccentric stub **15** projects from this end with its axis being parallel to the shaft axis. The stub **15** is approximately two-thirds the diameter of the shaft, and its offset or eccentricity is such that one edge is flush to an edge of the cylinder, that is, the cylindrical shaft and eccentric cylinder stub **15** and end have a common line element, as illustrated. The diameter of this stub, illustrated as being approximately two-thirds of the shaft diameter, may vary somewhat, but it should be at least one-half as great as the diameter of the shaft end **10** to be sufficiently strong as to resist a substantial torsion force.

The eccentric stub **15**, projecting from the shaft, provides a basis for forming a key K which may be fitted upon the end of the shaft to forcibly rotate the shaft to

lock or release the clamp as desired. The key, illustrated at FIG. 4, includes a cylindrical body **20**, a cylindrical shank **21** axially extending from the body, and a handle **22** at the end of the shank. The cylindrical body is of a diameter which is adapted to snugly fit within the cylindrical socket T. The end of the body is socketed with a concentric bore **23** having the same diameter as the shaft end **10** and a depth which is approximately equal to its diameter. This bore terminates as a flat bottom **24** and a cylindrical inset **25** extends into the bottom of this bore. This inset is offset from the bore with its axis being in spaced parallelism with the axis of the bore. The inset **25** is offset the same, and has the same diameter, as the stub **15** so that it may receive the eccentric stub **15** when the key is fitted upon the end of the shaft.

Accordingly, when the key K is placed into the socket T over the shaft and with the shaft end **10** extending into the bore, it may be rotated to a position where the stub **15** will move into the inset **25**. Further rotation of the key will turn the shaft S. It is anticipated that the diameter of the shaft end **10**, and the diameter and the offset of the stub **15** will be precisely turned in a shop having proper production tools. Likewise, the bore **23** and the inset **25** in the key end will be precisely drilled and will receive the mating components, the shaft end **10** and stub **15**, with a very slight clearance. Likewise, the body **20** of the key K will be turned to an external diameter which fits into the socket T with only a slight clearance.

It was found that without the use of carefully preset production tools and the use of production shop procedures, the bore and inset in the key and the stub on the shaft could not easily be formed with any degree of precision. Moreover, a key which has a sloppy fit upon the shaft within a socket will not function properly and will bind within the socket so that it cannot be used to turn the shafts. These considerations and the fact that a key of the type required to reach into the socket and to engage the end of the shaft to forcibly rotate this shaft, is difficult to build and is a tool not easily obtained, renders the lock formed by the shaft within the socket very difficult to be picked or opened by a person not having the proper key to do so. Actually, in field use, this arrangement has proved a more effective pick-proof lock for vehicle immobilizer clamps than ordinary conventional tumbler-type locks. While the shaft thus described, can function in an open space outside of a socket and has utility in such applications, it is nevertheless, more effectively pick-proof when carried within a socket because it is inaccessible insofar as an ordinary wrench is concerned.



I have now described my invention in considerable detail with respect to a preferred use of the same. However, it is to be understood that other uses, modifications and alterations to the invention can be devised and built by those skilled in the art.

I claim:

**1.** In combination with a locking device, a shaft lock including a threaded shaft carried in a threaded bore of a member of the device and being adapted to be turned therein to extend against other members to effectuate a locking action, and wherein:

(a) the end of the shaft is formed as a smooth, cylindrical member having a cylindrical stub projecting from the end thereof at a position eccentric to the axis of the shaft;

(b) the threaded bore of said member is formed within a cylindrical socket substantially concentric with the bore of a depth such that the end of the shaft is housed completely within the socket whenever the shaft has been turned into the bore to effectuate locking; and

(c) a cylindrical key adapted to fit within said socket and having a bore in its end adapted to receive the end of the shaft; and

(d) an eccentrically positioned inset extension of the bore adapted to receive the stub as the shaft moves into the bore.

**2.** In the organization set forth in claim **1**, wherein the end of the shaft is at least approximately one diameter within the bore when in locking position.

**3.** In the member defined in claim **1**, wherein the diameter of the stub is at least as great as one-half the diameter of the shaft, and wherein the offset is such that an edge of the stub is at an edge of the shaft.


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