

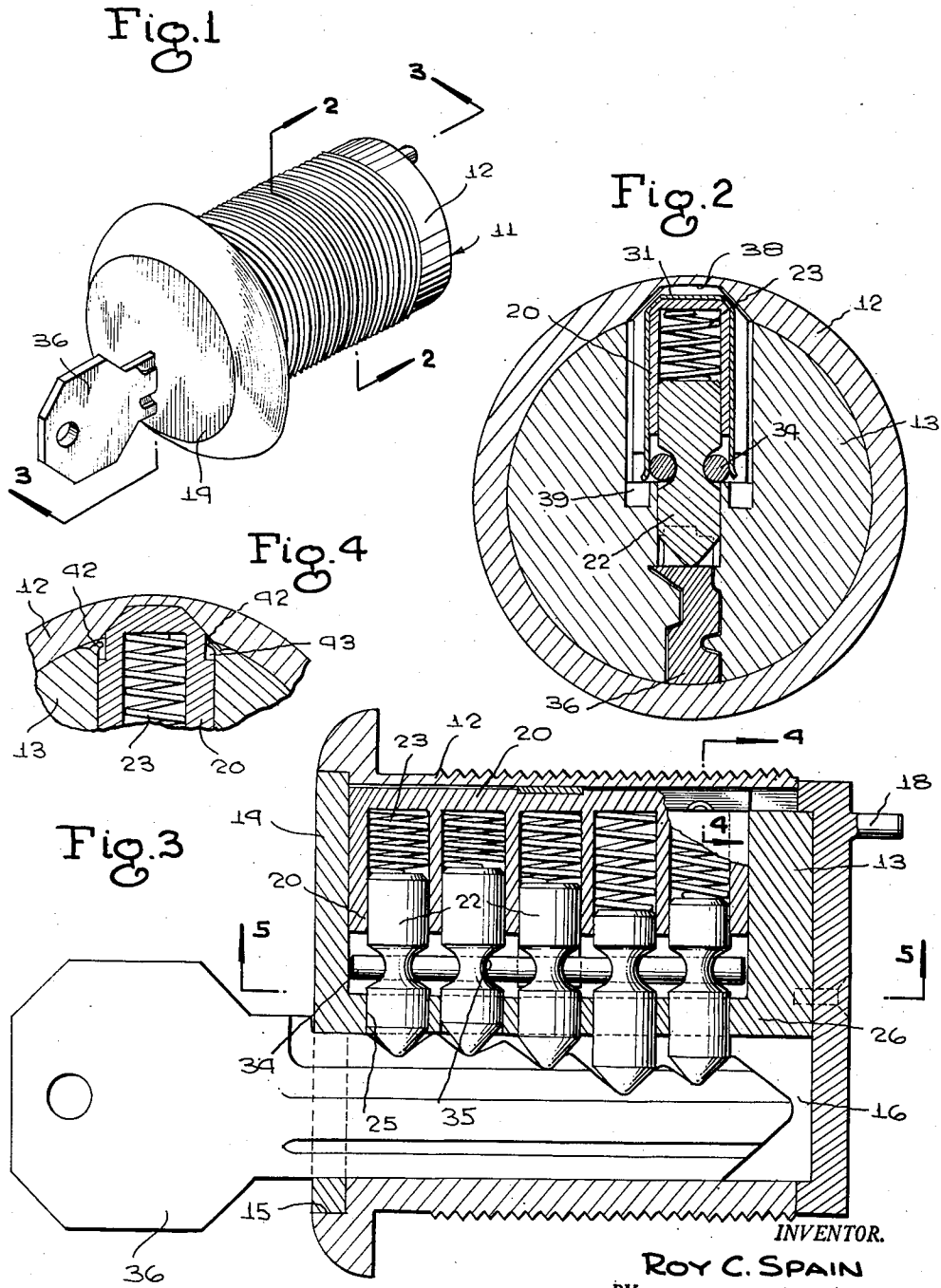
April 22, 1958

R. C. SPAIN  
SIDE BAR LOCK

2,831,338

Filed Sept. 1, 1953

3 Sheets-Sheet 1



INVENTOR.  
