Aug. 29, 1967 E. EBERITCH ETAL 3,338,078

TWO-PIECE KEY AND EXTRACTOR

Filed Feb. 18, 1965

FIG-1

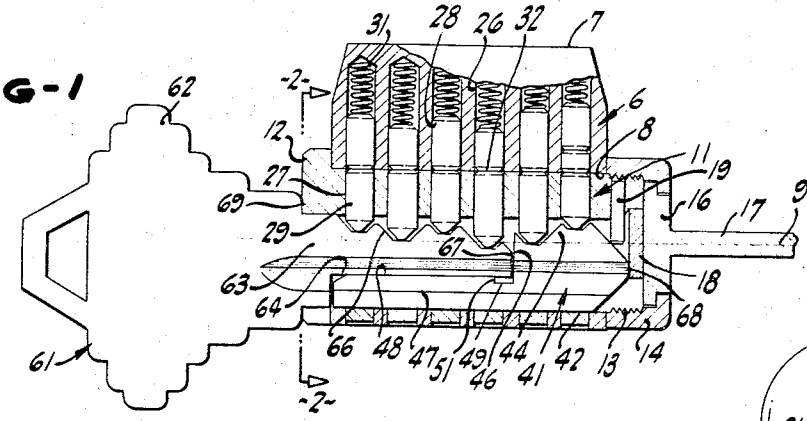


FIG-2

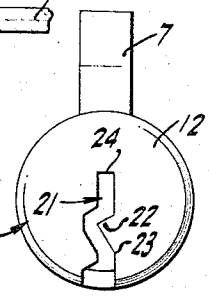


FIG-4

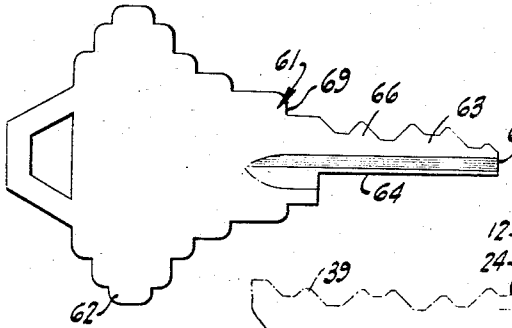


FIG-3

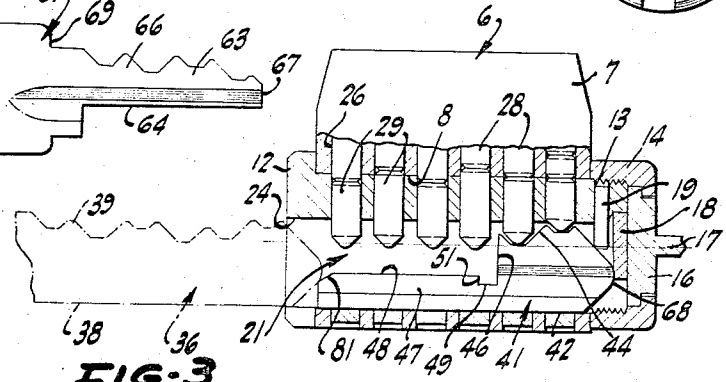


FIG-6

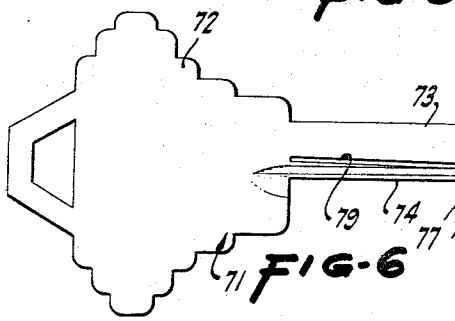
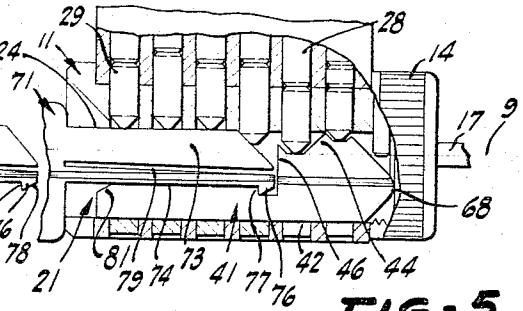


