

May 8, 1962

S. M. MOBERG

3,033,016

KEY FOR A PLUNGER TYPE LOCK

Filed June 1, 1960

3 Sheets-Sheet 1

Fig. 1.

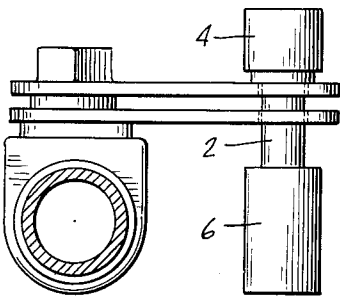


Fig. 2.

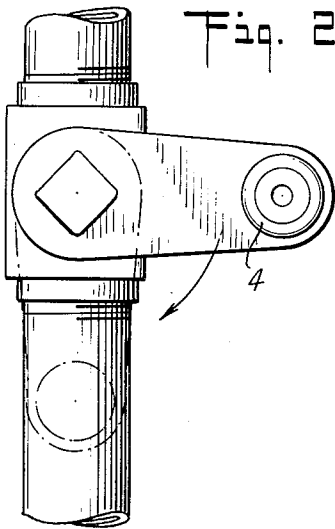


Fig. 5.

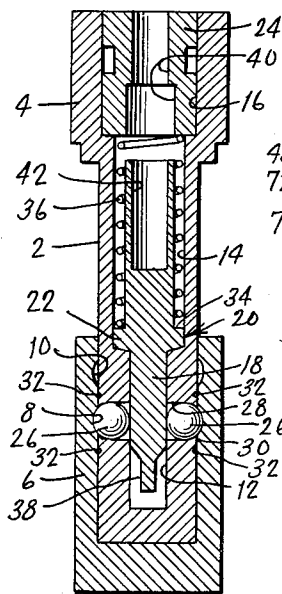


Fig. 6.

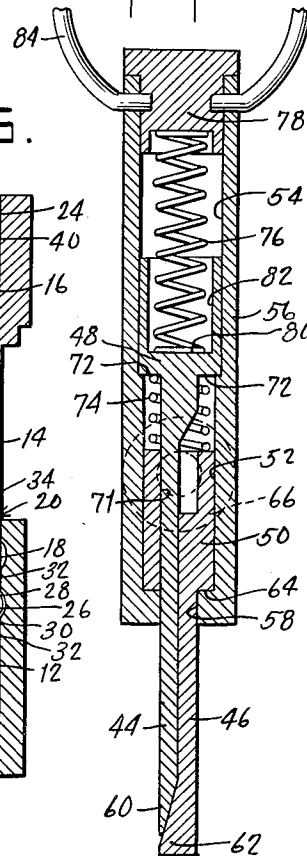


Fig. 3.

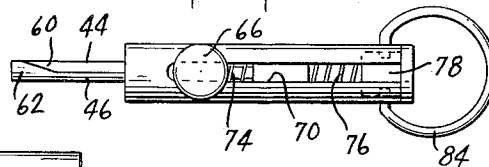
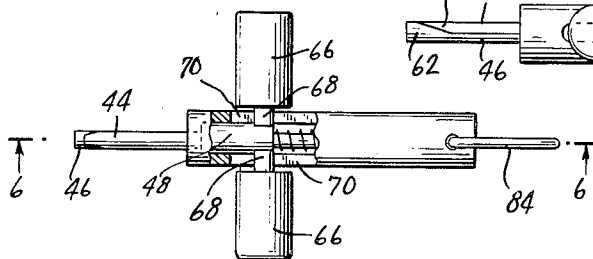


Fig. 4.



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Fig. 7.

