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3,002,268

SIDE BAR CYLINDER LOCK ASSEMBLY

Filed Dec. 18, 1956

3 Sheets-Sheet 1

FIG. 1

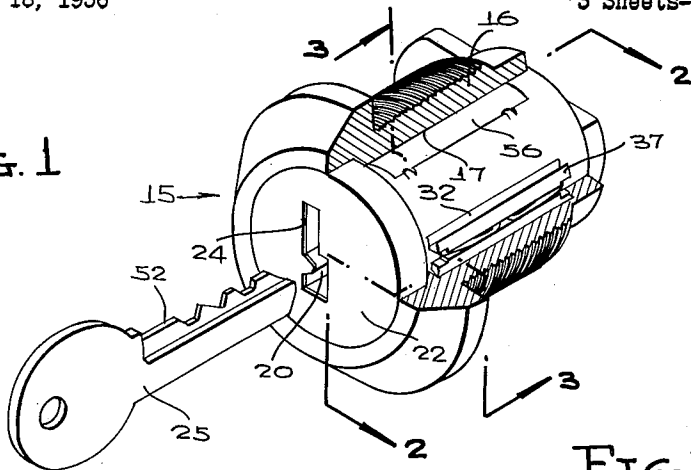


FIG. 2

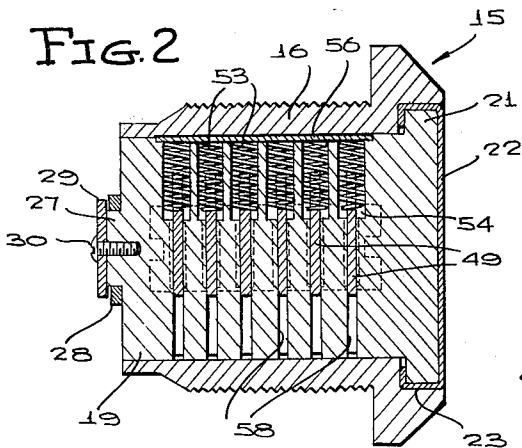


FIG. 3

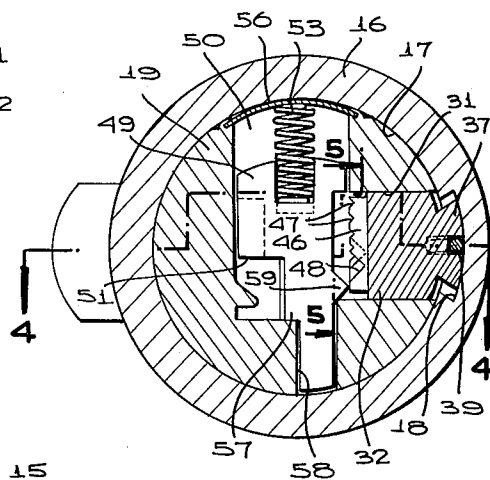
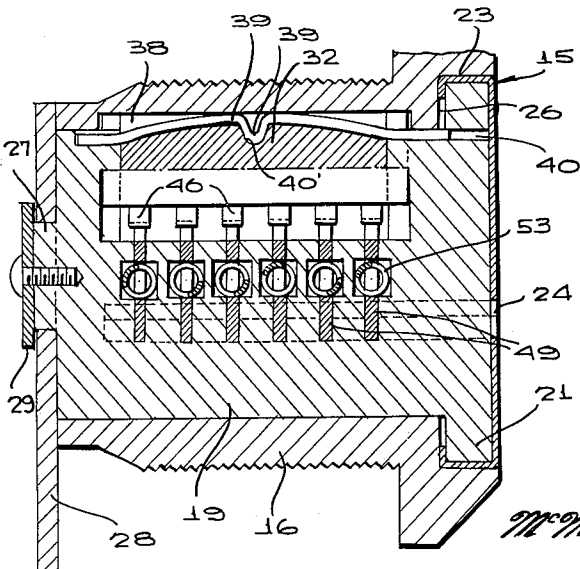


