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LOCKABLE FASTENER WITH PLUNGER-SLEEVING DRAW KEY

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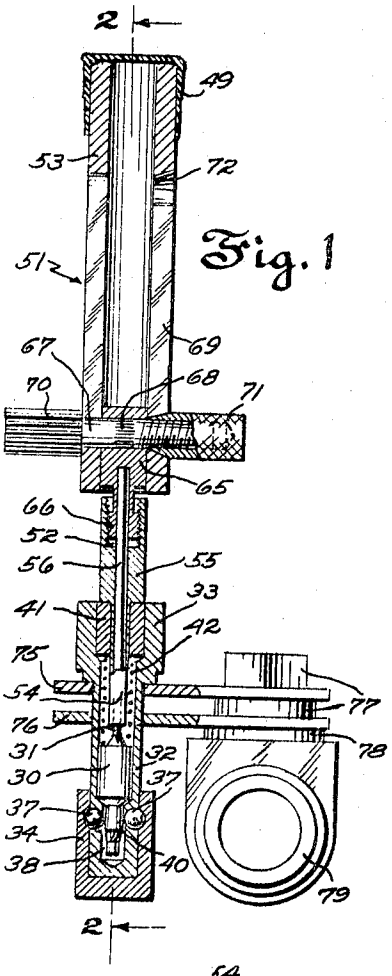