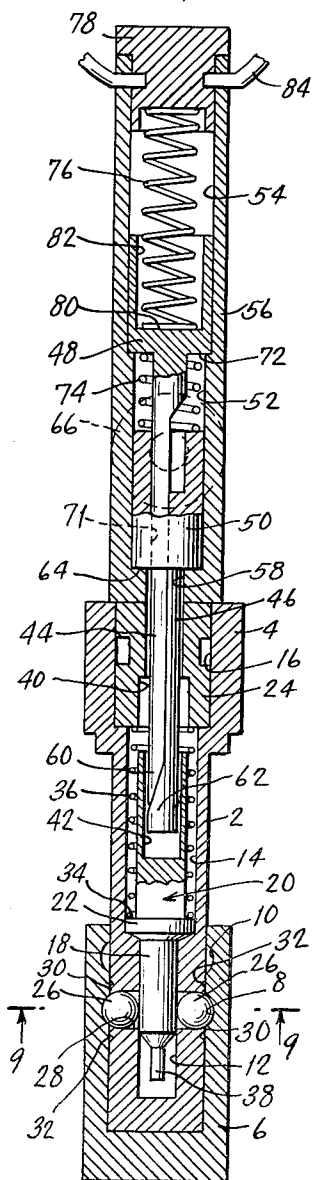


Fig. 8.

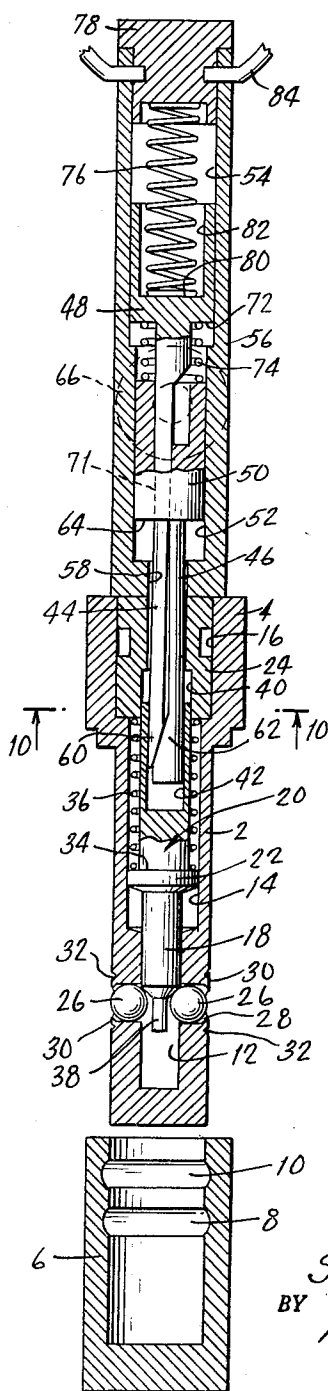


Fig. 9.

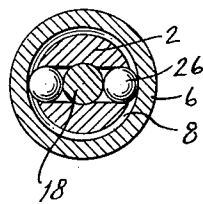
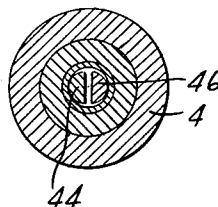


Fig. 10.