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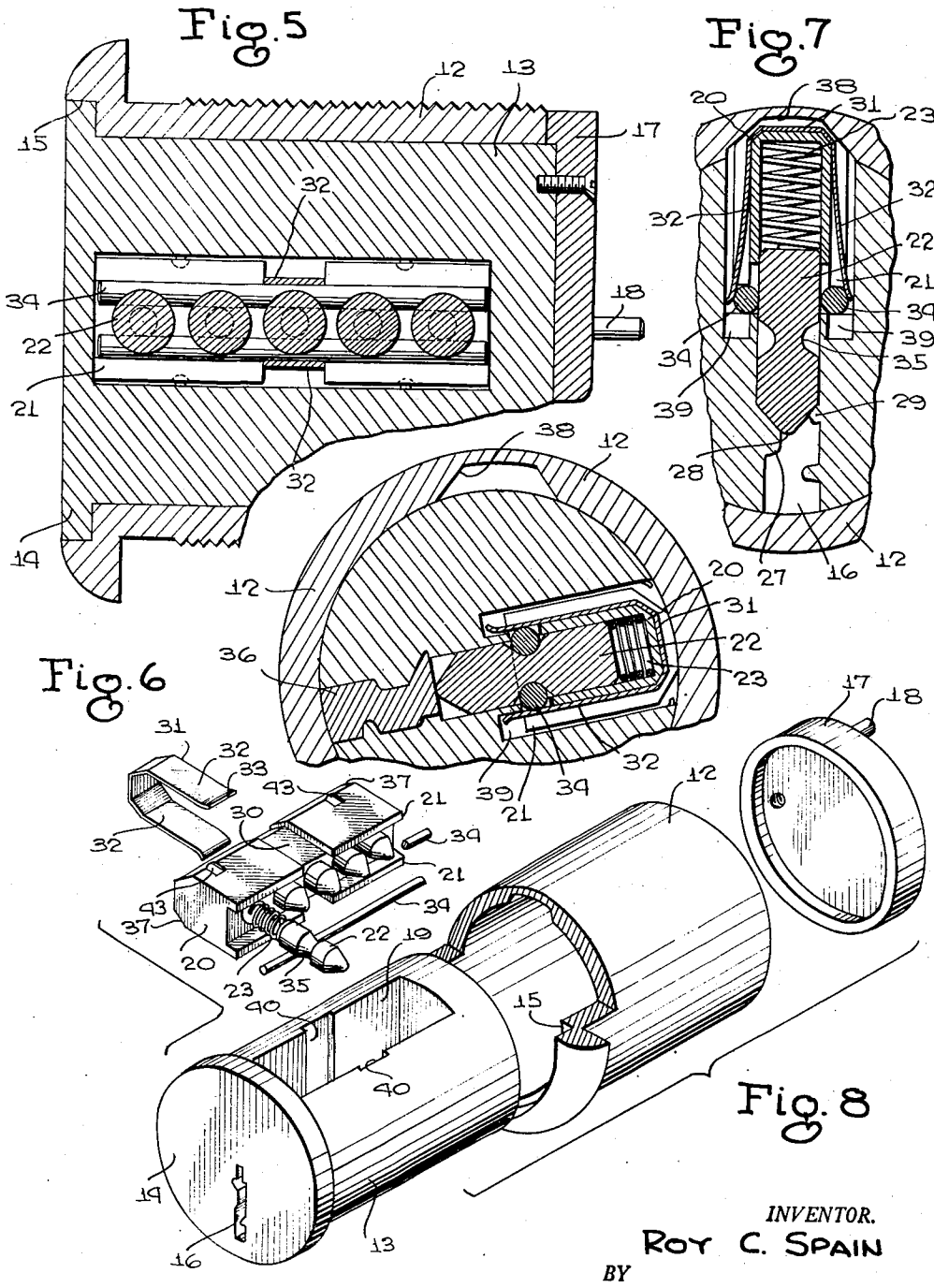
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig. 9