FIG-5



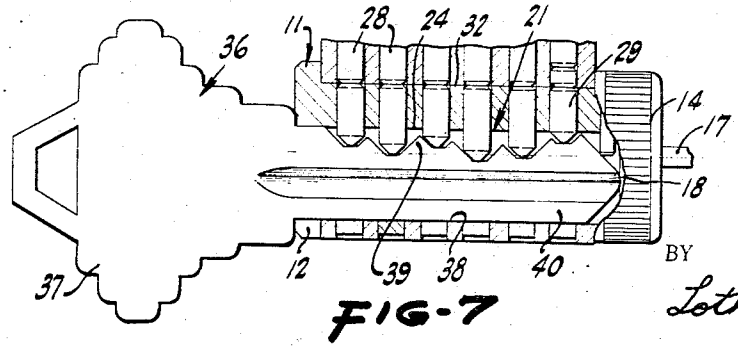


FIG-7

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TWO-PIECE KEY AND EXTRACTOR

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ABSTRACT OF THE DISCLOSURE

A lock unit having a plug with a longitudinally extending keyway therein is provided with a key tip of blade-like form having substantially the same cross sectional shape as the keyway and having a longitudinally extending lower surface and a parallel upper surface with a notch therein. The key tip rests against an end stop and can be extracted by a blade-like extractor having a longitudinally extending upper surface and a longitudinal slot defining a spring hook at the inner end of the extractor. The key tip and the extractor overlap and together occupy substantially all of the keyway and the hook flexes into the slot and moves over the upper surface of the key tip until the hook enters the notch and interengages the key tip and the extractor, following which the key tip is withdrawn from the keyway by and with the extractor.

Our invention relates to a lock unit construction especially designed for use in connection with a pin tumbler cylinder unit and effective under one condition to exclude all but specially prepared keys or tools and under another condition to permit the use of the normal keys for the lock. The change from one condition to the other is accomplished without the necessity of deforming lock unit parts or of having disposal mechanism within the lock unit for superseded parts.

In many instances it is advisable to condition a lock unit so that none of the standard keys which might ordinarily enter the lock unit can do so until the lock condition is properly changed. This is referred to as a "shut-out" feature. Also, there are instances in which it is advisable to condition a lock unit so that the key which ultimately and regularly operates the lock unit cannot and need not be initially utilized. This is referred to as a "construction" feature. Particularly during the construction period of a project, it may be helpful to have the permanent, pin tumbler lock units installed early in the job and to supply keys other than the permanent keys to the workmen. The temporary or primary keys serve during the course of construction, but when the job is delivered to the owner the secondary or permanent keys in some fashion are made effective and the primary or temporary keys are made ineffective.

It is therefore an object of our invention to provide a lock unit that can be conditioned to shut out all regular keys and that can be conditioned to operate with primary keys only until changed to operate with secondary or regular keys only.

Another object of the invention is to provide a lock unit in which a substantially standard pin tumbler cylinder unit is utilized and the entire structure for providing the shut-out feature and providing the construction feature is involved very largely with parts entering the keyway.

Another object of the invention is to provide a lock unit in which the shut-out feature excludes all keys and is nullified entirely without changes in the pin tumbler cylinder unit.

Another object of the invention is to provide a pin tumbler cylinder unit having a shut-out or construction key feature which can readily be changed from time to time to have those features or to operate normally.

It is a further object of the invention to provide an improved lock unit having multiple keying features with an exclusion of certain keys when desired.

A still further object of the invention is to provide an improved lock unit.