FIG. 4



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FIG. 6

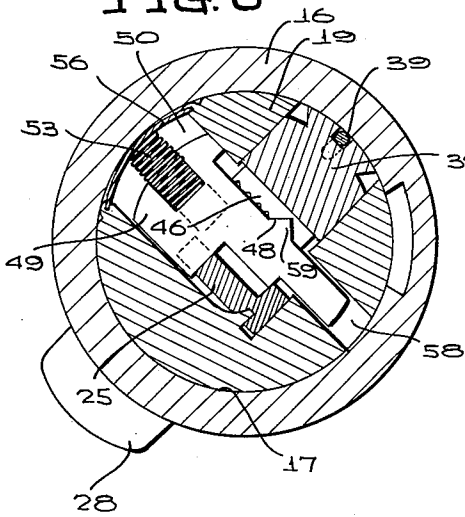


FIG. 5

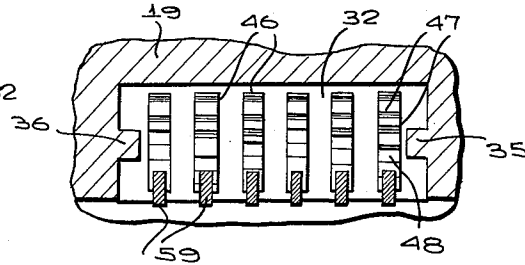
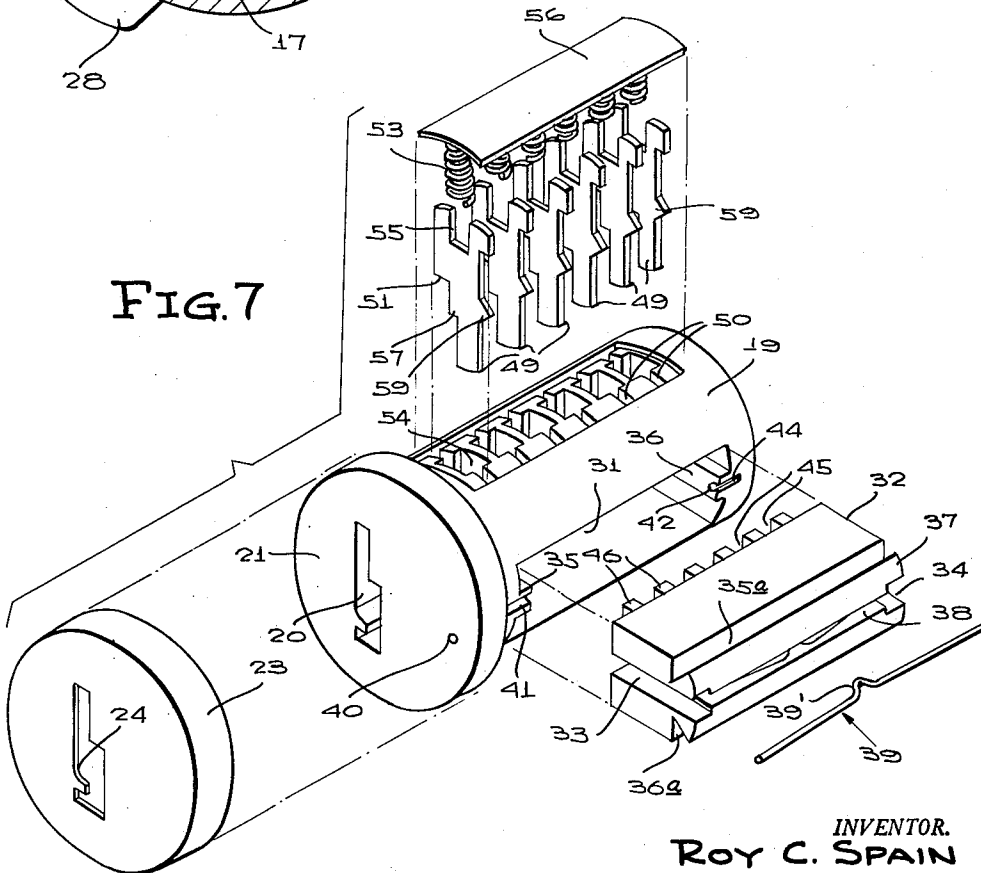