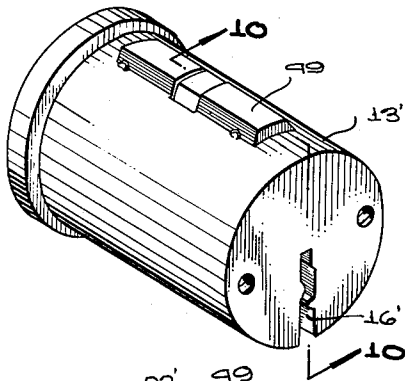


Fig. 10

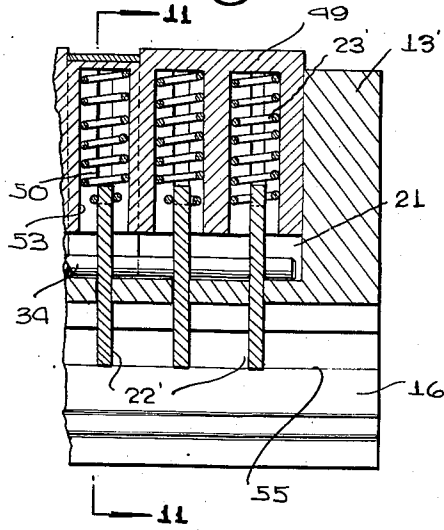


Fig. 11

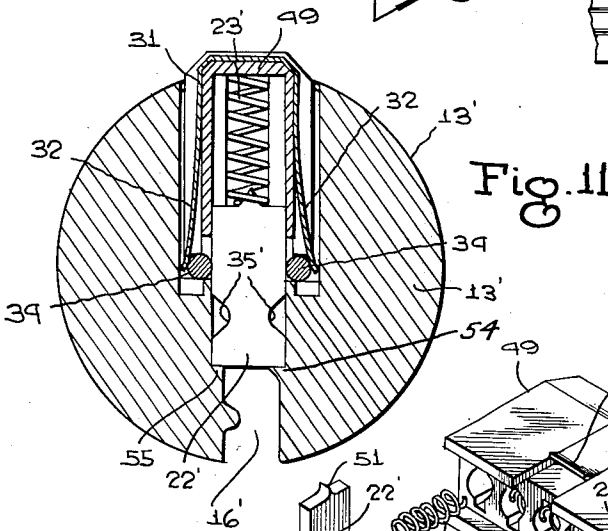
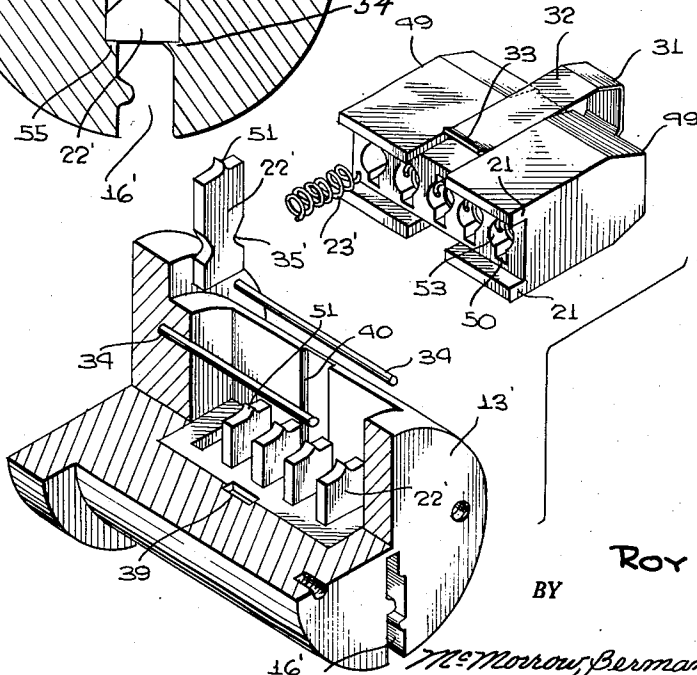


Fig. 12



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2,831,338

**SIDE BAR LOCK**

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Application September 1, 1953, Serial No. 377,788

18 Claims. (Cl. 70-419)

My invention relates to side bar locks. The locks of this class are of two general types, one type having springs that press the side bar away from locking position relatively to the lock cylinder and against the tumblers that control the side bar in the key plug. In the second type of side bar lock, springs press the side bar in the opposed direction, or in other words, toward locking position. A camming relation is then utilized between the lock cylinder and side bar for pressing the bar away from locking position when the key plug rotates. Torque applied to the key plug is damaging to the tumblers because the side bar then presses against the tumblers. The lock that I contribute by my invention is of the second type that I have described, utilizing a side bar pressed inwardly through rotation of the key plug, but having a feature whereby the side bar cannot be forced against the tumblers.

As an important feature of my invention, I utilize detent means through which the tumblers control the side bar, these detent means being arranged to accept the stresses incidental to the application of picking torque to the lock. The detent means, when in locking position, are interposed between the side bar and a part of the key plug, so that the key plug accepts through the detent means any pressure on the side bar due to an attempt to pick the lock. The detent means may take the form of a locking pin adapted to enter the tumbler gatings when these are aligned, thus allowing release movement of the side bar. The tumblers thereby control the side bar but are always free from pressure by the side bar.

