United States Patent [19]

Hoyt

[11] **3,835,674**

[45] **Sept. 17, 1974**

[54] **LOCKS**

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[73] Assignee: **OMCO Inc.,** Holden, Mass.

[22] Filed: **Apr. 20, 1973**

[21] Appl. No.: **352,983**

[52] **U.S. Cl.** **70/34**

[51] **Int. Cl.** **E05b 67/36**

[58] **Field of Search** ..... 70/34, 32–33, 70/25, 14, 386; 292/252; 339/91 B

[56] **References Cited**

UNITED STATES PATENTS

1,923,025	8/1933	Morse	70/34
2,983,978	5/1961	Wilgus	24/211
3,186,196	6/1965	Moberg	70/34
3,714,802	2/1973	Morse	70/34

FOREIGN PATENTS OR APPLICATIONS

1,354,923	2/1964	France	339/91 B

Primary Examiner—Robert L. Wolfe

[57] **ABSTRACT**

This device is a bolt type lock for preventing tampering with gas and electric meters. A hollow body with a fixed head on one end has a cap held onto the other end by locking means held extended into the cap by a spring-loaded plunger retractible solely through a small round key hole in the head, to unlock the lock. If any tool but the authorised key is used to pull the plunger, a piece that is normally left behind when the genuine key is used is brought into position in place of the plunger and keeps the locking means extended and the lock locked.

9 Claims, 4 Drawing Figures

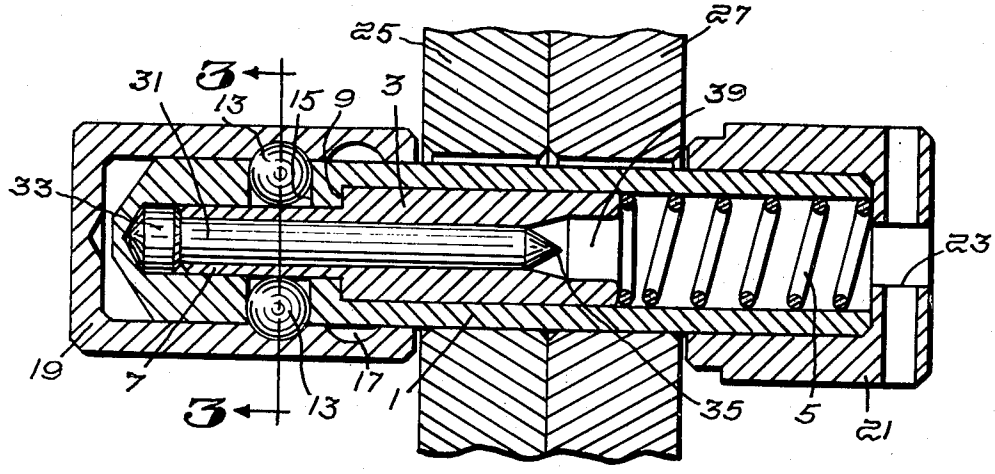


Fig. 1.

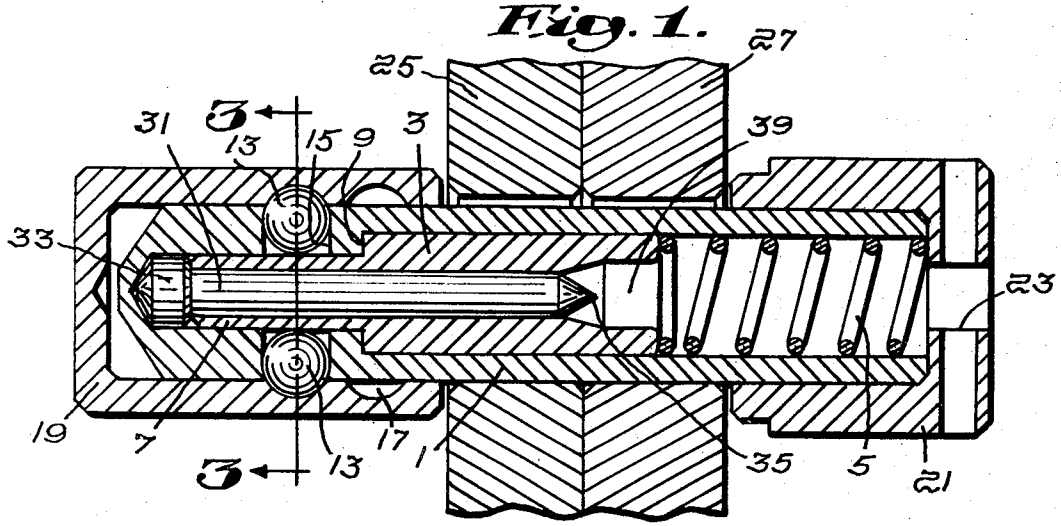


Fig. 2.