FIG. 7



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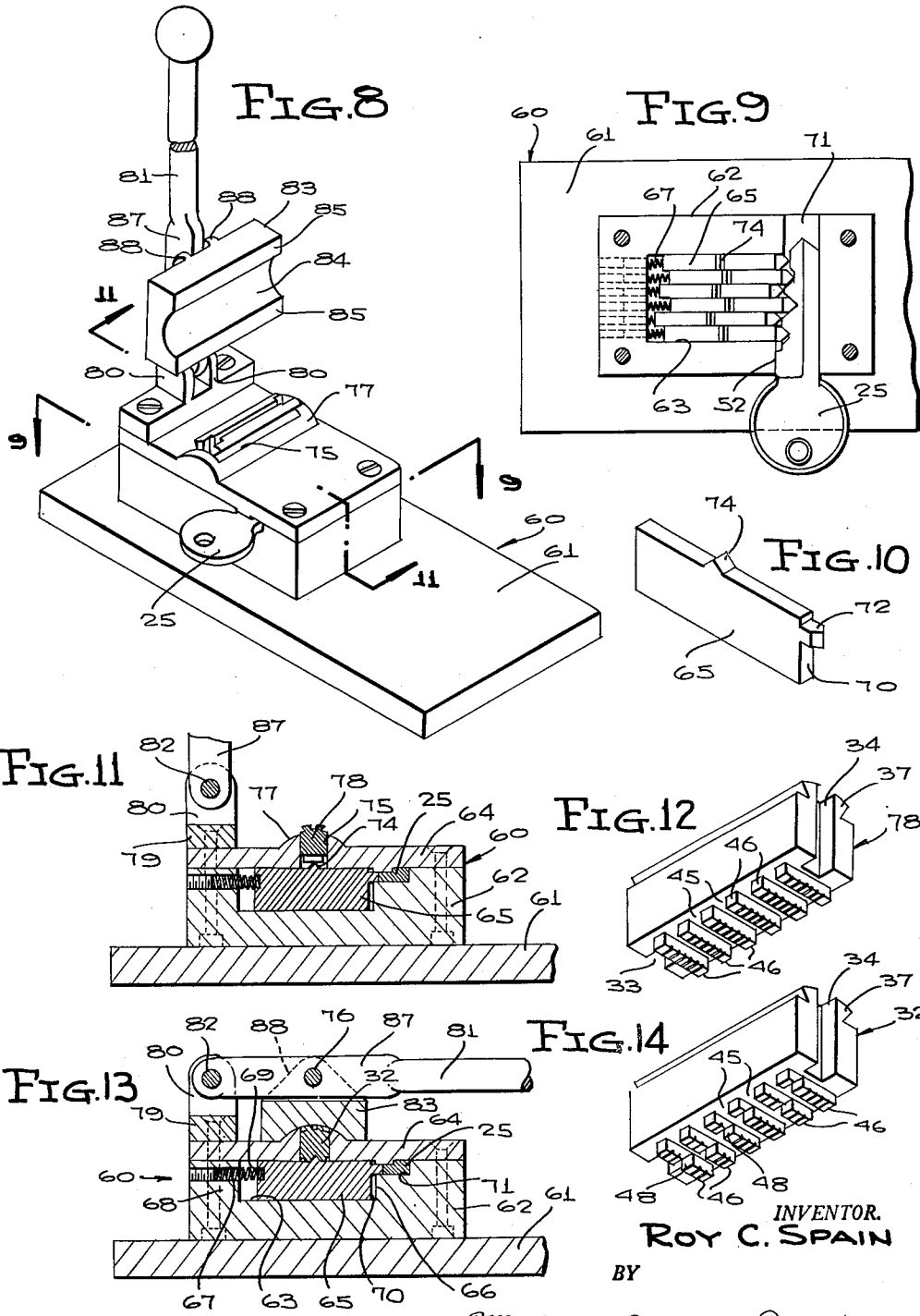
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SIDE BAR CYLINDER LOCK ASSEMBLY

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9 Claims. (Cl. 29-428)

This invention relates to locks of the type having a key plug that is assembled in a cylinder, with a fence or side bar mounted to move laterally in the key plug so as to move relatively to a locking position in a recess in the lock cylinder.