As another feature of my invention, I mount the side bar on the key plug in radially aligned relation to the tumblers. This makes possible the die casting of the key plug without a number of side cores or interlocking cores. In addition, the side bar in this arrangement can be utilized to hold the tumblers in assembled positions in the key plug.

As a further particular feature, the same springs are utilized for pressing both the side bar and tumblers to their normal locking positions. Thus, I form the side bar with bores in which the outer ends of the tumblers slide, with the springs held in these bores so as to press between the tumblers and the side bar. The springs thereby press the side bar outwardly toward locking position relatively to the lock cylinder, while acting also to press the tumblers relatively to the keyway.

I have thus outlined rather broadly the more important features of my invention in order that the detailed description thereof that follows may be better understood, and in order that my contribution to the art may be better appreciated. There are, of course, additional features of my invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which my disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my invention. It

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is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of my invention, in order to prevent the appropriation of my invention by those skilled in the art.

Figure 1 is a perspective view of a cylinder lock constructed in accordance with the present invention.

Figure 2 is an enlarged transverse vertical sectional view taken on the line 2-2 of Figure 1.

Figure 3 is an enlarged longitudinal vertical sectional view taken on the line 3-3 of Figure 1.

Figure 4 is an enlarged sectional detail view taken on the line 4-4 of Figure 3.

Figure 5 is a fragmentary horizontal longitudinal sectional view taken on the line 5-5 of Figure 3.

Figure 6 is a fragmentary transverse vertical sectional view similar to Figure 2 but showing the key plug in a partly rotated position which may be achieved by the use of a proper key in the lock.

Figure 7 is an enlarged fragmentary transverse vertical sectional view taken through the lock and showing the normal arrangement of a tumbler thereof in the absence of a key in the key plug.

Figure 8 is a perspective view, partly broken away, of the components of the lock of Figures 1 to 7, the components being shown in separated positions.

Figure 9 is a perspective view of a modified form of key plug which may be employed in a lock constructed in accordance with the present invention.

Figure 10 is an enlarged vertical sectional view taken on the line 10-10 of Figure 9.

Figure 11 is a transverse vertical sectional view taken on the line 11-11 of Figure 10.

Figure 12 is a perspective view, partly in section, showing the components of the key plug of Figures 9 to 11 in separated positions.

Referring to the drawings, and more particularly to Figures 1 to 8, 11 generally designates a cylinder lock comprising the cylinder 12 in which is rotatably mounted the key plug 13. Formed integrally on the forward end of the key plug 13 is the circular flange 14 that is received in a suitable annular recess 15 provided at the forward end of the cylinder 12. The key plug has the longitudinally extending, radial keyway 16, Fig. 3. Secured to the rear end of the key plug is the circular plate member 17 provided with the crank pin 18 which rotates when the key plug 13 is rotated in the cylinder 12. It will be readily understood that the rotation of the pin 18 operates the associated lock bolt mechanism or the like, said associated mechanism forming no part of the present invention.

The key plug 13 is formed with a longitudinally extending recess 19, Fig. 8, whose longitudinal median plane is substantially the same as the longitudinal median plane of the keyway 16, whereby the recess 19 is diametrically opposite to and in alignment with said keyway. Designated at 20 is a side bar shaped as a block extending longitudinally in recess 19 and slidably fitting in the recess 19 for radial movement toward and away from the keyway 16. The side bar 20 is formed at its respective opposite sides with the depending flange elements 21, 21 and is formed with a plurality of cylindrical recesses 20' spaced longitudinally along the side bar, said recesses opening between the flanges 21, 21 and slidably receiving the respective tumblers 22.

Mounted in the respective recesses 20' are the coiled springs 23 which bias the tumblers 22 downwardly toward the keyway 16 and also exert a biasing action on the side bar 20, urging said side bar away from said key slot. As shown in Figure 3, the lower end portions of the tumblers 22 extend slidably through respective circular aper-

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tures 25 provided in the wall 26 of the key plug between the recess 19 and the keyway 16. As shown in Figure 7, the keyway 16 is provided with the respective retaining ribs 27 and 29 which are normally engaged by the tapered tip 28 of each tumbler 22, whereby to limit the movements of the tumblers into the keyway 16.