Other objects together with the foregoing are attained in the embodiment of the invention described in the accompanying description and illustrated in the accompanying drawings, in which:

FIGURE 1 is a cross section on a central, median plane through a pin tumbler cylinder unit pursuant to the invention, a primary or temporary construction key being shown in elevation and in operating position;

FIGURE 2 is an end elevation, the view being taken from the plane 2—2 of FIGURE 1;

FIGURE 3 is a view comparable to FIGURE 1 but showing the lock unit conditioned to exclude secondary or regular keys from entry into the keyway;

FIGURE 4 is a side elevation of a key base or a primary or temporary key removed from the lock unit;

FIGURE 5 is a view comparable to FIGURE 1, but showing a key extractor in position for removing a key tip;

FIGURE 6 is a side elevation of a key extractor removed from the lock unit; and

FIGURE 7 is a view comparable to FIGURE 1, but showing in side elevation a secondary or permanent key in position to actuate the lock unit.

While the lock unit of the invention can be embodied in a number of different ways and can be arranged to take into account various pin tumbler cylinder units, it has successfully been incorporated in the form shown herein. It is to be understood that the disclosed lock unit is usually installed as part of a standard lock set and that the parts of the lock set not illustrated nor described herein are immaterial to an understanding of the invention embodiment.

Our lock unit includes a cylinder body **6** having a circular cylindrical portion and having an extension **7**. The body has a circular cylindrical bore **8** symmetrical about a longitudinal axis **9**. Rotatable within the bore **8** about the axis **9** is a cylinder plug **11**. This is circular cylindrical on the outside and turns freely. At one end the plug **11** has a radially outstanding flange **12** bearing against the end of the cylinder body to constrain axial motion of the plug in one direction. At the other end the plug **11** has threads **13** receiving a cylinder cap **14** constraining movement of the plug **11** in an axial direction and confining the plate portion **16** of a driver bar **17**. The plate portion **16** may act as an end closure or stop, but in some lock units a hardened, separate disk **18** is seated within the end of the plug. This may also act as a closure or end stop. In some cases a pin **19** in the plug **11** acts alone or with the plate **16** or the disk **18** or both as an end stop. The assembly is such that when the plug **11** is rotated, the non-circular driver bar **17** is likewise rotated to effect the operation of the lock set in the usual way.

The plug **11** is pierced substantially from end to end to define a keyway **21**. In cross section throughout and in end elevation, the keyway is of irregular configuration, its shape being in part defined by a number of longitudinally extending ridges **22** and grooves **23** in the customary fashion. The keyway **21** has its lower margin coextensive with the interior surface of the bore **8** except that it is enlarged on one side within the flange **12**. The keyway has its other side margin defined by a wall **24** approximately parallel to the exposed surface of the bore **8**. There is thus provided a keyway having a predetermined, fixed limit as to transverse dimensions throughout most of its length,

having a number of longitudinally extending ridges and grooves, and extending for the entire length of the plug.

Designed to be in precise alignment in one position of the plug are transverse bores **26** located in the cylinder body and transverse bores **27** in the plug **11**. These bores **26** and **27** are designed to receive a number of tumbler pins **28** and **29**, respectively, pressed in one direction by coil springs **31** in the extension **7**. The various tumbler pins **29** are arranged so that they extend far into the keyway unless stopped. A common shear line **32** adjacent the wall of the bore **8** is established by one arrangement of the various tumbler pins **28** and **29**. When the shear line **32** is established, but not otherwise, the cylinder plug **11** can be rotated about the axis **9** with respect to the cylinder body. If any one of the tumbler pins **28** or **29** is displaced to span the shear line between the plug and the body, the plug cannot be rotated and the lock is then secure. The mechanism as so far described is almost entirely standard and does not substantially depart from regular practice.