A main object of the invention is to provide a novel and improved cylinder lock assembly which is simple in construction, which is easy to assemble, and which is especially suitable for mass production techniques wherein the lock may be assembled with its associated equipment in a convenient and efficient manner and may be fitted to the bittings of a key, whereby a plurality of locks may be fitted to the same key and will be thereafter operated by said key.

A further object of the invention is to provide an improved cylinder lock assembly of the side bar type which involves inexpensive components, which is resistant to any unauthorized attempts to defeat the lock, and which is inexpensive to manufacture.

A still further object of the invention is to provide an improved cylinder lock of the side bar type which employs identical tumblers, whereby the lock is especially suitable for mass production techniques, and which is so arranged that a number of locks may very easily be equipped for operation by the same key. To do that, I utilize for the lock a fence having portions that are adapted to be particularly formed to coact one with each lock tumbler. Then, I form those fence portions in accordance with the bittings of a predetermined key that will be used to set the tumblers. That enables the locks to be identical in manufacture, with any one or more of the locks adapted to be easily fitted to a particular key through a relatively simple forming operation on the fence.

A still further object of the invention is to provide an improved cylinder lock of the side bar type, the lock employing a plurality of identical tumblers which are displaced by amounts that are determined by the bittings of a key inserted in the lock, the lock being provided with a fence member having notches therein adapted to receive corresponding lugs on the fence member when the lugs are aligned with the notches, whereby the fence member will be released and will allow the key plug to rotate, the assembly being relatively compact, involving inexpensive components, and providing a high degree of security.

A still further object of the invention is to provide an improved fence member for a cylinder lock of the side bar type and an improved method and apparatus for forming said fence member, the configuration of the fence member being determined by the key which it is desired to employ in association therewith, whereby a plurality of locks may be readily adapted for use by the same key, as is desirable, for example, in automobiles and similar equipment.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

FIGURE 1 is a perspective view, with a part broken away, of an improved cylinder lock constructed in accordance with the present invention, and shown with its associated key.

FIGURE 2 is a vertical longitudinal cross sectional view taken on the line 2—2 of FIGURE 1.

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FIGURE 3 is a transverse vertical cross sectional view taken on the line 3—3 of FIGURE 1.

FIGURE 4 is a longitudinal vertical cross sectional view taken on the line 4—4 of FIGURE 3.

FIGURE 5 is an enlarged cross sectional detail view taken on the line 5—5 of FIGURE 3.

FIGURE 6 is a transverse vertical cross sectional view, similar to FIGURE 3, but showing the fence member in its released position and the key plug rotated from the position shown in FIGURE 3.

FIGURE 7 is a perspective view showing the parts of the key plug assembly of the cylinder lock of FIGURE 1, said parts being somewhat enlarged in scale as compared with FIGURE 1 and being shown in separated positions.

FIGURE 8 is a perspective view showing an apparatus for forming the fence member of the lock of FIGURES 1 to 7.

FIGURE 9 is a fragmentary horizontal cross sectional view taken on the line 9—9 of FIGURE 8.

FIGURE 10 is an enlarged perspective view of one of the transversely slidable bottom die elements employed in the apparatus of FIGURES 8 and 9.

FIGURE 11 is a transverse cross sectional view, somewhat enlarged in a scale, taken on the line 11—11 of FIGURE 8.