Fig. 1

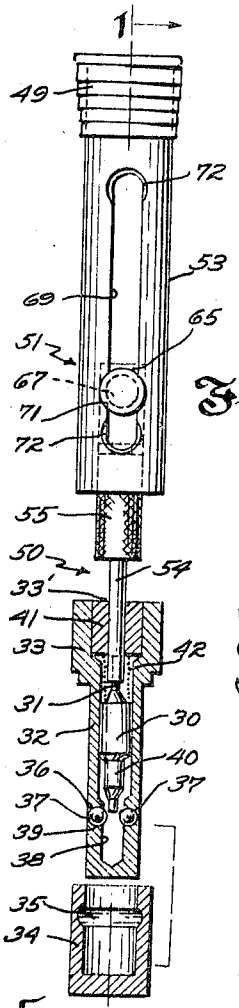


Fig. 2

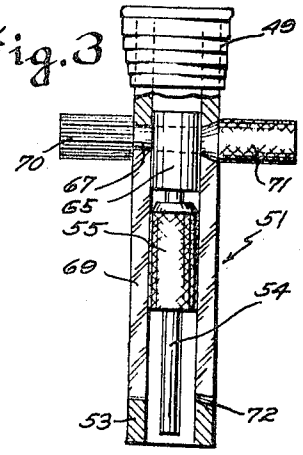


Fig. 3

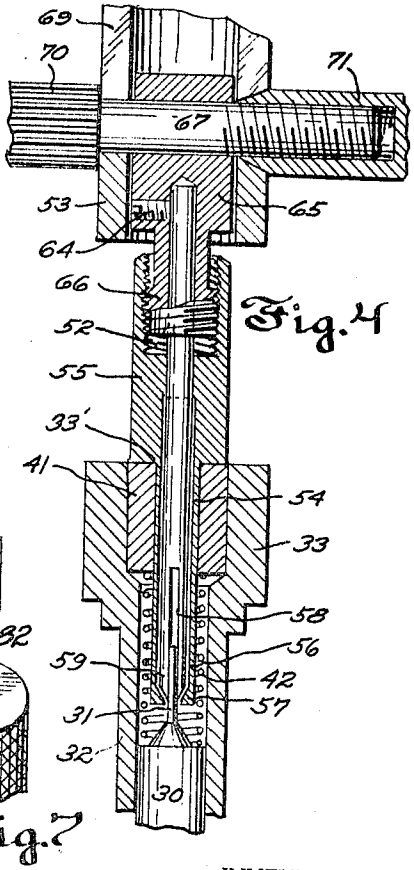


Fig. 4

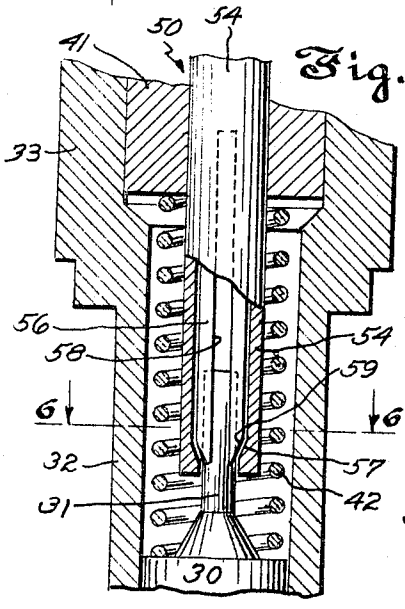


Fig. 5

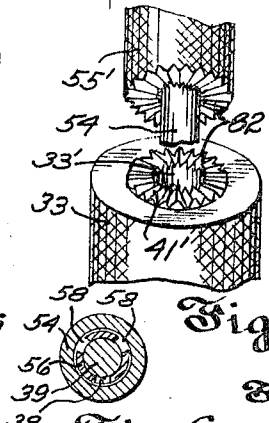


Fig. 6

Fig. 7

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LOCKABLE FASTENER WITH PLUNGER-SLEEVING DRAW KEY

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10 Claims

ABSTRACT OF THE DISCLOSURE

A fastener applied to a valve or the like for preventing unauthorized opening thereof and comprising two hollow, axially partable, telescoped members releasably locked together by the reciprocative movement of a contained plunger reached by inserting a draw key through a restricted opening in the end of one of the fastener members. Novelty resides in the plunger having a projecting stud that is sleeved over by a hollow end of the draw key which end is then caused to contract radially by manipulation of the key from outside the fastener whereby to cause said hollow end of the key to clasp the plunger stud with sufficient tightness to pull the plunger into fastener unlocking position.

Brief summary of the invention

Fasteners of the type concerned have heretofore been constructed to be unlocked by the sliding movement of a contained reciprocative plunger that is recessed or hollow so as to be receptive to the radially expandable end of a draw key. By flaring expansion the end of such conventional type of key can be made to wedge in the hollow of the plunger for seizing it by a frictional cling sufficiently strong to pull the plunger into fastener unlocking position. Many easily made mechanical makeshifts can substitute for such type of draw key including instruments intended for the inside calipering of holes, bent wire hooks, headed-over nails, etc. Therefore the tamper proof character of such fasteners has become ineffectual when for instance the fastener is used to prevent unauthorized opening of a valve or electric switch controlling the supply of gas, water or current from the service line of a public utility.

An object of the present improvements is to provide a fastener with a locking mechanism that requires for its unlocking a draw key of sufficiently sophisticated structure so that crude, lock picking devices such as those mentioned above cannot be used to open the fastener.

Another object is to provide improved locking mechanism in such form that it can be substituted for conventional locking mechanism already existing and in use in fasteners of the type concerned.

Another object is to provide for operating the improved lock mechanism a draw key that is more sturdy and convenient to use than conventional keys.

Another object is to equip the lock mechansm with a plunger that is sleeved over and gripped by the radially contractible end of a hollow draw key for pulling the plunger into fastener unlocking position. This is in contrast to the prior practice of wedging the flarable end of an expansible draw key into a hollow or recess in the end of the plunger for reciprocating it.

A specific object is to construct the key so that its working parts which in use protrude from the handle are telescopically retractable to within the hollow of the handle when not in use, whereby the length of the key is halved for compactness when stored or carried.

These and related objects of the invention will appear in fuller particular from the following description of a preferred embodiment of the invention having reference to the appended drawings wherein:

FIG. 1 is a sectional view looking in the direction of the arrows from a plane designated **1—1** in FIG. 2 extending lengthwise through the center of a fastener and its unlocking key embodying the present improvements, together with a valve that is held closed by the fastener in its locked condition.

FIG. 2 is an elevation of the key still inserted in the fastener after having unlocked the partable sections thereof shown separated and in section on the plane **2—2** in FIG. 1 looking in the direction of the arrows.

FIG. 3 is a view of the handle of the key as in FIG. 1, with its projectable working parts withdrawn to completely within the hollow of the handle.

FIG. 4 shows a portion of FIG. 1 drawn on a larger scale.

FIG. 5 shows a portion of FIG. 4 drawn on a still larger scale.

FIG. 6 is a view taken in section on the plane **6—6** in FIG. 5 looking in the direction of the arrows.

FIG. 7 is an exploded view of abutting surfaces of the key and the fastener modified to oppose relative turning thereof.