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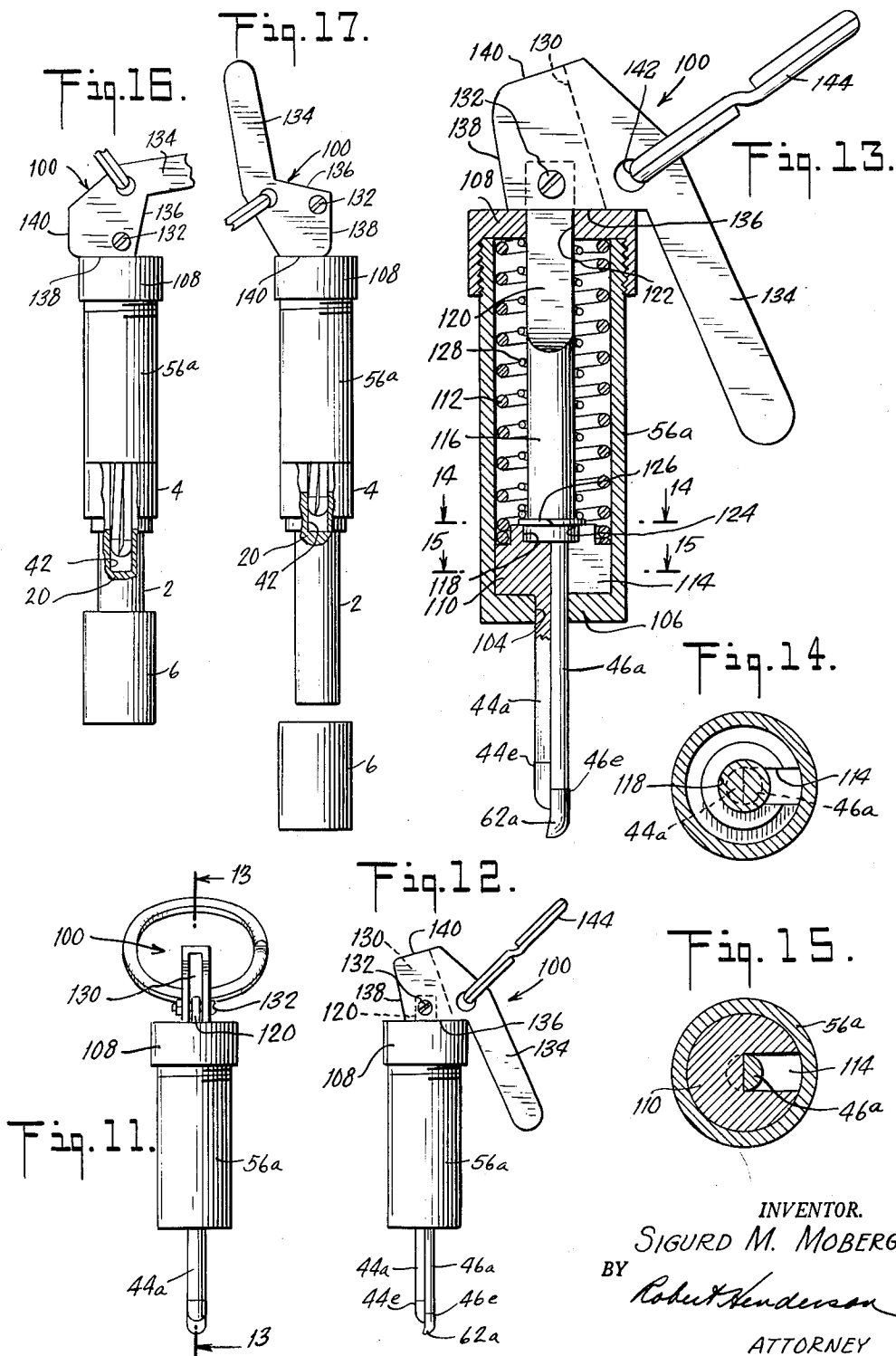
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3 Sheets-Sheet 3



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KEY FOR A PLUNGER TYPE LOCK

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12 Claims. (Cl. 70-395)

This invention relates to a plunger-type of lock having an enlarged head integral with or fixed on one end of a shank or plunger and a separate, enlarged head which may be applied to the other end of the plunger and removed therefrom by means of a key; and relates, also, to a key suitable for opening such a lock.

Such a plunger type of lock is commonly used to hold, in locked relationship, two members having similar apertures which may be moved into such relationship that the two apertures are in alignment. The plunger of the lock, minus the mentioned removable head, may be inserted into and through said apertures, whereafter the removable head may be applied endwisely to the plunger and be removable thereafter only by the use of a suitable key. The two heads, of course, are of greater diameter than the two apertures, so that once the lock is in place in association with the two mentioned apertured members, the latter cannot be materially moved or separated except upon unlocking of the lock with the key and removal of the lock from the apertured members.

Such locks and keys therefor are not fundamentally new; however, the present invention has, for an important object, the provision, for such a lock, of an improved key which is not easily duplicated, and which may be easily manipulated to open the lock.

Another object of the invention is the provision of an improved plunger-type lock which cannot be opened by prior keys designed for use with prior locks, and the provision, also, of an improved key, conveniently usable to open either the present improved plunger-type lock or the prior plunger-type locks.

Preferred embodiments of an improved plunger-type lock, keys for said lock, and lock and key combinations, according to this invention, are disclosed in the accompanying drawings without, however, limiting this invention to the structures shown therein.

In the drawings:

FIGURE 1 is an elevational view illustrating the improved plunger-type lock in locking association with an arm of a valve such as might be used, for example, in a gas-carrying pipeline.

FIG. 2 is an elevational view as seen from the top of FIG. 1.

FIG. 3 is a side elevational view of a first form of improved key suitable for use in such a lock.

