

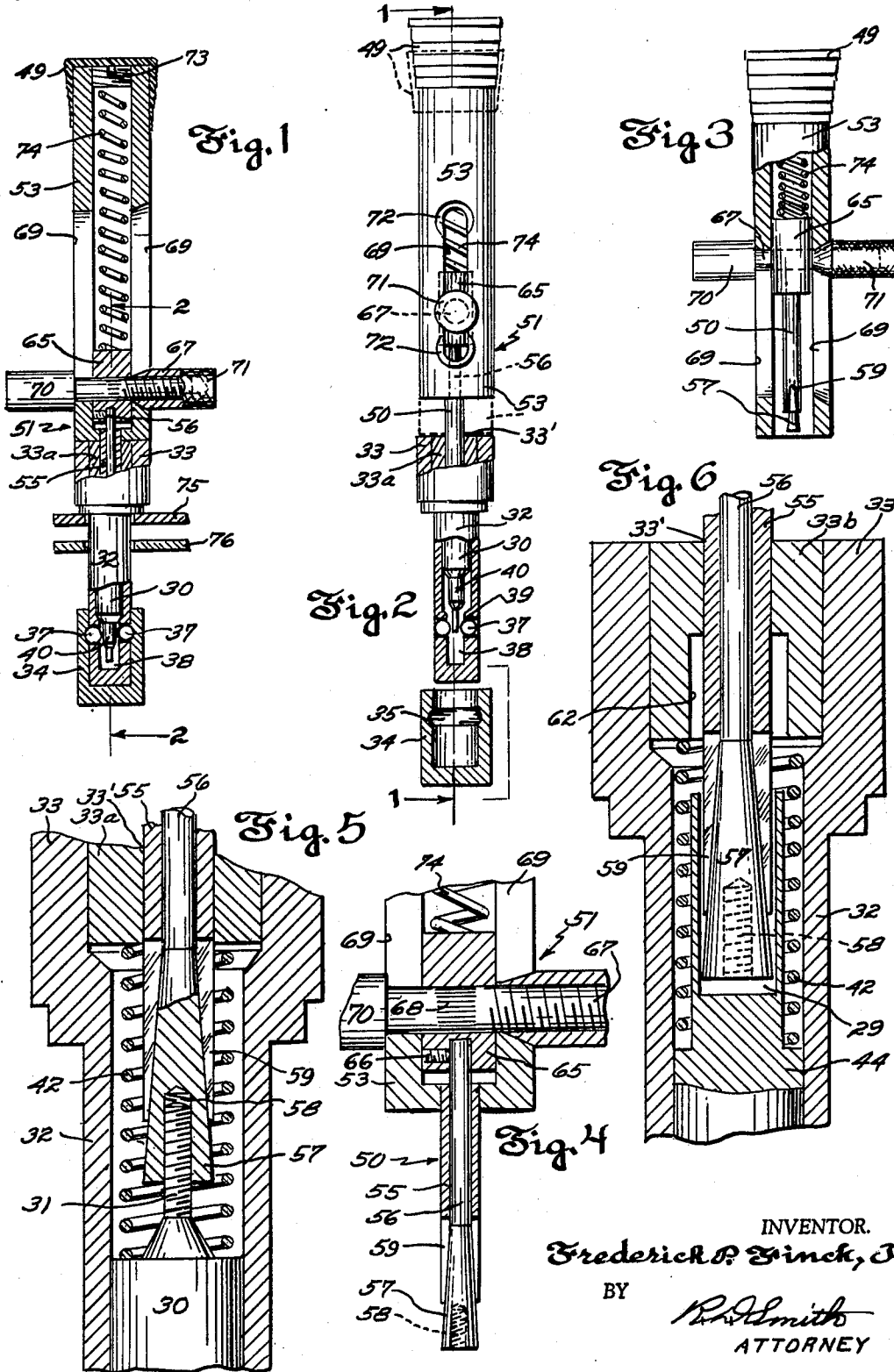
Nov. 18, 1969

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DRAW KEY FOR UNLOCKING FASTENERS HAVING SOLID
OR HOLLOW CONTROL PLUNGERS