FIGURE 12 is a bottom perspective view of a blank for a fence member, enlarged in scale, as compared with FIGURES 8 and 11, and adapted to be inserted in the apparatus of FIGURE 8 for forming the fence member of a lock for use with a specific key.

FIGURE 13 is a cross sectional view similar to FIGURE 11, but showing the apparatus in its final forming position with the fence member blank indented by the bottom die elements of the apparatus.

FIGURE 14 is a perspective view, similar to FIGURE 12, but showing the finally formed fence member after removal from the forming apparatus of FIGURE 8 and after completion of the final step of formation of same.

Referring to the drawings, and more particularly to FIGURES 1 to 7, 15 generally designates a cylinder lock provided with a cylinder 16 having a bore 17 formed with a longitudinal locking recess 18. Designated at 19 is a key plug which is rotatably mounted in the bore 17 and which is formed with a longitudinal keyway 20.

As is clearly shown in FIGURES 2, 4 and 7, the key plug 19 is formed at its forward end with an enlarged head portion 21 which is covered by a circular scalp 22 having a peripheral channel 23 receiving the head portion 21 and covering the forward surface thereof. The scalp 22 is formed with a keyhole 24 registering with the keyway 20.

The head portion 21 of the key plug and the peripheral channel portion 23 of the scalp 22 are rotatably received in an enlarged annular recess 26 formed at the forward end of and being concentric with the bore 17 of cylinder 16.

The key plug 19 is formed at its rear end with a stud 27, preferably of non-circular shape, over which is engaged an arm 28 having an opening shaped to receive the stud 27, the arm being retained on the stud by a washer 29 substantially larger in area than the stud and secured thereon by a fastening screw 30, as is clearly shown in FIGURE 4.

The arm 28 rotates with the key plug 19 and may be associated with any conventional mechanism, for example, a door bolt-retracting mechanism, which may be actuated by rotating the key plug 19 with the proper key inserted in the recess 20.

The keyplug 19 is formed with a laterally opening slot 31, extending substantially perpendicular to the keyway 20 and containing a laterally movable fence member 32

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therein. The fence member 32 is of substantial length and is formed at its opposite ends with the respective guide grooves 33 and 34 which are slidably engaged with respective guide ribs 35 and 36 formed in the ends of the laterally opening slot 31, as is clearly shown in FIGURE 7. The outer portion of the fence member 32 is formed with longitudinal grooves 35a and 36a above and below, as shown in FIGURE 7, defining a generally dovetail-shaped longitudinal outer rib 37 which is movable to locking position in the locking recess 18 of the lock cylinder 16, as shown in FIGURE 3.

The locking rib 37 is formed at its outer surface with the longitudinal groove 38, and engaging in said groove is a rod-like spring member 39. The spring member 39 has one end thereof slidably received in a bore 40 formed in the forward end portion of the keyplug 19 and partially positioned in a longitudinal groove 41 at said forward end behind the head portion 21, as shown in FIGURE 7, the rear end of the rod-like spring member 39 being secured in a recess 42 formed in the rear end portion of keyplug 19 at the rib 36, as is clearly shown in FIGURE 7. The recess 42 comprises a cylindrical bore having a longitudinal slot 44 opening at the outer surface of keyplug 19, the lips of said slot being deformed inwardly to rigidly secure the rear end of the spring member 39 to the plug 19 at that point.

The spring rod 39 is formed at its intermediate portion with an inwardly directed loop 39' which is seated in a recess 40' formed in the intermediate portion of the floor of the groove 38. Spring rod 39 normally tends to assume a configuration wherein it is substantially straight, except for the loop 39', thus biasing the fence member 32 away from locking position and tending to retract the rib 37 inwardly from the locking recess 18.

The fence member 32 is vertically indented at its inner surface, as shown at 45, to define the longitudinally spaced, parallel vertical ribs 46, said ribs being located in equally spaced transverse vertical planes perpendicular to the longitudinal vertical plane of the key-receiving recess 20.

Each rib 46 is formed with a plurality of spaced dummy notches 47 of relatively shallow depth and with a main, V-shaped notch 48 of substantial depth.