FIG. 4 is a side elevational view of said key as viewed from the top of FIG. 3; partly broken away to show some internal details.

FIG. 5 is an enlarged, central, longitudinal sectional view of said lock.

FIG. 6 is an enlarged, central, sectional view of said key; this view being taken substantially on the line 6-6 of FIG. 4.

FIG. 7 is a central, longitudinal, sectional view of said lock and said key, inter-associated as immediately before the manipulation of the key to open the lock.

FIG. 8 is a view substantially the same character as FIG. 7, but showing the lock and key as immediately following the manipulation of the key to open the lock.

FIG. 9 is a cross-sectional view of the lock substantially on the line 9-9 of FIG. 7.

FIG. 10 is a cross-sectional view of the lock and key substantially on the line 10-10 of FIG. 8.

FIG. 11 is a side elevational view of a second or modified

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form of improved key according to this invention, usable with the disclosed plunger-type lock.

FIG. 12 is a side elevational view of the modified key as viewed from the right side of FIG. 11.

FIG. 13 is an enlarged, central, longitudinal, sectional view of the modified key, substantially on the line 13-13 of FIG. 11.

FIG. 14 is a cross-sectional view of the modified key, substantially on the line 14-14 of FIG. 13.

FIG. 15 is a cross-sectional view of the modified key, substantially on the line 15-15 of FIG. 13.

FIG. 16 is a side elevational view, at about the same scale as FIGS. 11 and 12, of the modified key in the disclosed plunger lock, the latter being broken away to show operation of the key preliminary to unlocking of the lock.

FIG. 17 is a view generally similar to FIG. 16, but showing operation of the key to open the lock.

The lock, as may be understood from FIG. 5, comprises a cylindrical shank 2 having at its upper end (as viewed in the drawings) an integral enlarged head 4, and, at its lower end, a removable enlarged cup-shaped head 6 formed with an internal annular groove 8 which functions as a locking groove when the shank 2 is seated at its inner-most position in the head 6, as illustrated in FIGS. 5 and 7. A similar supplemental internal annular groove 10 may optionally be employed within the head 6 to permit locking of the lock, with its heads 4 and 6 somewhat farther apart than shown in FIGS. 5 and 7 as may sometimes be desirable or necessary.

The shank 2 and the head 4 are formed with bores and counterbores 12, 14 and 16 therein which respectively accommodate therewithin a lower portion 18 of a slidable operating member 20, an enlarged upper portion 22 of said slidable operating member and a retaining plug 24 which is so tightly fitted into the bore 16 that it may not accidentally become dislodged therefrom.

Toward the lower end of shank 2 are provided two locking balls 26 disposed at opposite sides of the lower portion 18 of the operating member 20 within a transverse bore 28 which extends completely through the shank and intersects the bore 12. The balls 26 fit precisely but, nevertheless, movably in the bore 28 and are held against dislodgment from the latter by slight inward projections 30 of metal formed at the opposite extremities of bore 28 by peening or knicking the metal of the shank 2 at points marked 32, in a well-understood manner. When the operating member 20 is in its lowermost position in relation to the shank 2, as shown in FIGS. 5 and 7, the lower portion 18 of the operating member engages the two balls 26 and holds them in their outermost positions in the bore 28, in which positions they extend into internal groove 8 in the head 6 whereby securely to hold the latter on the shank 2. Obviously, a similar association of parts would serve to cause the balls 26 to cooperate with annular groove 10 for the same purpose if the head 6 were not to be pushed completely onto the shank 2.

The enlarged upper portion 22 of the operating member 20 is exteriorly reduced to form on said member an annular shoulder 34 and to provide an annular space to accommodate a coil spring 36 which is compressed between the shoulder 34 and the inner end of retaining plug 24.

The end of lower portion 18 of the operating member 20 is reduced, as at 38, and when the operating member 20 is slid upwardly as indicated in FIG. 8, the reduced end 38 is in transverse alignment with the balls 26, thereby permitting the latter each to move inwardly and to become disengaged from the groove 8 (or groove 10) and thereby enable the head 6 to be completely separated from the remainder of the lock as shown in FIG. 8. It will be seen that the compressed spring 36 normally holds the operating member 20 in locking relationship to the balls 26

and that the opening of the lock depends upon the provision of means for sliding the operating member 20 upwardly in the shank 2 against the force of the spring 36. The latter means are in the form of the illustrated key which, with its operation, will now be described.