The lock unit can be appropriately actuated by a secondary key **36** (FIGURE 7) of the customary sort. This key has a bow **37** and a shank **40**. In cross section, the shank **40** is complementary to the cross section of the keyway **21**. In length, the shank occupies substantially the entire keyway, the inner tip of the key substantially abutting the wafer **18** or the pin **19**, or both. The secondary or permanent key **36** is substantially straight along the lower edge **38** of the shank to abut and rotate on the inside surface of the bore **8**. The other edge of the key shank **40** is serrated or provided with a contoured portion **39** appropriately to engage the tumbler pins **29** so that when the key is fully inserted there will be an appropriate shear line.

Pursuant to the invention, there is provided a special key arrangement. As particularly shown in FIGURES 1, 3 and 5, a key tip **41** is provided for introduction into the keyway **21**. This is a section of rigid material having throughout a cross section complementary to the configuration of the keyway **21**. That is, the key tip has complementary, longitudinal grooves and ridges closely to interfit with the grooves **23** and ridges **22** so that the key tip is accurately positioned and guided within the keyway. The key tip has no transverse motion, toward or away from the surface of the bore **8**, except as required for normal manufacturing tolerances and for easy sliding movement of the kep tip in the direction of the axis **9**. The key tip along one edge **42** is entirely straight just like the lower edge **38** and is intended to ride upon the surface of the bore **8** in the same fashion. Opposite one part of the edge **42** the key tip is provided with a contoured portion **44** or a serrated edge of appropriate configuration to control one, two or more (in the present instance, two) tumbler pins **29** to locate them at the shear line. An another part, the key tip is defined by a transverse surface **46** disposed axially between adjacent tumbler pins **29**.

The key tip has a further portion **47** extending longitudinally. This not only continues the lower straight edge **42**, but also has a straight or flat upper surface **48** underlying but spaced from the remaining ones of the tumbler pins **29** and facing them. Between one end of the upwardly facing surface **48** and the transverse surface **46**, the key tip has a catch **49** in the nature of a groove or notch having a transveresly extending wall **51**.

Cooperating with the key tip is a key base **61** (FIGURES 1 and 4) having the customary operating bow **62** and having a relatively short shank **63**. The shank **63** in cross section is complementary to the keyway **21** and is in effect a continuation of the cross section of the key tip. Along a part of its length the bottom of the key base has a downwardly facing surface **64** designed to slide on and abut the upwardly facing surface **48** of the key tip. The opposite edge of the key base has a contoured portion **66** serrated to position at the shear line the remaining tumbler pins **29** not controlled by the key tip **41**. The bottom

surface **64** is approximately coextensive with the surface **48** of the key tip so that when the end surface **67** of the key base is close to or in abutment with the surface **46** of the key tip, all the various serrated or contoured portions, within manufacturing limits, precisely position their respective tumbler pins. With this arrangement, that is to say, with both the key tip and the key base in position in the keyway, the operation of the lock unit is the same as it is with the secondary key **36** in position.

The key base **61** separately and by itself constitutes a primary or construction key which, when positioned with the key tip **41** lodged in the keyway, will serve to actuate the lock unit. The key base **61** can be inserted and withdrawn easily and any number of times and can transmit torque to turn the plug and bar **17**. The key tip can remain in place without endwise movement, being yieldingly restrained by the tumbler pins **29** and the springs **31**. The installation of the key tip can be made by manually starting the tip into the keyway and then completing the sliding movement of the key tip in the keyway by then introducing the key base and having the surface **67** advance the surface **46** until such time as the parts are home.

The final location of these parts can be arranged in any one or more of several ways or all of the several ways simultaneously, providing manufacturing tolerances are close. The key tip **41** can be positioned in its extreme right-hand location as seen in FIGURE 1 by having the point **68** of the key tip abut the disk **18** or the flange **16** if the disk **18** is not used.

The key base **61** may be provided in the bow portion with a shoulder **69** designed in one extreme position to contact the outermost face of the flange **12** on the plug **11**. If the parts are precisely made, the contact between the portions **68** and **18**, for example, and the shoulder **69** and the flange **12** can be substantially simultaneous. The disk **18**, for example, or the pin **19** form positive end stops. Alternatively, if the springs **31** are relatively strong, the pointed tumbler pins **29** operating in the serrations of the key tip will serve yieldingly to hold the tip accurately in its extreme position. All of the various locating means can be used together, or any one or more can be used separately or in combination.