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2 Sheets-Sheet 1



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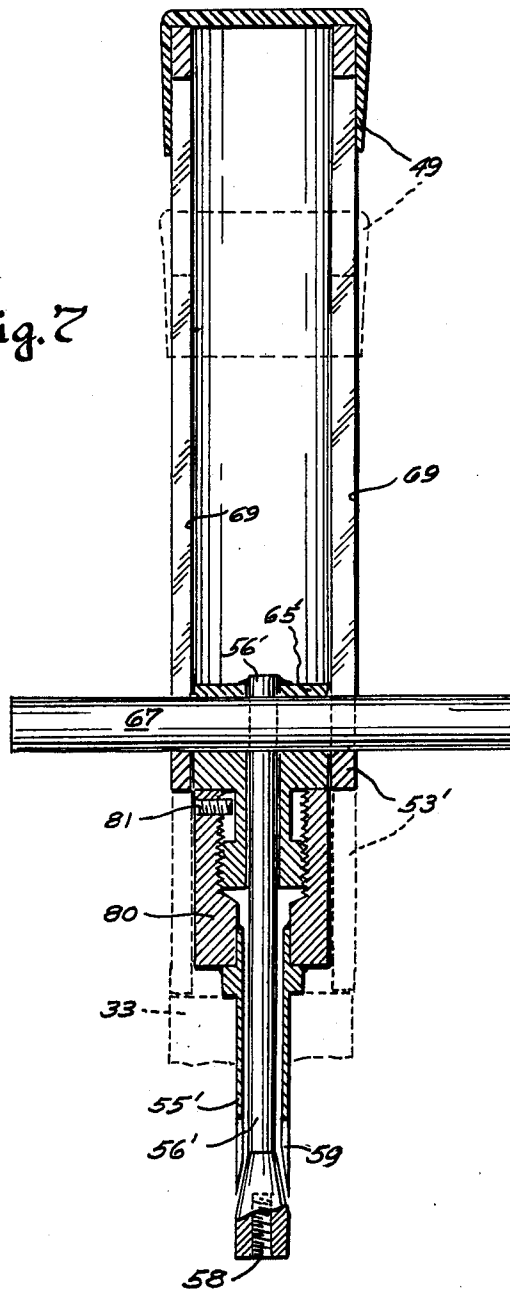
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Fig. 7



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**DRAW KEY FOR UNLOCKING FASTENERS
HAVING SOLID OR HOLLOW CONTROL
PLUNGERS**

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7 Claims

ABSTRACT OF THE DISCLOSURE

A draw key constructed for pulling attachment to fastener locking plungers of diverse constructions. The fasteners have separable telescopically assembled body parts which when locked together retain otherwise separable work elements such as might be coupled by a padlock. The draw key has a main straight hollow handle in coaxial alignment with which a compound stem extends to be inserted in the fastener and into pulling engagement with the control plunger. By manipulating the main handle together with auxiliary handles from outside the fastener the compound stem can be made either to wedge in and cling to the wall of a recess in the end of a hollow type of locking control plunger or can be screwed into pulling engagement with a threaded stud carried by a solid type of control plunger.

Fasteners of the type concerned have heretofore been constructed to be unlocked by the sliding movement of a contained reciprocative plunger. More recently such plungers are being made of diverse constructions, some presenting to the draw key a hollow recessed end receptive to the flaring cling of the key, and others presenting to the key a solid, projecting, threaded stud onto which the plunger engaging end of the draw key can be screwed.

Heretofore such diversification of plungers has required different kinds of keys for opening different fasteners resulting, among other disadvantages, in uncertainty as to what key will open what fastener.

An object of the present improvements is to provide a draw key that is of universal nature in use so that the same key will unlock different fasteners having a diversity of plunger constructions.

A further object is to provide the key with main and auxiliary handles relatively slidable in rectilinear paths along a common axis, and with a plunger pulling, compound stem, a core member of which stem is equipped with a screw threaded socket so that by turning the main handle about said axis the core member can be screwed onto an externally threaded projecting part of a solid type of plunger, the core member also being slidable relatively to an outer tubular member of the compound stem by manipulating the auxiliary handles, whereby to cause the outer tubular member to expand into clinging engagement with a recess in a hollow type of plunger.

These and other objects of the invention will appear in full particular from the following description of a preferred embodiment of the invention having reference to the appended drawing wherein:

FIG. 1 is a view partially in section looking in the direction of the arrows from the plane 1—1 in FIG. 2 showing a draw key embodying the invention adapted to unlock fasteners controlled by reciprocative plungers of differing construction.

FIG. 2 is a view showing the draw key in elevation and the unlocked fastener partially in section on the plane 2—2 in FIG. 1.