The retaining plug 24 is formed with a bore 40 extending throughout its length, and the upper end of the upper portion 22 of the operating member 20 is formed with a longitudinal bore 42, these bores being provided in the lock to permit the insertion and operation of key fingers as hereinafter described.

Fundamentally, the key of FIGS. 3, 4 and 6—8 includes a pair of fingers which enter the bore 42 and are then spread apart to enter into tight frictional engagement with the wall of said bore, and, when held thus spread, axial or longitudinal movement of said fingers causes the operating member 20 to slide between its locking position, as in FIGS. 5 and 7, and its unlocked position, as in FIG. 8. More particularly, such key fingers, shown at 44 and 46, are formed respectively with enlarged inner ends 48 and 50 which are slidable within bores 54, 52 formed within a cylindrical housing 56. The mentioned fingers, as may best be seen from FIG. 10, are complementarily semi-circular in cross-sectional shape and extend through a circular aperture 58 formed in the bottom of the housing 56.

The lower end of finger 44, at the side thereof which intimately faces finger 46, is tapered away from the latter finger to form a wedge portion 60, and the lower end of finger 46, at its side which intimately faces finger 44, is enlarged and tapered toward the latter finger to form a wedge portion 62 which cooperates with wedge portion 60 to spread the lower ends of the two fingers apart when said fingers are moved longitudinally in relation to each other.

The lower portion of finger 46 and the enlarged upper end 50 adjoin at a shoulder 64 which normally seats within the housing 56 at the bottom of the bore 52, and the length of the enlarged upper end 50 is somewhat less than the length of the bore 52. Opposed, lateral, operating arms 66, disposed exteriorly of the housing 56, are formed with reduced inner ends 68, as clearly shown in FIG. 4, which extend slidably through and within similar longitudinal slots 70, formed in opposite sides of the housing 56; and the inner ends 68 are rigidly fixed to the enlarged upper end 50 of the finger 46.

The finger 44 extends upwardly, slidably, through aperture 58 and a longitudinal bore 71 formed in the enlarged upper end 50 of the finger 46. The lower portion of finger 44 extends upwardly beyond the enlarged upper end 50 of the finger 46 to a point at which it, at a shoulder 72, adjoins the enlarged upper end 48. The enlarged upper end 48 normally seats down upon a shoulder within the housing 56, which shoulder defines the juncture of bore 52 with bore 54. The enlarged upper end 48 of the finger 44 is substantially shorter than the bore 54 so that part of finger 44 and the latter's upper end portion 48 are slidable longitudinally within the housing 56.

The finger 46 is normally held yieldably in its lowermost position in the housing 56 by coil spring 74 which is compressed between the enlarged upper end 50 of the finger 46 and the shoulder 72. The finger 44 is normally held yieldably in its lowermost position, as shown in FIG. 6, by a coil spring 76 which is compressed between a plug 78 fixed in the upper end of the housing 56 and a bottom surface 80 of a bore 82 formed, to accommodate the latter spring, in the upper part of the enlarged upper end 48 of the finger 44. As a convenience for carrying the key, the latter may be provided with a ring 84 pivotally connected to the upper end of the housing 56.

In utilizing the described lock and key, the opening of the lock, from its closed or locked condition shown in FIG. 5, is accomplished by inserting the fingers 44, 46 of the key into and through the bore 40 and into the bore 42 of the lock until the lower end of the key's housing

56 abuts the upper end of the head 4 of the lock, as illustrated in FIG. 7, in which association the wedge portions 60 and 62 of the key's fingers are within the bore 42. Then, while the housing 56 is thus held against the lock by the palm of the user's hand, the operating arms 66 are pulled upwardly (i.e., rightwardly as viewed in FIGS. 3 and 4) by the user's fingers, as far as they can go. Finger 46 and, to a lesser extent, finger 44 move with the arms 66, and such operation serves to release or open the lock.