Designated at 49 are a plurality of identical tumblers which are slidably mounted in the keyplug 19 respectively in the transverse vertical planes of the ribs 46 in respective vertical grooved recesses 50 formed in the cylinder 19.

The vertical recesses 50 communicate with the longitudinally extending keyway 20, and the tumblers are formed with respective identical shoulder elements 51 engageable with a bitted edge 52 of a key 25 inserted in the recess 20, whereby the tumblers 49 will be vertically positioned in accordance with the configuration of said bitted edge 52. The tumblers 49 are biased downwardly, as viewed in FIGURE 7, by respective coiled springs 53 positioned in respective vertical recesses 54 formed in the keyplug 19 at the intermediate portions of the vertical tumbler recesses 50, the top portions of the tumblers being formed with rectangular notches 55 receiving the lower end portions of the spring 53. A longitudinally extending arcuate cover plate 56 is secured on the keyplug 19 over the tumbler recesses 50, covering same and being engaged by the top ends of the tumbler biasing spring 53, whereby the tumblers 49 are biased downwardly.

The tumblers are formed with stop shoulders 57 engageable with the floor of the key-receiving recess 20 to limit downward movement of the tumblers, the lower end portions of said tumblers being slidably received in the relatively narrow lower portions 58 of the respective tumbler recesses 50, as is clearly shown in FIGURE 3.

Each tumbler 49 is formed with a generally triangular lug 59 which is receivable in a corresponding V-shaped gating 48 of the fence member 32 when the tumblers have been properly aligned with the gatings 48 by the inser-

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tion of a proper key 25 into the keyway 20. Normally, the tumbler springs 53 bias the tumblers to their lowermost positions, as shown in FIGURE 3, wherein the lugs 59 engage the edges of the ribs 46 and maintain the fence member 32 in its locking position, shown in FIGURE 3, wherein the rib 37 is held in the locking recess 18 against the biasing force of the rod-like spring 39. When a proper key 25 is inserted in the keyway 20, the identical tumblers 49 are elevated by different amounts, depending upon the bittings 52 of key 25, said amounts being such as to raise the lugs 59 into alignment with the corresponding gatings 48 of the fence member, whereby the lugs 59 are allowed to enter all the gatings 48 simultaneously, releasing the fence member and allowing the spring 39 to move the fence member to release position, so that the locking lug 37 is withdrawn from the locking recess 18. This allows the keyplug 19 to be freely rotated by the key 25, whereby the lock may be operated to release its associated apparatus, for example, to retract a door bolt, or the like. Thus, as shown in FIGURE 6, when the lugs 59 are engaged in the gatings 48, the fence member 32 is retracted by the rod-like spring 39, so that the keyplug 19 may be rotated freely in the bore 17.

It will be noted that all the tumblers 49 are identical and that fence 32 is the only part of the lock assembly that need be particularly shaped to correspond to a key, the fence having ribs 46 that are gated at different locations thereon, in accordance with the bittings 52 of the associated key 25. By employing identical tumblers 49, the mass production of the locks is greatly facilitated, since in the prior art, the tumblers ordinarily have parts of different configuration in accordance with the bittings of the key to be employed with the lock.

Obviously, if so desired, tumblers may be employed wherein the lugs 59 are at different locations with respect to each other, but it is important to understand that my invention makes this unnecessary. That is because my novel method, which I shall describe more fully, enables a fence to be very easily formed in accordance with the bittings of a key. In other words, the fence can hold the combination of the lock, so that the tumblers may be identical.