FIG. 3 is a view of the handle of the key of FIG. 1,

with its fastener operating parts withdrawn completely to within the hollow of the handle as when not in use.

FIG. 4 shows an end portion of the improved draw key removed from the fastener.

FIG. 5 is a view in section on the plane 2—2 in FIG. 1 drawn on an enlarged scale showing a solid plunger operatively engaged by the improved draw key to be pulled thereby for unlocking the fastener.

FIG. 6 is a similar view on the same scale as FIG. 5 showing a hollow plunger operatively engageable by the same draw key to be pulled thereby for unlocking a different fastener.

FIG. 7 shows a modified form of draw key wherein a screw threaded ferrule is provided for making it unnecessary to hold or anchor the fastener while the unlocking key is being operated.

The fastener shown in the drawings with the exception of the locking and unlocking plunger 30 may be mainly like that disclosed in my copending applications, Ser. No. 443,787, now U.S. Patent No. 3,390,561, filed Mar. 30, 1965, or Ser. No. 692,099, filed Dec. 20, 1967. It comprises separable body sections, one being a hollow shank 32 having an enlarged head 33, and the other being a removable cap 34 having an internal annular strike groove 35. The fastener locking mechanism further includes hard balls 37 serving as locking and unlocking bolts by shifting position in transverse bores 39 through the cylindrical wall of the shank into and out of groove 35 in the cap 34 which groove serves as the strike of the locking mechanism. Thus in FIG. 1 balls 37 protrude from shank 32 into the groove 35 so that cap 34 is held securely against removal from shank 32 and the fastener remains locked. Balls 37 are retained against falling out of bores 39 when cap 34 is not present by means of peened over edges of the bores in usual manner. An intermediate length 40 of plunger 30 can be positioned within a counterbore 38 of reduced diameter in the lower end of shank 32. When so positioned plunger portion 40 blocks balls 37 from moving radially inward out of groove 35. Plunger 30 has a top end of its body portion reduced to form of a projecting stud 31 that is screw threaded externally for pulling engagement with the internally threaded socket 58 in the conically flared end 57 of core member 56 of the stem 50 of the draw key. The plunger is constantly urged to its position in FIG. 1 by an expansion spring 42 which is under tension between the plunger 30 and the head 33 of shank 32. A plunger 44 of modified form is shown in FIG. 6.

In the head 33 of shank 32 there is fixedly lodged a bearing bushing 33a of hard metal providing a restricted aperture 33' which admits to the interior of the fastener with a snug sliding fit the compound stem 50 of the draw key 51. The key comprises a straight hollow handle 53 into which stem 50 is telescopically retractable when the key is not in use as shown in FIG. 3.

Key stem 50 comprises an outer tubular member 55 fixed rigidly at one of its open ends to the straight hollow handle 53 and also a core rod 56 slidable inside the member 55 having the aforesaid conically tapered terminal portion 57 protruding from said open end of the outer member 55. Portion 57 contains a screw threaded socket 58. The wall of member 55 need not exceed .005" in thickness at its tip end that sleeves the tapered terminal portion 57 of core member 56 and is split at 59 to enable said tip end to flare. Means to cause differential lengthwise sliding movement between core member 56 and the outer tubular member 55 will next be described.

The upper end of core member 56 is fixed in a piston block 65 by set screw 66 (FIGS. 1 and 4). 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 of the main handle 53 for sliding block 65 lengthwise within the handle. Extension 70 may be integral with bar 67 while extension 71 is a threaded thimble that when desired can be screwed far enough onto the threaded end of bar 67 so that its tapered inner end is caught by engagement with detentive enlargements 72 of slot 69 for temporarily holding the working parts of the key in their retracted position shown in FIG. 3.

In the top end of handle 53 there is fixedly lodged a removable screw plug 73 retaining a compression spring 74 that bears downwardly upon the piston block 65. Plug 73 and the top end of the main handle are covered by a cap 49 of semisoft material such as rubber or plastic devoid of sharp edges. This eases contact with the palm of an operator's hand while the index finger and second finger of the same hand are hooked under bar extensions 70 and 71, respectively, for pulling the piston block 65 upward toward the capped end of the handle.

In FIG. 1 a typical use for the kind of fastener here concerned is indicated by the holding together in face to face relation of exemplary work parts 75 and 76 which otherwise are free to separate. Typical of such work parts to be held together by the fastener are relatively movable handles of valves, electric switches, etc. for the purpose of preventing unauthorized opening thereof. See my copending application filed Dec. 20, 1967.