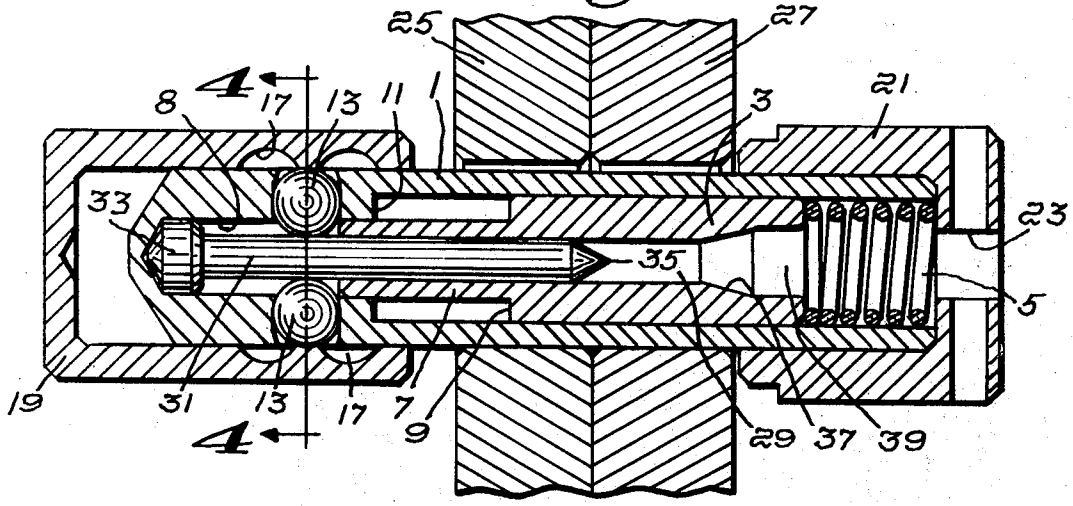


Fig. 3.

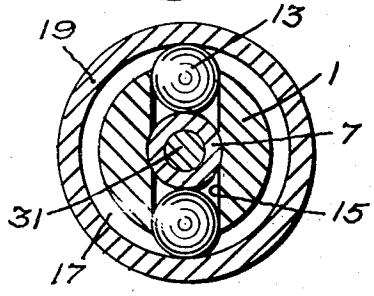
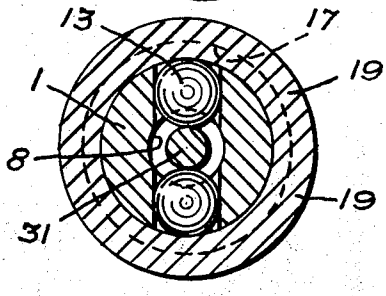


Fig. 4.



LOCKS

This invention is an improvement in plunger type locks, such as are used on shut-off valves or switches, designed to make it practically impossible to open the lock without the proper key.

Plunger type locks of the construction shown in U.S. Pat. Nos. 1,923,025 and 3,714,802 to L. H. Morse et al. and 3,002,368 to Moberg are so widely employed by gas and electric public utility companies to prevent unauthorized opening of gas supply valves and tampering with electricity meters that efforts to pick these locks are sometimes successful on the strength of knowledge or deduction of the manner of operation of the lock.

The only effective point of attack is through the extremely narrow circular aperture at one end which forms the keyhole. By thinning the end of a common nail to spade shape and distorting it by hammering it into the socket in the plunger it is occasionally possible to obtain the frictional engagement with the walls of the socket needed to retract the plunger against the resistance of its spring and thus release the locking balls and open the lock.

The present invention defeats this method of lock-picking by making the plunger in two parts, such that the jamming of the nail end in the plunger socket wedges the two parts together to move in unison and obstruct the inward unlocking migration of the locking balls; but when the authentic key is used the two parts separate and let the balls move inward to unlock the plunger.

An illustrative embodiment is shown in the drawings, in which

FIG. **1** is an axial section of the lock in locked relation.

FIG. **2** is a similar view of the parts shown in FIG. **1** in unlocked relation.

FIG. **3** is a transverse section on line **3—3** of FIG **1.**

FIG. **4** is a transverse section on line **4—4** of FIG. **2.**

Having reference to the drawings, the lock comprises a tubular body or bolt **1** and a plunger **3** slidable therein and pressed toward the closed end of body **1** by spring **5.** One end **7** of plunger **3** is of reduced diameter, an annular shoulder **9** thereof abutting against an internal annular shoulder **11** formed by reducing the bore of body **1** at **8** to fit the end-portion **7,** the engagement of these shoulders limiting the extent of movement of plunger **3** as biased by spring **5.** In this relation, the end-portion **7** holds two steel balls **13** partly extended radially of the plunger from the opposite ends of a bore **15** formed diametrically through the walls of the counterbore **8,** and having inwardly swaged ends. Thus extended, these locking members **13** are received in one of annular grooves **17** formed inside a cap **19** fitting freely over the end of body **1,** locking the cap removably in place thereon.