The fastener shown in the drawings, with the exception of the locking and unlocking plunger **30**, is substantially like that disclosed in my co-pending application, Ser. No. 443,787, filed Mar. 30, 1965 now Patent No. 3,390,561. It comprises two telescopically separable body sections, one being a hollow main shank **32** having an integral enlarged head **33**, and the other being a removable, thimble-like cap **34** provided with at least one internal annular groove **35**. The bolts of the locking mechanism are herein represented by hard balls **37** which shift radially in transverse bores **39** through the cylindrical wall of the shank into and out of occupancy of the internal annular groove **35** in cap **34** which serves as the strike of the locking mechanism. The aforesaid plunger **30** can be positioned partially within a counterbore **38** in the lower end of shank **32**, and when so positioned block balls **37** from moving radially inward. Plunger **30** is constantly urged to its position in FIG. 1 by an expansion spring **42** under tension between the plunger **30** and the head **33** of shank **32**. The balls **37** are retained against falling out of bores **39** by peaned-over outer edges **36** of the bores. Thus in FIG. 1 the balls **37** protrude into the annular groove **35** so that cap **34** is held securely against removal from the body shank **32**.

In the head **33** of shank **32** there is fixedly lodged a bearing bushing **41** of hard metal providing a restricted aperture **33'** which admits to the interior of the fastener with a snug sliding fit the stem **50** of a draw key **51**. Key **51** comprises a hollow handle **53** into which the stem **50** is telescopically retractable when the key is not in use as shown in FIG. 3. To make it difficult to reproduce the key stem **50** a suggested overall outside diameter is .144 inch and inside diameter .070 inch leaving a compound tubular wall thickness of only .037 inch comprised only of the walls of two relatively slidable telescopic hollow members.

The key stem **50** is of compound construction comprising as an outer tubular member a rigid quill **54** whose top end serves as a ferrule **55** of enlarged diameter containing a screw threaded socket **52**. Quill **54** affords a slide bearing for an inner tubular member comprising a hollow ended pinch rod **56** whose cylindrical wall is resilient and notched at **58** and of a size to sleeve over plunger

stud 60 normally with a free slip fit. The notched end portion of the wall can be made to contract radially sufficiently to grip the plunger stud 60 tightly when the pinch rod is made to slide downward relatively to quill 54 in FIGS. 1, 4 and 5. In the last of said figures the cooperative conformation of the bottom ends of both pinch rods and quill are shown in enlarged detail. The quill terminate downward in a conically tapered opening 57 occupied by the correspondingly tapered periphery 59 of the notched end of the pinch rod.

The aforesaid plunger 30, instead of being hollow or recessed to receive an expansible key stem, is provided at its top with a slim stud 31 projecting from the plunger toward aperture 33' in axial alignment therewith so that the leading end of key stem 50 when inserted into the fastener through said aperture is guided toward plunger stud 31 and sleeves telescopically thereover is shown in the drawings. Means to cause differential lengthwise movement between pinch rod 56 and quill 54 will next be described.

The upper end of pinch rod 56 is fixed in a cylindrical block 65 that is by set screw 64 fast thereto and which has a depending, externally screw threaded appendage 66 whose threads are in mesh with the internal screw threads in socket 52 of ferrule 55. A cross bar 67 is removably lodged in block 65 by the press fit of its roughened portion 68 therein and extends through diametrically opposite slots 69 in the wall of handle 53 so as to be slidable lengthwise thereof. Cross bar 67 is provided with extensions 70 and 71 outside the handle 53 for pulling block 65 lengthwise within the handle. Extension 70 may be integral with bar 67 while extension 71 is a threaded cap that can be screwed onto the threaded end of bar 67 while its tapered open end is stationed in a tapered stop enlargement 72 of slot 69 for temporarily holding the working parts of the key in their retracted position shown in FIG. 3. The extreme top end of handle 53 is covered by a cap of semi-soft material such as rubber or plastic 49 devoid of sharp edges for ease of contact with the palm of an operator's hand while his index finger and second finger are hooked under bar extensions 70 and 71, respectively, for pulling the block 65 toward the capped end of the handle.

While there are many uses for an unlockable fastener of the type herein disclosed, a common use is shown in FIG. 1 where the shank 32 of the fastener extends through aligned apertures in relatively swingable valve lugs 75 and 76, the former being fixed on the valve stem 77 and the latter being fixed and stationary on the valve body 78 which is mounted as a fitting in the fluid conduit 79.