It is not necessary to utilize the key base **6** to position the key tip. Any instrument which will enter the keyway and abut an available part of the key tip to move it to its end position is satisfactory. The key tip when in place appears as it is shown in FIGURE 3. Also as shown in the broken lines in FIGURE 3, a standard secondary key **36** cannot then do more than barely enter the keyway since there is an obstruction furnished by the outward end of the key tip. Thus the key tip serves as a shut-out device for all but a key base or a special tool. If only the shut-out feature is required, the key tip need not have serrations **44** but can have a straight edge. In this instance, the tumbler pins **29** do not act as yielding end stops.

When it is desired to condition the lock unit for operation by a standard secondary or permanent key, means are provided for removing the key tip. Especially as shown in FIGURE 6, there is provided a special tool in the form of an extractor **71**. This is an integral body preferably fabricated of material such as stainless steel having a relatively high elasticity. The extractor is shaped at one end to provide a bow **72** comparable to the regular key bow. The extractor has a relatively straight guide portion **73** and also has a spring arm **74**. The aggregate cross sectional shape of the portions **73** and **74** is substantially complementary to the keyway **21**, so that the extractor can be introduced into the keyway by a longitudinal movement. The extractor configuration as to ridges and grooves **22** and **23** is substantially the same as the key **36**, for example.

When inserted, the extractor is thus carefully guided in the keyway so that it does not have any substantial transverse motion, the only lateral motion permitted being that due to machining tolerances to provide for a slid-

ing fit. The extractor cannot tip or cock in the keyway, but is confined to rectilinear translation in the direction of the axis **9**. The spring arm **74** is in effect an integral leaf spring terminating at one end in a spring hook **76**. The hook has a transverse surface **77** and an inclined or chamfered surface **78**. Preferably, the spring arm **74** becomes thicker and stronger in a transverse direction as it approaches the key bow **72**. This is because a notch **79** separating the parts is inclined to the axis **9**. The width of the notch is greater than the depth of the hook **76**.

When the extractor is introduced into the plug keyway, the bevelled or chamfered surface **78** rides upon a complementary chamfered surface **81** on the outermost end of the key tip. The tendency to force the key tip inwardly is resisted by the superior force of the springs **31** or by whatever end stop or stops may be used. The extractor is introduced substantially as far as it will go with the end of the hook **76** substantially abutting the surface **46**. Since the extractor cannot move transversely, it is the function of the spring arm **74** to flex or yield laterally as the hook is lifted when the bevelled surfaces **78** and **81** ride over each other. In effect, the spring is bent or cocked. This reduces or substantially closes the outermost end dimension of the slot **79**, but does not displace the portion **73** of the extractor since such portion rides snugly along against the upper surface **24** of the keyway or along the complementary ridges and grooves. As soon as the extractor has been fully inserted, the pre-stressed hook **76** springs downwardly, as shown in FIGURE 5, so that the straight surface **77** lies just behind the transverse surface **51** of the key tip.

When the extractor is then withdrawn along the axis **9**, the key tip, being engaged, is withdrawn with it. Since both of the surfaces **77** and **51** are transverse, there is a firm interengagement made with no tendency to cam the spring arm out of the way because of resistance due to the tumbler pins rising against their springs and falling as the serrated or contoured portion of the key tip slides outwardly of the keyway. The key tip is thus removed from the keyway and can be manually grasped and taken away. This leaves the keyway completely free and open for the subsequent reception of the permanent secondary key **36**.

By a reverse operation, at any time in the future it is desired to shut out the secondary or permanent key and again to make the lock unit responsive to a temporary primary key, the key tip can be reinserted and can subsequently again be withdrawn. This mechanism, therefore, does not require for its operation the mutilation or permanent deformation of any part and does not require any disposal means within the plug or cylinder body for a loose part. Also, the conversion from a primary to a secondary condition and back can take place any number of times with the plug and cylinder unit being unharmed and undisturbed.