This upward movement of the arms 66, while occurring as a continuous or uninterrupted operation, nevertheless, performs two distinct functions. The first of these functions is a wedging action which takes place between the wedge portions 60 and 62 to urge said portions apart. That wedging action occurs because initial upward movement of the arms 66 and finger 46 takes place without any accompanying movement on the part of finger 44; this because spring 76 is stronger than the spring 74. This initial movement of finger 46 continues to the extent necessary to cause the wedge portions 60 and 62 to wedge the fingers 44 and 46 apart and tightly against the wall defining the bore 42 in the lock's operating member 20.

When the mentioned wedging action has been completed and, because of that action and also because of the considerably compressed condition of spring 74, the continued upward movement of the arms 66 relative to the housing 56 causes the two fingers 44 and 46 to move upwardly in unison, and because of the tight frictional engagement of those fingers with the lock's operating member 20 within the latter's bore 42, said operating member is pulled upwardly within the shank 2 against the force of the spring 36. This upward movement of the lock's operating member 20 within the shank 2 causes the lower end portion 38 of said operating member to come into transverse register with the balls 26, as in FIG. 8, freeing said balls to shift inwardly to become disengaged from inner annular groove 8 (or groove 10) of the lock's head 6, thereby permitting opening of the lock by separation of the head 6 from the rest of the lock. By the time that the lock's operating member 20 has reached its upper or unlocking position, as indicated in FIG. 8, the load or force accumulated in the springs 36, 74 and 76 will sufficiently oppose further upward movement of the fingers 44 and 46 to terminate such upward movement of the operating member 20.

After the lock has been opened in the manner described, the user releases arms 66, whereupon springs 74 and 76 expand and restore the fingers 44, 46 to their non-wedging or inoperative relative positions shown in FIG. 6. As said fingers no longer grip the operating member 20 of the lock, said operating member is restored by spring 36 to its ball-holding or locking position shown in FIGS. 5 and 7; and the key may be freely withdrawn from the lock.

To put the head 6 back upon the shank 2 of the lock and to lock said head thereon, the key's fingers 44, 46 are reinserted in the lock and the key is then operated by pulling its arms 66 upwardly, in the manner already described, thereby raising the lock's operating member 20 and enabling the balls 26 to move inwardly in the lock to permit the association of the head 6 therewith. Then, release of the arms 66 permits the lock's operating member 20 to descend, in the manner just described, and force the balls 26 outwardly and partially into groove 8 (or 10) to secure the head 6 upon the remainder of the lock against any possible disassociation therefrom without the use of a key.

The second or modified form of key, illustrated in FIGS. 11-17, differs from the described first form of key chiefly in having a manually operable cam member 100 which performs the functions of the operating arms 66 of the first form of key, and in having a more compact arrangement of lock-operating fingers and telescoping springs related to said fingers.

Referring particularly to FIG. 13, the second form of key has cross-sectionally semi-circular fingers 44a and 46a, the latter having a wedge portion 62a at its lower end causing said fingers to be wedged apart when finger 46a is shifted upwardly relative to finger 44a, so that the just-mentioned fingers operate like and for the same purposes as fingers 44 and 46 of the first key.

The fingers 44a and 46a extend upwardly, slidably through an aperture 104 in the lower, flat end 106 of a cylindrical housing 56a, threaded on the upper end of which is a cap 108. An almost completely circular, integral, enlarged upper end portion 110 of finger 44a is slidable within the housing 56a, and a spring 112, compressed between the cap 108 and portion 110, normally holds finger 44a in its lowermost position shown in FIG. 13.

Finger 46a extends slidably upwardly through aperture 104 and also through a slot 114 in portion 110, and has an enlarged plunger-like upper end portion 116 which is eccentric with respect to finger 46a but is concentric to the housing 56a. The lower end of portion 116 seats within a recess 118 in the top of portion 110. The upper end of portion 116 is formed as an integral extension 120 of rectangular shape in cross-section, and this extension extends upwardly, slidably through a rectangular aperture 122 in the cap 108 and beyond the top surface of the latter.

The portion 116 is slightly shouldered as at 124 to support a washer 126, and a coil spring 128, surrounding portion 116 and telescoped within spring 112, is compressed between the washer 126 and the cap 108 to yieldably hold the finger 46a normally in its lowermost non-wedging or non-operative position shown in FIG. 13.