The side bar 20 is formed at its intermediate portion with a groove 30 extending across its top and sides to form a seat for a U-shaped spring 31 that has side arms 32, 32, said side arms being outwardly curved at their ends, as shown at 33, 33. Disposed on the bottom wall 26 of the recess 19 at the opposite sides of the tumblers 22 are the respective longitudinally extending locking pins 34, 34 which are engaged by the ends of the spring arms 32, 32, as shown in Figure 7, and which are urged thereby into engagement with the respective side surfaces of the tumblers 22, the locking pins 34, 34, being normally disposed beneath the bottom edges of the respective side bar flanges 21, 21. The peripheries of tumblers 22 are grooved to form the respective gatings 35 into which the locking pins 34, 34 move when a key 36 moves the tumblers to predetermined positions to align these gatings, as shown in Figs. 2 and 3. The actual movement of the pins 34, 34 into the aligned gatings 35 is effected by the spring arms 32, 32, and the locking pins 34, 34 then release the side bar 20 for inward radial movement in the recess 19, as in Fig. 6. Such radial movement is normally prevented by the abutment of the bottom edges of the flanges 21 on the side bar with the locking pins 34, 34, as shown in Figure 7.

The respective longitudinal outer corners of the side bar 20 are beveled, as shown at 37, 37 and the inside surface of the cylinder 12 is formed with a longitudinally extending recess 38 shaped to receive the beveled outer edge of the side bar 20. The force exerted by the spring arms 32, 32 on the locking pins 34, 34 is relatively light, and therefore, any unauthorized attempt to rotate the key plug, as by the use of a picking tool inserted in the keyway 16, will cause the side bar 20 to be cammed inwardly by its engagement with an inclined longitudinal surface of the recess 38. This causes the side bar flanges 21, 21 to grip the locking pins 34, 34 and to hold them against inward movement relative to the tumblers 22. However, when the proper key 36 is employed in the keyway 16, the spring arms 32, 32 move the locking pins 34, as above described, into the aligned gatings 35, and away from flanges 21, allowing the side bar 20 to move freely to release position as the key rotates key plug 13.

The bottom wall 26 of the recess 19 is formed with the respective recesses 39, 39 into which the curved ends 33, 33 of springs 31 move when the side bar 20 is cammed inwardly, as is clearly shown in Figure 6.

The side surfaces of the recess 19 may be likewise formed at their intermediate portions with vertical grooves 40, 40, Fig. 8, to provide clearance for the ends 33, 33 of the spring 31 as the side bar 20 moves radially, and to assist in maintaining the spring 31 in its proper position.

In order to retain the side bar 20 in the recess 19 when the key plug 13 is removed from the cylinder 12, as where the key plug is manufactured and marketed as an independent subassembly, and to facilitate the handling of the key plug during the assembly of the key plug with the cylinder 12, or in other desired receptacles, the top edges of the recess 19 may be staked inwardly at a plurality of points therealong, as shown at 42 in Figure 4, as for example at a pair of points on each longitudinal top edge of said recesses. The inwardly staked lug elements 42 extend into respective recesses 43 provided in the longitudinal top corner portions of the side bar 20, and thereby limit outward movement of the side bar 20 past locking position under the force of the spring 23. It will be understood that the stake lug elements 42 are formed subsequent to the insertion of the side bar 20 into the recess 19 at the completion of the assembly of the key plug 13.

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Fabrication of the key plug 13 is considerably facilitated by the arrangement of the recess 19 in a radially aligned relationship with respect to the keyway 16, rather than at an angle to the plane of the keyway 16, and the recess 19 and the keyway 16 may be formed by substantially a single operation rather than by a plurality of operations.

Referring now to the form of the invention shown in Figures 9 to 12, the key plug, shown at 13' employs plate tumblers 22' instead of the pin tumblers employed in the previously described form of the invention. The tumblers 22' are provided with the opposed side gatings 35', 35' in which the locking pins 34 are receivable when the respective tumblers have been moved to positions wherein their side notches 35', 35' are in longitudinal alignment. The side bar, shown at 49, is provided with the longitudinally spaced, transversely extending slots 50 in which the plate tumblers 22' slide, the tumblers being formed at their top edges with the projections 51 which are received in the bottom ends of the biasing springs 23'. The intermediate portions of the slots 50 are cylindrically formed, as shown at 53, to receive the coiled springs 23', the upper ends of said springs bearing against the upper ends of the recesses 50 to exert the inward biasing force on the plate tumbler 22' while at the same time exerting an outward biasing force on the side bar 49. Shoulder elements 55 and 54 extend longitudinally in the keyway 16', as shown in Fig. 11, to limit movements of the tumblers 22' into keyway 16.