In describing the operation and use of the improved draw key, reference will be made to the unlike, lock controlling plungers designated 30 on the one hand in FIGS. 1, 2 and 5 and on the other hand designated 44 in FIG. 6. Plunger 30 is herein referred to as a solid plunger and is mainly like the fastener controlling plunger disclosed in my aforesaid application No. 443,787. The modified plunger 44 is herein termed a hollow plunger and is mainly like that disclosed in my aforesaid application No. 692,099, filed December 20, 1967. The pliers type of handle proposed for manipulating the draw key in the earlier filed application is not capable of turning a core member such as 56 about its own axis. It therefore cannot be used for screwing the key stem 50 onto the threaded stud 31 of plunger 30 herein.

The top end of modified plunger 44 in FIG. 6 is made hollow by a recess 29 that is receptive to the compound key stem 50. Because of longitudinally extending splits 59 the flarable outer tubular member 55 of the key stem can be laterally expanded into tight clinging engagement with the cylindrical wall of recess 29 thus making firm pulling attachment to plunger 44. The bearing bushing 33b in FIG. 6 is shown to have a cavity 62 into which the top end of plunger 44 can rise.

Starting with the key 51 removed from the fastener and the fastener parts 32 and 34 automatically locked by plunger 30 positioned by spring 42 as in FIGURES 5 and 6, the key will be prepared for insertion in the fastener by positioning its handle parts 53, 70 and 71 as in FIG. 4. Here the auxiliary handles 70 and 71 are positioned at the bottom of slots 69 in the main handle 52 where they may be detained by screwing handle 71 onto the cross bar 67 far enough to lodge the tapered end of handle 71 in the stop enlargement 72 at the lower terminal of the slot. By turning handle 53 on its own longitudinal axis the socket 58 in the bottom end of core member 56 can be screwed into threaded engagement with the stud 31 on the solid type plunger 30.

Now with the second and third fingers of the operator's hand crooked under the cross handles 70, 71 the entire key can be lifted so as to part from the fastener head 33 whereupon the key stem draws upwardly on the locking plunger 30 lifting it from locking position in FIG. 1 to its unlocking position in FIG. 2 against the yielding opposition of spring 74. Release of the key stem from the plunger is accomplished by turning handle 53 in reverse direction to unscrew core member 56 from plunger stud

31. The bearing of plunger 30 on contacting parts affords sufficient friction to prevent the plunger from being rotated by the turning of core member 56.

When the same draw key is to be used to pull upward on a hollow plunger such as 44 in FIG. 6, the operation of turning handle 52 to screw core member 56 onto the plunger will of course be omitted. The key stem 50 will be inserted into the cavity 29 of the plunger. Cross handle extension 71 will then be disengaged from the lower detent seat 72 by backing it off from cross bar 67. The cross handles 70, 71 can then be lifted toward the top of main handle 53 by pressing the handle cap 49 against the palm of the operator's same hand whose fingers pull upwardly on the cross handles. The cross handles are shown to be so lifted in FIG. 2 which as hereinbefore explained causes a downward thrust on the outer member 55 of the key stem simultaneously with an upward pull on the core member 56 of the stem. It has been explained that this draws the tapered end of the core member inward of the bottom end of the flarable outer member 55 and expands the latter laterally so as to wedge against the wall of the cavity 29 with a sufficiently tight cling to pull the plunger upward into unlocking position when the key is drawn away from the fastener as in FIG. 2. The key will be released from the plunger automatically by the action of spring 74 when the operator opens his hand, the fastener being detained by work parts such as 75, 76 which it has served to lock together.

It is thus shown that the same key is operative to unlock fasteners having either solid or hollow type lock controlling plungers with the benefits explained.

It will be noted that a key constructed as in FIG. 6 requires that the main handle 53 be separated somewhat from the head 33 of the fastener in order to draw the plunger into unlocking position because the outer tubular member 55 of the compound key stem 50 is fixed to said main handle. Hence movement of cross handles 70, 71 relative to main handle 53 alone cannot pull upward on the plunger 30 or 44 with the degree of leverage available in the draw key disclosed in my copending application filed Dec. 20, 1967.

The same leverage advantage can be had, however, if the presently improved key is equipped with a ferrule 80 as shown in FIG. 7. In that case, as in FIGS. 1 to 6 inclusive, the key will operate either solid or hollow plungers and its construction will be as follows.