The other end of body **1** is closed by a cap **21** press-fitted or otherwise permanently fixed thereon, and having an axial bore **23** forming the keyhold of the lock, as will appear.

In use, the device is employed as a locking bolt, as by putting the body portion **1** through aligned apertures in the fixed arm **25** and movable valve-operating arm **27** of a valve in a pipeline, for example, and then applying the cap **19** to lock the valve in closed relation. The

plunger **3** is drawn back by a key such as that of Moberg U.S. Pat. No. 3,033,016 until portion **7** lets the balls **13** recede within the surface of body **1** as shown in FIG. **2,** permitting cap **19** to be applied to the end of body **1** as shown in FIG. **1.** Removal of the key releases the plunger to return under the push of spring **5,** extending the balls **13** into one of the grooves **17** and locking the cap in place.

In accordance with the invention, as already indicated the ball-engaging portion of plunger **3** is made in two parts. The reduced inner end **7** of the plunger which holds the locking balls **13** extended is formed with a cylindrical axial bore **29,** in which is slidably mounted a pin **31** having a cylindrical head **33** of the same diameter as the ball-engaging end portion **7** of the plunger **3.** The shank of the pin **31** terminates in a conical point **35** of 30° taper. When the pin is in inmost position in the cylindrical portion of bore **29** the base portion of the cone is at the narrow end of a conical enlargement **37** of 30° taper in the bore **29.** The remainder **39** of the bore is cylindrical.

The dimensions of the parts and of the spring **5** when fully compressed are such that if the pin **31** holds its position in bore **29** as plunger **3** is fully retracted, the head **33** of the pin **31** will be brought into a position between the balls **13** and will hold them extended as shown in FIG. **3,** thus keeping the lock locked, so if a nail or other lock-picking means driven into the cavity **37, 39** of the plunger manages by remote chance to wedge tightly enough to be able to retract the plunger against the thrust of spring **5,** it will do so by wedging against the slope of the cone **35** of the pin **31** and accordingly hold the pin from relative movement in the plunger. Thus the head **33** will follow the portion **7** into position between the balls **13** and the lock will stay locked.

However, when the authentic key capable of exerting the necessary radial frictional gripping power against the wall of cylindrical portion **39** to let the user overpower spring **5** and move the plunger clear of the balls **13,** the pin **31** is left behind as shown in FIG. **2** and only its shank is between the balls **13,** which differential movement as shown in FIG. **4** lets the balls move inward out of engagement with the groove in cap **19,** releasing the cap and thus effecting the unlocking of the lock.

The head **33** is made a close fit in the bore **29** so that, piston-like, the air pressure applies a slight restraint to hold it from following the retreating end of portion **7** of the plunger. Additionally, a film of oil sealing the head to the bottom and sides of bore **29** can be used to help overcome machining deficiencies.

With the included angle of 60° between the slope of the conical end **35** of the pin **31** and the conical wall **37** it is practically impossible for the flattened end of a driven nail to recurve into jamming relation with the pin or the wall **39** tightly enough to pull the plunger far enough to unlock the cap **19.**

Thus made according to the invention the lock is practically incapable of being picked.

While I have illustrated and described certain forms in which the invention may be embodied, I am aware that many modifications may be made therein by any person skilled in the art, without departing from the scope of the invention as expressed in the claims. Therefore, I do not wish to be limited to the particular forms shown, or to the details of construction thereof, but

What I do claim as my invention is:

1. A lock having a tubular body, radially extendible locking members thereon, a spring-biased plunger therein actuating such members and retractable clear of the locking members, and means within the body adapted to hold the locking members extended when the plunger is withdrawn from actuating relation with such members by wedging means engaging both the plunger and the said means.

2. A lock according to claim **1** in which the said means alternatively holds and releases the locking members.

3. A lock according to claim **1** in which the said means moves with the plunger to hold the locking members in locking relation and moves relatively to the plunger to release the locking members.

4. A lock according to claim **3** in which the said means remains at rest with respect to the plunger to release the locking members.

5. A lock according to claim **1** in which the plunger has an axial bore and the said means is relatively movable in such bore.

6. A lock according to claim **5** in which the said means holds the locking members extended when it and the plunger move in unison.

7. A lock according to claim **5** in which the said means is relatively movable with respect to the plunger and ceases to hold the locking members extended upon independent movement of the plunger with respect to such means.

8. A lock according to claim **1** in which the plunger has an axial bore and the said means has a shank slidable in such bore and a head extending beyond the bore engaging the locking members when the plunger is withdrawn from actuating relation with such members.

9. A lock according to claim **8** in which differential movement between the plunger and the shank keeps the head out of engagement with the locking members.

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