The upper end of extension 120, protruding above the cap 108, is disposed within a slot 130 in the cam member 100 wherein it is pivotally held by a suitable pivot pin or bolt 132. The cam member is shaped substantially as illustrated and has an operating handle 134 and first, second and third cam surfaces, numbered, respectively, 136, 138 and 140, which cooperate with the top surface of cap 108 to operate the fingers 44a and 46a. Optionally, the cam member may be formed with an aperture 142, permitting attachment of the key to a split key ring 144.

When cam member 100 is positioned, as in FIGS. 12 and 13, with cam surface 136 against the flat top of cap 108, the fingers 44a and 46a are in non-wedging or non-operative position and the key's fingers may be freely inserted into or removed from a lock of the character disclosed herein. Assuming that said fingers, in their non-wedging positions, have been inserted in a lock to open the latter, and that the bottom of cylinder 56a abuts the top end of the lock as in FIG. 16, manual turning of the cam member counterclockwise, to bring cam surface 138 into intimate contact with cap 108, as shown in said figure, causes finger 46a to be raised so that the key's fingers are wedged apart to grip tightly the inner surface of bore 42 of the lock. This positively associates the key with the lock, but does nothing more. Optionally, the extremities of the fingers 44a and 46a may be slightly enlarged as indicated at 44e and 46e to localize, at said extremities, the gripping engagement of the fingers with the inner surface of the bore 42 of the lock.

Thereafter, to open the lock, the cam member 100 is given a further counterclockwise movement to bring cam surface 140 into intimate contact with the cap 108, thereby raising the two inter-wedged fingers 44a and 46a, concomitantly raising the lock's operating member 20 from its FIG. 16 position to its FIG. 17 position. This brings the reduced lower end 38 of said operating member (FIG. 8) into register with the balls 26 to permit the latter to withdraw from groove 8 (or 10) to free the lock's head 6 in the manner already described.

It should be observed that the disposition of the cam surfaces 136, 138 and 140 is such as to yield the de-

scribed operation. Additionally, however, the springs 112 and 128 coact with portions 116 and 120 and with the cam member 100 to cause the latter to remain in whichever of the three described positions to which it may be moved. Thus, while the described first form of key remains associated with the upper part of the lock only while the arms 66 are held by the user in their raised or wedging position, the described second form of key remains securely associated with the upper part of the lock when either of cam surfaces 138 or 140 is in intimate contact with the cap 108. This feature, particularly where cam surface 140 is in contact with the cap 108, is a great convenience, as the key, then, remains with the upper part of the lock in readiness for convenient, subsequent re-closing of the lock.

Re-closing of the lock, where the second form of key is employed, involves only the re-application of the head 6 to the lock and turning of the cam member 100 back to the position shown in FIGS. 12 and 13, whereafter the key readily separates from the lock.

The described operation of the keys disclosed herein is much more convenient than the operation of keys heretofore provided for such locks. Additionally, the described arrangement, under which the fingers 44, 46 or 44a, 46a are wedged apart within the lock, provides a positive means for gripping and operating the lock's operating member 20 despite the fact that, in contrast to designs of previous locks of this type, the bore 42 of said operating member is not in any way constricted toward its upper end. Such constriction of the bore 42 toward its upper end, a necessary or desirable characteristic in prior plunger lock and key arrangements, involves troublesome and costly machining to form the bore 42, while, in the presently disclosed lock, the bore 42 may be easily and economically formed.

It should be noted, moreover, that keys, according to this invention, may be used to open prior plunger locks in which the only substantial difference from the lock disclosed herein resides in the mentioned constriction of the upper end of the bore 42. Obviously, the wedged-apart fingers 44, 46 or 44a, 46a will just as effectively grip within a bore having a constricted upper end as they will within a bore having no such constriction. Because of this situation, the key disclosed herein may be used, not only with new locks, according to this invention, which may be more economically produced, but such keys may also be used to open the mentioned older type of plunger locks. Thus, by utilizing this invention, the advantages of the newer locks are available, while, as the new type of key disclosed herein can open both old type and new type locks, it is not necessary for a workman to carry both types of keys.

It will be apparent that the disclosed concepts may be utilized in other ways than disclosed herein, without, however, departing from the invention as set forth in the accompanying claims.