Key handle 53' has the longitudinal slots 69 in which ride the cross handles 67'. The outer tubular member 55' of the key stem is not fixed to the main handle 53' but is fixed to a ferrule 80 that has screw threaded engagement with piston 65', a stop 81 limiting the extent of unscrewing of the ferrule from the piston. The outer tubular stem member 55' is fixed to ferrule 80 instead of directly to the main handle 53'. The core member 56' is substantially as shown in FIGS. 1 to 6, inclusive, containing the screw threaded socket 58'.

To operate the key of FIG. 7 in the fastener of FIG. 5 main handle 53' as before can be turned for screwing core member 56' onto the threaded stud 31 of the plunger 30 in the fastener. Now if the cross handles 67' are pulled upward by the second and third fingers of the operator's hand whose palm is pressing downward on the top of main handle 53' there will be an upward pull on the plunger simultaneously with a downward thrust of the main handle against fastener head 33 resulting in a strong force being exerted manually for shifting the plunger to its unlocking position shown in FIG. 2, this not requiring the fastener to be anchored or held downward during the upward pull of the key.

To operate the same key of FIG. 7 for unlocking the fastener of FIG. 6, the main handle 53' will be turned while the ferrule 80 is held from turning by the other hand of the operator. This causes differential longitudinal sliding between core member 56' and the outer stem member 55' in directions to draw the core member into

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flared wedging attachment to the plunger 44 as in FIG. 6. This action is explained in full in my copending application filed Dec. 20, 1967. When such attachment is accomplished the handles 53' and 67' will be cooperatively manipulated as in FIG. 2 while the main handle 53' is thrust downward into abutting contact with the fastener head 33 shown in broken lines in FIG. 2. A piston restoring spring such as 74 may be placed in the hollow of handle 53'. In the unlocking operation of the key here referred to it will be seen that the handle 53' pushes downward on the fastener head 33 while the core member pulls upward on the plunger making it needless to hold the fastener against rising with the plunger.

What is claimed is:

1. A draw key for unlocking fasteners by pulling engagement with either hollow or solid locking plungers interchangeably, said key comprising, handle parts arranged to slide relatively along a common axis when manipulated by a single hand of the user, a compound draw stem for insertion in the fastener comprising a radially flarable outer tubular stem member operably connected to one of said relatively slidable handle parts and a core member of said stem operably connected to another of said handle parts in a manner to be caused to slide inside of and relatively to said flarable tubular member, said core member having a conically tapered terminal portion cooperating with said flarable tubular member in a manner to expand the latter into clinging engagement with a hollow locking plunger responsively to relative sliding of said handle parts, and a screw threaded socket in said terminal portion of said core member aligned with said common axis and disposed to be screwed as a nut into holding engagement with a threaded solid plunger by turning said key handles about said common axis.

2. A draw key as defined in claim 1, in which the said core member of the said stem is fixed in all respects to one of the said relatively slidable handle parts.

3. A draw key as defined in claim 1, in which the said outer member of the said compound stem is an integral rigid tube fixedly joined at one end to one of the said relatively slidable handle parts.

4. A draw key as defined in claim 1, in which the said outer tubular member of the said key stem is fixed to a first one of the said relatively slidable handle parts, and

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the said core member is fixed to another one of said handle parts.

5. The combination with a draw key as defined in claim 1, of a fastener having a tubular shank, and a fastener locking plunger of the solid type comprising a relatively large body portion slidably fitting said shank and having an end portion carrying external screw threads sufficiently small in diameter to provide annular space between said shank and said threads permitting the said members of the said compound key stem to perform relative telescopic movement in said space while in sleeving relation to said screw threads, whereby to minimize the overall length of a draw key capable of pulling either on a solid or hollow plunger in the fastener.

6. The combination defined in claim 5, together with a ferrule fixedly connected to the said outer member of the said compound key stem having screw threaded connection to the said inner member of said stem, said ferrule being accessible for rotary manipulation between the said fastener and the said handle parts.

7. The combination defined in claim 6, in which one of the said handle parts is hollow and the said ferrule is telescopically slidable within said hollow handle part whereby to permit the latter to be pressed against the said fastener while the other of said handle parts slides within said hollow handle part in a direction away from said fastener for pulling on the said solid locking plunger in the fastener.

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70—34, 386, 387