While the extractor is preferably not provided with any contoured or serrated portions and does not itself properly align the initial tumbler pins, it can be so serrated if desired so that the extractor can also operate to complement the key tip and with it serve as a complete key. With this arrangement, each time the extractor is withdrawn, the key tip is withdrawn with it. In most cases, this is undesirable. It is therefore preferred to utilize a special primary key or key base, such as shown in FIGURES 1 and 4, which can be inserted, operated and withdrawn any number of times without in anywise disturbing the key tip. The extension **47** of the key tip serves not only as an entering guide and support for the primary key and serves not only to make sure the keyway is substantially occupied when the primary key is rotated, but also makes sure that the two key portions; that is to say, the key base and the key tip, do not tip or cock with respect to each other. They are both confined laterally within the keyway. It is only the internal, lateral yielding motion of the spring arm **74** that accomplishes the interlock.

The closest references presently known to the applicants are as follows.

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Michnoff, 2,662,390, Dec. 15, 1953
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"National Locksmith," September 1962, page 94.

What is claimed is:

1. In a lock unit, a plug provided with a keyway therein having a predetermined cross section defined by a plurality of longitudinal ridges and grooves, a key tip having a cross section complementary to said predetermined cross section whereby said key tip is confined to longitudinal translation in said keyway, a catch on and in longitudinal alignment with one end of said key tip within the confines of said predetermined cross section, an extractor having a cross section complementary to said predetermined cross section and defined by a plurality of longitudinal ridges and grooves whereby said extractor is confined to longitudinal translation in said keyway, means effective in one position of said key tip in said keyway for holding said key tip against longitudinal translation in one direction, and means comprising a substantially longitudinal slot forming a spring hook on and in longitudinal alignment with the end of said extractor within the confines of said predetermined cross section and interengageable with said end catch when said extractor is translated in said keyway in said one direction toward said key tip therein.

2. In a lock unit having a rotatable plug with a longitudinally extending keyway therein and a plurality of tumbler pins arranged in line along said keyway and movable transversely in said keyway, a key tip movable along said keyway, said key tip along one portion of its length having a contour to position at least one of said tumbler pins and having along another portion of its length a longitudinally extending, smooth first surface facing toward at least one other of said tumbler pins, a key base having a contour to position said other one of said tumbler pins and having a longitudinally extending, smooth second surface facing away from said other one of said tumbler pins and adapted to overlap and slide along said first surface, and means disposed within the width of said key tip and said key base and between the outer end of said key tip and the inner end of said key base for interlocking said key tip and said key base, said means comprising a notch in said key tip adjacent said first surface and a substantially longitudinal slot in said key base forming a spring hook adjacent said second surface.

3. For use in a lock unit having a plug rotatable about an axis and having a keyway extending along said axis, an extractor axially movable along said keyway and including a longitudinally extending blade-like guide portion having substantially the same width as said keyway and having one edge slidable along one wall of said keyway and separated by a substantially longitudinal slot forming a transversely yieldable spring arm extending alongside of and substantially in the plane of said blade-like guide portion and terminating in a hook extending transversely of said axis in a direction away from said slot.

4. In a lock unit having a plug with an elongated keyway therein, a blade-like key tip movable along said keyway, interengaging means on said key tip and on said plug constraining said key tip against substantial transverse movement in said keyway, means forming a transversely extending catch on the outer end of said key tip, and in the plane of said key tip a blade-like extractor body movable along said keyway and having a longitudinally extending slot therein, interengaging means on said extractor body and on said plug constraining said extractor body against substantial transverse movement in said keyway, a transversely extending hook, and means for mounting said hook on the inner end of said extractor

body and in the plane of said extractor body for transverse movement into said slot and relative to said extractor body and said key tip for interengaging said catch and said hook when said extractor body overtakes said key tip within said keyway.

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