The operation of the modified form of the invention shown in Figures 9 to 12 is substantially the same as that of the previously described form of the invention, shown in Figures 1 to 8. The insertion of a proper key in the keyway 16' moves the tumbler plates 22' to place their gatings 35' in longitudinal alignment, and the spring arms 32 then move the locking pins 34 into the aligned gatings 35'. This allows the side bar 49 to be cammed inwardly when the key plug 13' is rotated by the key.

While certain specific embodiments of an improved lock 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. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, said key plug being formed with a longitudinally extending keyway and with a longitudinally extending side bar recess communicating with the keyway, a longitudinally extending side bar slidably mounted in said recess for movement radially toward and away from said keyway, a plurality of longitudinally aligned tumblers slidably mounted in said side bar for radial movement and projecting into said keyway, spring means between said tumblers and side bar urging said tumblers toward said keyway and urging said side bar away from said keyway, a longitudinally extending locking pin disposed in said recess and engaging said tumblers, said tumblers being formed with side gatings in which said pin is at times receivable, said side bar having a side flange whose edge is normally disposed over said locking pin, limiting movement of said side bar toward said keyway, said flange being movable past said pin when the pin is received in said side gatings, said cylinder being formed with an internal cam recess receiving the outer longitudinal edge of said side bar and camming said side bar inwardly when said key plug is rotated in said cylinder.

2. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, said key plug being formed with a longitudinally extending keyway and with a longitudinally extending side bar recess communicating with the keyway, a longitudinally extending side bar slidably mounted in said recess for movement radially toward and away from said keyway, a plurality of longitudinally

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aligned tumblers slidably mounted in said side bar for radial movement and projecting into said keyway, spring means between said tumblers and side bar urging said tumblers toward said keyway and urging said side bar away from said keyway, a longitudinally extending locking pin disposed in said recess and engaging said tumblers, said tumblers being formed with side gatings in which said pin is at times receivable, said side bar having a side flange whose edge normally is disposed over said locking pin, limiting movement of said side bar toward said keyway, said flange being movable past said pin when the pin is received in said side gatings, said cylinder being formed with an internal cam recess receiving the outer longitudinal edge of said side bar and camming said side bar inwardly when said key plug is rotated in said cylinder, and a spring member mounted on said side bar and engaging said locking pin, said spring member biasing said pin into engagement with said tumblers.

3. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, said key plug being formed with a longitudinally extending keyway and with a longitudinally extending side bar recess communicating with the keyway, a longitudinally extending side bar slidably mounted in said recess for movement radially toward and away from said keyway, a plurality of longitudinally aligned tumblers slidably mounted in said side bar for radial movement and projecting into said keyway, spring means between said tumblers and side bar urging said tumblers toward said keyway and urging said side bar away from said keyway, a longitudinally extending locking pin disposed in said recess and engaging said tumblers, said tumblers being formed with side gatings in which said pin is at times receivable, said side bar having a side flange whose edge normally is disposed over said locking pin limiting movement of said side bar toward said keyway, said flange being movable past said pin when the pin is received in said side gatings, said cylinder being formed with an internal cam recess receiving the outer longitudinal edge of said side bar and camming said side bar inwardly when said key plug is rotated in said cylinder, and means on the key plug limiting outward movement of the side bar from said side bar recess.

4. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, said key plug being formed with a longitudinally extending keyway and with a longitudinally extending side bar recess communicating with the keyway, a longitudinally extending side bar slidably mounted in said recess for movement radially toward and away from said keyway, a plurality of longitudinally aligned tumblers slidably mounted in said side bar for radial movement and projecting into said keyway, spring means between said tumblers and side bar urging said tumblers toward said keyway and urging said side bar away from said keyway, respective longitudinally extending locking pins disposed in said recess on opposite sides of and engaging said tumblers, said tumblers being recessed at their opposite sides to receive at times said locking pins, said side bar having respective side flanges whose edges normally are disposed over said locking pins limiting movement of said side bar toward said keyway, said flanges being movable past said pins when the pins are received in the recessed opposite sides of the tumblers, said cylinder being formed with an internal cam recess receiving the outer longitudinal edge of said side bar and camming said side bar inwardly when said key plug is rotated in said cylinder.

5. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, said key plug being formed with a longitudinally extending keyway and with a longitudinally extending side bar recess communicating with the keyway, a longitudinally extending side bar slidably mounted in said recess for movement radially toward and away from said keyway, a plurality of longitudinally aligned tumblers slidably mounted in said side bar for

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radial movement and projecting into said keyway, spring means between said tumblers and side bar urging said tumblers toward said keyway and urging said side bar away from said keyway, respective longitudinally extending locking pins disposed in said recess on opposite sides of and engaging said tumblers, said tumblers being recessed at their opposite sides to receive at times said locking pins, said side bar having respective side flanges whose edges normally are disposed over said locking pins limiting movement of said side bar toward said keyway, said flanges being movable past said pins when the pins are received in the recessed opposite sides of the tumblers, said cylinder being formed with an internal cam recess receiving the outer longitudinal edge of said side bar and camming said side bar inwardly when said key plug is rotated in said cylinder, and a U-shaped spring member mounted on said side bar and engaging said locking pins, said spring member biasing said pins inwardly into engagement with said tumblers.

6. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, said key plug being formed with a keyway and with a side bar recess parallel to said keyway in communication therewith, a side bar slidably mounted in said recess for movement radially toward and away from said keyway while moving out of and into locking relation to the cylinder, a plurality of tumblers slidably mounted in said side bar for radial movement and projecting into said keyway, spring means between said tumblers and side bar urging said tumblers toward said keyway and urging said side bar away from said keyway, locking means disposed in said recess and engaging said tumblers, said tumblers being formed with side gatings in which said locking means is at times receivable, means acting when the key plug rotates to press the side bar toward the keyway whereby to move the side bar out of locking relation to the cylinder, and means on said side bar normally disposed over said locking means limiting movement of said side bar toward said keyway and being movable past said locking means when said locking means is received in said side gatings.

7. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, said key plug being formed with a keyway and with a side bar recess extending parallel to said keyway in communication therewith, a side bar slidably mounted in said recess for movement radially toward and away from said keyway while moving out of and into locking relation to the cylinder, a plurality of tumblers slidably mounted in said side bar for radial movement and projecting into said keyway, spring means between said tumblers and side bar urging said tumblers toward said keyway and urging said side bar away from said keyway, locking means disposed in said recess and engaging said tumblers, said tumblers being formed with side gatings in which said locking means is at times receivable, means acting when the key plug rotates to press the side bar toward the keyway whereby to move the side bar out of locking relation to the cylinder, means on said side bar normally disposed over said locking means limiting movement of said side bar toward said keyway and being movable past said locking means when said locking means is received in said side gatings, and spring means biasing said locking means into engagement with said tumblers.

8. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, said key plug being formed with a keyway and with a side bar recess located in the same plane as said keyway in communication therewith, a side bar slidably mounted in said recess for movement radially toward and away from said keyway, a plurality of tumblers slidably mounted in said side bar for radial movement and projecting into said keyway, spring means between said tumblers and side bar urging said tumblers toward said keyway and urging said side bar away from said keyway, locking means disposed in said recess and engaging said tum-

blers, said tumblers being formed with side gatings in which said locking means is at times receivable, and means on said side bar normally disposed over said locking means limiting movement of said side bar toward said keyway and being movable past said locking means when said locking means is received in said side gatings, said cylinder being formed with an internal cam recess receiving the outer longitudinal edge of said side bar and camming said side bar inwardly when said key plug is rotated in said cylinder.

9. In a lock of the class described, a key plug comprising a body formed with a keyway and with a side bar recess radially aligned with said keyway in communication therewith, a side bar slidably mounted in said recess for movement radially toward and away from said keyway, a plurality of tumblers slidably mounted in said side bar for radial movement and projecting into said keyway, spring means between said tumblers and side bar urging said tumblers toward said keyway and urging said side bar away from said keyway, locking means disposed in said recess and engaging said tumblers, said tumblers being formed with side gatings in which said locking means is at times receivable, and means on said side bar normally disposed over said locking means limiting movement of said side bar toward said keyway and being movable past said locking means when said locking means is received in said side gatings.

10. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, a side bar mounted in said key plug for radial movement relatively to the plug, means whereby the side bar upon outward radial movement is in locking relation to said cylinder, a series of tumblers mounted in radially aligned relation to the side bar in the key plug, said tumblers having gatings, detent means interposed between the side bar and a part of the key plug to prevent radial movement of the side bar inwardly of said key plug out of locking position whereby to accept independently of the tumblers picking pressure applied to the side bar, said detent means moving into the tumbler gatings and away from the said part of the key plug when the gatings are aligned whereby to allow the side bar to move out of locking position.

11. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, a side bar mounted in said key plug for radial movement relatively to the plug, means whereby the side bar upon outward radial movement is in locking relation to said cylinder, a series of tumblers mounted in radially aligned relation to the side bar in the key plug, said tumblers having gatings, detent means interposed between the side bar and a part of the key plug to prevent radial movement of the side bar inwardly of said key plug out of locking position whereby to accept independently of the tumblers picking pressure applied to the side bar, said detent means moving out of blocking relation to said side bar when said tumblers are aligned with their gatings in predetermined relation to the detent means.

12. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, a side bar mounted in said key plug for inward and outward movement relatively to the plug, means whereby the side bar upon outward movement is in locking relation to said cylinder, a series of tumblers mounted in the key plug, said tumblers having gatings, detent means interposed between the side bar and a part of the key plug to prevent movement of the side bar inwardly of said key plug out of locking position whereby to accept independently of the tumblers picking pressure applied to the side bar, said detent means moving into the tumbler gatings and away from the said part of the key plug when the gatings are aligned whereby to allow the side bar to move out of locking position.

13. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, a side bar mounted in

said key plug for radial movement relatively to the plug, means whereby the side bar upon outward radial movement is in locking relation to said cylinder, a series of tumblers mounted in radially aligned relation to the side bar in the key plug, said tumblers having gatings, pins interposed between the side bar and a part of the key plug whereby to accept independently of the tumblers picking pressure applied to the side bar, and means moving said pins into the tumbler gatings and away from the said part of the key plug upon movement of the tumblers to align their gatings with the pins whereby to allow the side bar to move out of locking position.

14. In a lock of the class described, a cylinder, a key plug rotatable in said cylinder, a series of tumblers mounted for movement in said key plug, a side bar mounted in said key plug for movement relatively to the tumblers with that movement in aligned relation to the tumbler movement, means through which the side bar upon movement away from the tumblers is in locking relation to the cylinder, means controlled by the tumblers and coacting with the side bar to enable said tumblers to control the unlocking movements of said side bar, and means limiting the movements of the side bar past locking position whereby to hold the tumblers assembled to the key plug when the plug is removed from the cylinder.

15. In a lock of the class described, a lock cylinder, a key plug rotatable in said cylinder having a keyway, a side bar mounted in said key plug for inward and outward movement relatively to the plug, means whereby the side bar upon outward movement is in locking relation to the lock cylinder, said side bar having a series of openings in aligned relation to said keyway, a series of tumblers mounted in the openings in the side bar and sliding relatively to the side bar when actuated by a key in said keyway, and means controlled by the tumblers and coacting with the side bar to enable said tumblers to control the unlocking movements of said side bar.

16. In a lock of the class described, a lock cylinder, a key plug rotatable in said lock cylinder having a keyway, a side bar on said key plug, a series of tumblers in aligned relation to said side bar, a spring between each tumbler and the side bar pressing the side bar to locking position relatively to the lock cylinder, the springs also pressing each tumbler relatively to the keyway whereby to be actuated by a key in said keyway, means acting when the key plug rotates to move the side bar out of locking position, and means controlled by the tumblers and coacting with the side bar to enable said tumblers to control the movements of said side bar out of locking position.

17. In a lock of the class described, a lock cylinder, a key plug rotatable in said cylinder having a keyway, a side bar mounted on said key plug for movement relatively to said key plug in a radial direction, said side bar having a series of openings in aligned relation to said keyway, a series of tumblers mounted to slide in the openings in the side bar, springs in the side bar openings pressing the side bar to locking position relatively to the lock cylinder and also pressing each tumbler relatively to the keyway whereby to be actuated by a key in said keyway, means acting when the key plug rotates to move the side bar out of locking position, and means controlled by the tumblers and coacting with the side bar to enable said tumblers to control the unlocking movements of said side bar.

18. In a lock of the class described, a lock cylinder, a key plug rotatable in said cylinder having a keyway, a side bar mounted on said key plug for movement relatively to said key plug in a radial direction, said side bar having a series of openings in aligned relation to said keyway, a series of tumblers mounted to slide in the openings in the side bar, springs in the side bar openings pressing the side bar to locking position relatively to the lock

cylinder and also pressing each tumbler relatively to the keyway whereby to be actuated by a key in said keyway, said cylinder formed with a cam surface acting against the pressure of said spring when the key plug rotates whereby to press the side bar away from locking position, detent means interposed between the side bar and a part of the key plug to prevent movement of the side bar out of locking position and to accept independently of the tumblers picking pressure applied to the side bar, said tumblers having gatings, and means whereby the detent means move into the gatings and away from the said part

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of the key plug upon actuation of the tumblers to align the gatings.

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