Referring now to FIGURES 8 to 14, 60 generally designates an apparatus employed to form the gatings in the fence member 32. The apparatus 60 comprises a bottom supporting plate 61 on which is secured a block member 62 formed with a longitudinal channel 63, which may be defined by providing a rectangular, longitudinally extending recess in the block 62. Secured on the block 62 is a cover plate 64 and slidably mounted in the channel 63 are a plurality of transversely extending bottom die elements 65, said die elements being biased laterally toward a side wall 66 of the channel 63 by respective coiled springs 67 engaged in the opposite side wall 68 of the channel 63 and having their inner ends received in recesses 69 formed in the respective bottom die elements 65. As shown in FIGURE 13, the springs 67 act to bias the die elements 65 to the right, and act to urge the respective edge portions 70 of the respective die elements towards engagement with the side wall 66 of channel 63. Block 62 is formed with a horizontal key-receiving recess 71 opening into the channel 63 at the side wall 66 thereof, and each bottom die element 65 is formed with a positioning lug 72 which is engageable in the recess 71 and which is engageable by the bitted edge 52 of a key 25 inserted in the recess 71. Each bottom die element 65 is formed at its top edge with a generally triangular die projection 74 which is received in a longitudinal guide slot 75 formed in the cover plate 64, the cover plate being thickened to define a generally cylindrical convex rib 77 at the guide slot 75. The guide slot 75 is dimensioned to receive a fence blank, shown at 78 in FIGURE 12 and illustrated as positioned in the guide slot 75 in FIGURE 11, preliminary to forming the fence blank to its final configuration.

Secured to the block 62 over the margin of the cover

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plate 64 is a hinge bracket 79 provided with a pair of upstanding, parallel hinge lugs 80, 81. Designated at 81 is a die lever which is pivoted to the bracket 79 between the hinge lugs 80, as by a transverse pivot pin 82. The bracket 79 is arranged parallel to the convex rib 77 and upstanding, parallel hinge lugs 80, 80. Designated at 81 at the same radial distance from pivot pin 82 as the guide slot 75 is a pressure die member 83 comprising a block formed with a groove 84 having a shape complementary to the convex rib 77 for accepting that rib when the lever 81 is rotated downwardly, for example, to the horizontal position thereof shown in FIGURE 13. When thus positioned, the marginal surface portions 85, 85 at the opposite sides of the groove 84 engage the horizontal top surface of the plate 64, acting to properly center the top pressure die 83.

As shown in FIGURE 13, the top die member 83 is pivotally connected to the lever 81, as by a transverse pivot bolt 76 extending through the flattened lever portion 87 and respective pivot lugs 88 provided on the top die member 83.

In operation of the apparatus 60, a blank 78 is placed in the guide slot 75 with its ribs 46 facing downwardly and engaged on the die projections 74 of the bottom die elements 65. The key 25 is inserted in the recess 71, whereby the feeler elements 72 of the bottom die members 65 are engaged by the bitting edge 52 of the key, causing the die members 65 to be displaced in accordance with the key bittings. This positions the die projection 74 in accordance with the key contour. The top pressure die member 83 is then moved downwardly and engaged on the convex rib 77 by rotating the lever 81 from its vertical position to its lowered position, sufficient downward force being exerted on the lever 81 to cause the die projections 74 to indent the ribs 46. When the top die member 83 has been pressed into full contact with the plate 64, as shown in FIGURE 13, the die projections 74 engage sufficiently in the ribs 46 to form the V-shaped gatings 48 therein required for the release of the associated lock by the key 25 employed in forming the fence member.

After the fence member has been formed, as above described, the lever 81 is elevated, disengaging the top die member 83 from the convex rib 77. By withdrawing the key 25, the bottom die members 65 are then displaced so as to cause their die projections 74 to cam the completed fence member upwardly a sufficient distance so that it may be grasped and removed from the guide slot 75.

As will be readily apparent, a number of identical fence members may be thus quickly and efficiently formed, which is highly desirable in certain production procedures, for example, in the assembly of automotive locks for vehicles wherein a single key must operate a plurality of locks on the vehicle.

The fence blanks 78 are formed in any suitable manner and, for example, may be cast, pressure molded, or the like. In the formation of the blanks, the grooves 45, defining the ribs 46 therebetween may be indented in the blank simultaneously with the formation of the remainder thereof, or may be formed by an individual machining operation subsequent to casting of the main body of the blank.