In FIG. 1 the fastener is normally locked by the spring biased plunger 30 against retraction of its bolting balls 37 from the groove 35 in the removable cap 34, regarded as the strike of the lock. The stem 50 of draw key 51 is slidably inserted through the slide bearing aperture 33' in the head of shank 32 which directs the bottom end of stem 50 into encompassing relation to the plunger stud 31 as shown in FIG. 1. To cause the pinch rod 56 to grasp stud 31, the ferrule 55 is held from turning by the thumb and forefinger of one hand of the user while by means of handle 53 the screw threaded appendage 66 of key block 65 is turned relatively to the screw threaded ferrule 55. This forces the pinch rod 56 of the key downward while the quill 54 is prevented from corresponding downward movement by the abutment of ferrule 55 against the top of the shank head 33 of the fastener.

The combined manipulation of ferrule 55 and handle 53 forces the tapered notched end of pinch rod 56 axially downward so that it wipes against the taper in the opening 57 at the bottom end of quill 54. This causes the split wall of the pinch rod to be squeezed radially inward against the plunger stud 31 whereby to grip it with a sufficiently tight cling to enable the plunger 30 to be lifted by extensions 70, 71 of cross bar 67 as in FIG. 2 against the tension of spring 42. This unlocks the cap 34 from balls 37 so that the cap can be removed from shank 32 to open the fastener.

The unlocking key 51 can be modified for one-handed operation as shown in FIG. 7 where abutting surfaces of ferrule 55' and the bushing 41', which is fixed in the fastener head 33, are provided with mating radial ridges and grooves 82 that oppose turning of the ferrule relatively to the fastener when the key stem 50 has entered aperture 33' and ferrule 55' is pressed downward against the fastener and turned by the key handle 53. This screws the threaded appendage 66 into the threaded socket 52 by one-handed operation since the ferrule 55' need not be touched, thus driving downward the pinch rod 56 relatively to the quill and causing the pinch rod to grip the plunger stud 31 and pull it upward by overcoming the tension in spring 42 whereby to uncouple fastener cap 34 from shank 32.

What is claimed is:

1. A lockable fastener with unlocking draw key, the fastener comprising telescopically separable sections, one of which has a restricted aperture in the end thereof, a locking plunger housed by said fastener and reciprocable therewithin, a stud projecting from said plunger toward said aperture in coaxial alignment therewith, and the draw key including a hollow ended compound stem insertable through said aperture into encompassing relation to said stud, said stem including relatively reciprocable inner and outer tubular members, the inner of which members is resiliently contractile to clasp said stud and the outer of which members is shaped cooperatively with said inner member to cause the latter to contract radially into tight gripping relation to said stud responsively to relative reciprocation of said members while said stem is sleeved about said stud.

2. A fastener with draw key as defined in claim 1, together with operatively intermeshed screw and nut devices outside of the said fastener connected to the said inner and outer tubular members of the said key stem in a manner to cause relative reciprocation thereof when the said devices are relatively rotated.

3. A fastener with draw key as defined in claim 2, in which the said outer tubular member is rigid and terminates in an internally conically tapered open end portion.

4. A fastener with draw key as defined in claim 2, in which the said inner tubular member has a notched resilient wall and terminates in an externally conically tapered open end portion.

5. A fastener with draw key as defined in claim 2, in which the said outer tubular member is rigid and terminates in an internally conically tapered open end portion, and the said inner tubular member has a notched resilient wall and terminates in an externally conically tapered open end portion occupying the said end portion of said outer tubular member.

6. A fastener with draw key as defined in claim 2, in which the said nut device comprises an internally threaded ferrule carrying the said outer tubular member and the said screw device comprises a rotatable handle carrying the said inner tubular member.

7. A fastener with draw key as defined in claim 6, in which the said handle is coaxially aligned with the said tubular members and with the said ferrule.

8. A fastener with draw key as defined in claim 7, in which the said screw devices include a hollow handle and a piston carrying the said inner tubular member reciprocative in said handle.

9. A fastener with draw key as defined in claim 8, together with auxiliary handles on said piston located within reach of the said ferrule for operation simultaneously therewith by the operator of the draw key.

10. A fastener with draw key as defined in claim 9, together with detent means for arresting the said auxiliary handles at a predetermined point lengthwise of the said hollow handle including a stop stationed on said hollow handle, and a catch mounted on one of said auxiliary han-

dles in a manner to be moved into and out of arrestable engagement with said stop.

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RICHARD E. MOORE, *Primary Examiner.*

U.S. Cl. X.R.

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