I claim:

1. A key for opening a lock which has a slidable operating member which is yieldably biased toward locking position and has a bore, opening in the direction of movement of said operating member away from said locking position toward an unlocking position, said key comprising a housing, plural, relatively slidable finger elements carried partly within said housing and having integral flexible fingers projecting from said housing in intimate side-by-side relationship and adapted to enter said bore, spreading means coacting with said fingers for spreading the latter apart, in response to relative sliding movement of said finger elements, into firm frictional engagement with wall portions of said bore, yieldable means coacting with said housing and said finger elements to urge said fingers outwardly relatively to said housing and manually operable means projecting from said housing and coacting with said finger elements to relatively slide the latter and to impart a retracting, uni-

son movement to said fingers, when the latter are thus spread, to cause movement of the lock's said operating member toward its unlocking position.

2. A key according to claim 1, said spreading means comprising a wedge formation at the end of one of said fingers and arranged to coact with another of said fingers, upon relative longitudinal movement of said one and other of the fingers, to spread said fingers apart, and said manually operable means being adapted to impart said relative longitudinal movement to said fingers.

3. A key according to claim 2, said manually operable means including a manipulatable projection, connected with one of said fingers and accessible at the exterior of the key for manipulation to move the finger, connected to it, relatively to another of said fingers and thereby spread said fingers apart; and said projection being further manipulatable, after said spreading of the fingers, to move said fingers and said operating member, gripped by said fingers, toward said member's unlocking position.

4. A key according to claim 3, said projection extending laterally, relatively to said fingers, to the exterior of the key.

5. A key according to claim 3, said projection extending endwisely, relatively to said fingers, to the exterior of the key.

6. A key according to claim 5, said key including a manually operable cam pivotally connected to the outer end of said projection and coacting with an adjacent portion of said housing to actuate said projection.

7. A key according to claim 6, said cam having different surfaces coacting with said housing to position said projection and the finger connected thereto in three different positions in which, (1) said fingers are unspread, (2) said fingers are spread apart, and (3) said fingers are firmly engaged within the lock's operating member and the latter is in its unlocking position.

8. A key for opening a lock which has a cylindrical housing, an an internal, cylindrical operating plunger which is axially slidable oppositely between locking and unlocking positions and is formed with a bore, opening and facing in the direction of movement of the plunger toward its unlocking position; said key comprising a cylindrical housing, a pair of longitudinally slidable finger elements having inner portions within said key housing and integral fingers projecting from one end of the key housing, spring means within the key housing coacting with said inner portions of the finger elements to urge

said fingers outwardly, wedge means at the outer extremity of one of said fingers coacting with the other of said fingers to spread the two fingers apart upon relative movement of the latter, and an extension connected to the inner portion of one of said finger elements and extending to the exterior of said key housing; the key housing being abutable endwisely against the lock housing with said fingers disposed within said bore, and said extension being manually movable to move one of said finger elements relatively to the other of said elements to cause the wedge means to spread apart and grip said plunger within said bore, and the extension being further movable to move said plunger toward its unlocking position.

9. A key according to claim 8, said extension being slidable longitudinally of said key housing within a longitudinal slot formed in the latter.

10. A key according to claim 8, said extension being slidable longitudinally of said key housing within an aperture formed in an end of said key housing and having an external cam pivoted thereto, manually movable to three different positions in which different cam surfaces of said cam coact with the key housing (1) to hold said in non-spread relative positions, (2) to hold said fingers in spread relative positions, and (3) to hold said fingers in retracted positions with the plunger of the lock gripped by said fingers in unlocking position.

11. A key according to claim 1, said yieldable means comprising two coil springs of which one is compressed between a wall of said housing and one of said finger elements and the other is compressed between said wall and the other of said finger elements.

12. A key according to claim 1, said yieldable means comprising two coil springs of which one is compressed between a wall of said housing and one of said finger elements and the other is compressed between said finger elements.

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**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3,033,016

May 8, 1962

Sigurd M. Moberg

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 7, line 38, for "an an" read -- and an --;
column 8, line 22, after "said", second occurrence, insert
-- fingers --.

Signed and sealed this 28th day of August 1962.

(SEAL)

Attest:

ESTON G. JOHNSON

Attesting Officer

DAVID L. LADD

Commissioner of Patents