While a specific embodiment of a cylinder lock of the side bar type and methods and apparatus for forming the fence member thereof have been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. The method of making a fence for use in a tumbler lock in which tumblers coacting with the fence are positioned by a predetermined bitted key, comprising the steps of arranging a series of forming tools in an order corresponding to the bittings of the key, adjusting the

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position of each forming tool in accordance with the corresponding bitting of said key, and applying said series of forming tools to the fence to form said fence.

2. The method of making a fence for a lock having a series of tumblers that are set by a particularly bitted key, with said tumblers each formed with a part adapted to coact with the fence, comprising the steps of arranging a series of forming tools in an order corresponding to the bittings of the particularly bitted key, adjusting the position of each forming tool in accordance with the corresponding bitting of said key, and applying said series of forming tools to the fence to form on said fence a series of portions for coacting one with the coacting part of each tumbler.

3. The method of making a side bar for a lock having a series of tumblers that are set by a particularly bitted key, with said tumblers each formed with an outstanding lug for coaction with a gating on the side bar, comprising the steps of arranging a series of cutting tools in an order corresponding to the bittings of the particularly bitted key, adjusting the position of each cutting tool in accordance with the corresponding bitting of said key, and applying said series of cutting tools to the side bar to form in said side bar a series of gatings for coacting one with the lug of each tumbler.

4. The method of equipping a side bar lock having tumblers, with a side bar that will be actuated through the tumblers by a particularly bitted key, comprising the steps of arranging a series of forming tools in an order corresponding to the bittings of the particularly bitted key, adjusting the position of each forming tool in accordance with the corresponding bitting of said key, applying said series of forming tools to the side bar to form a part of said side bar, and assembling said side bar in the lock with the formed part of said side bar in predetermined relation to the lock tumblers.

5. The method of equipping a side bar lock having tumblers, with a side bar that will be actuated through the tumblers by a particularly bitted key, comprising the steps of applying the bittings of a key relatively to forming means whereby to position the forming means, applying the so positioned forming means to a side bar to form said side bar with portions that are arranged in accordance with the key bittings, and assembling said side bar in the lock with one of its formed portions in coacting relation to each tumbler.

6. The method of making a side bar lock having tumblers and a fence that will be actuated through the tumblers by a particularly bitted key, comprising the steps of forming in an identical position on each tumbler of a series of tumblers a part for coacting with a fence, forming on a fence a series of portions corresponding to said series of tumblers with said fence portions offset relatively to one another in accordance with the bittings of a key, and assembling said fence and series of tumblers in the lock with one fence portion in coacting relation to each of said tumbler parts.

7. The method of forming a fence for a lock of the kind having a series of key-actuated tumblers with each of said tumblers set by a corresponding key bitting whereby to place that tumbler in position to accept the fence, comprising the steps of forming the fence with a series of portions corresponding one to each of said tumblers, and forming said portions of the fence with surfaces that are complementary to parts of said tumblers and that are offset relatively to one another in accordance with the bittings of a key.

8. The method of forming a fence for a lock of the kind having a series of key-actuated tumblers with each of said tumblers set by a corresponding key bitting whereby to place that tumbler in position to accept the fence, comprising the steps of forming the fence with a series of outstanding ribs corresponding one to each of said tumblers, and forming on said fence ribs gatings that are shaped to accept parts of the tumblers with

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said gatings in positions that are offset relatively to one another in accordance with the bittings of a key.

9. The method of forming a fence for a lock of the kind having a series of key-actuated tumblers with each of said tumblers set by a corresponding key biting whereby to place that tumbler in position to accept the fence, comprising the steps of forming the fence with a series of outstanding ribs corresponding one to each of said tumblers, placing a series of dies in positions that are offset relatively to one another in accordance with the bittings of a key, arranging said fence with one fence rib in opposed relation to each die, and pressing said fence relatively to said series of dies to indent in said ribs gatings that are shaped to accept parts of the tumblers.

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