Oct. 8, 1957 E. N. JACOBI 2,808,717

SIDE BAR LOCK WITH LEVER TUMBLERS

Filed July 17, 1953 5 Sheets-Sheet 1

Fig. 1.

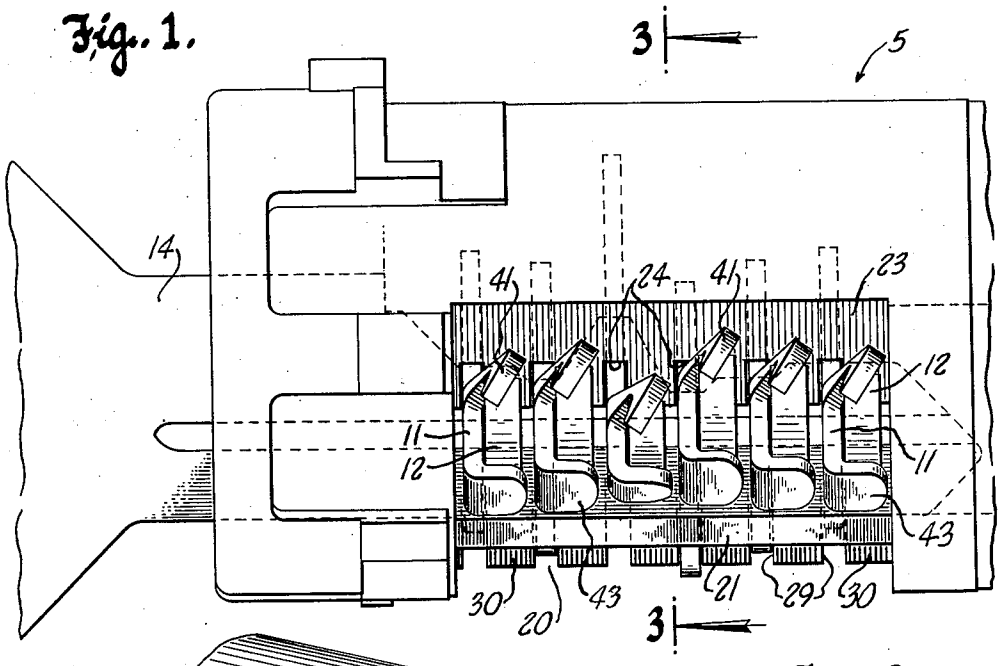
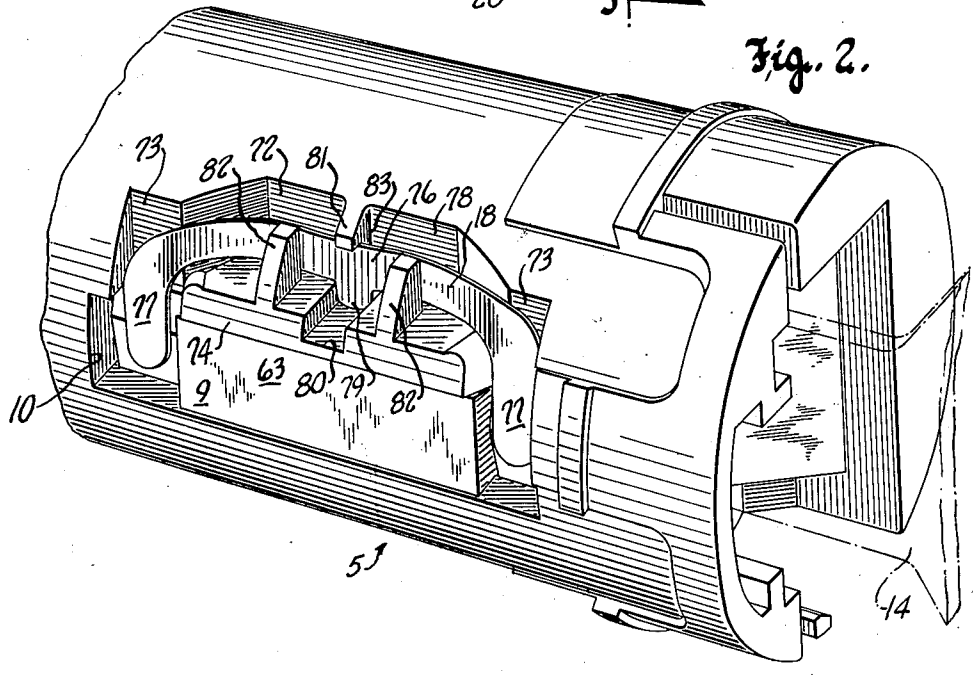


Fig. 2.



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SIDE BAR LOCK WITH LEVER TUMBLERS

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Fig. 3.

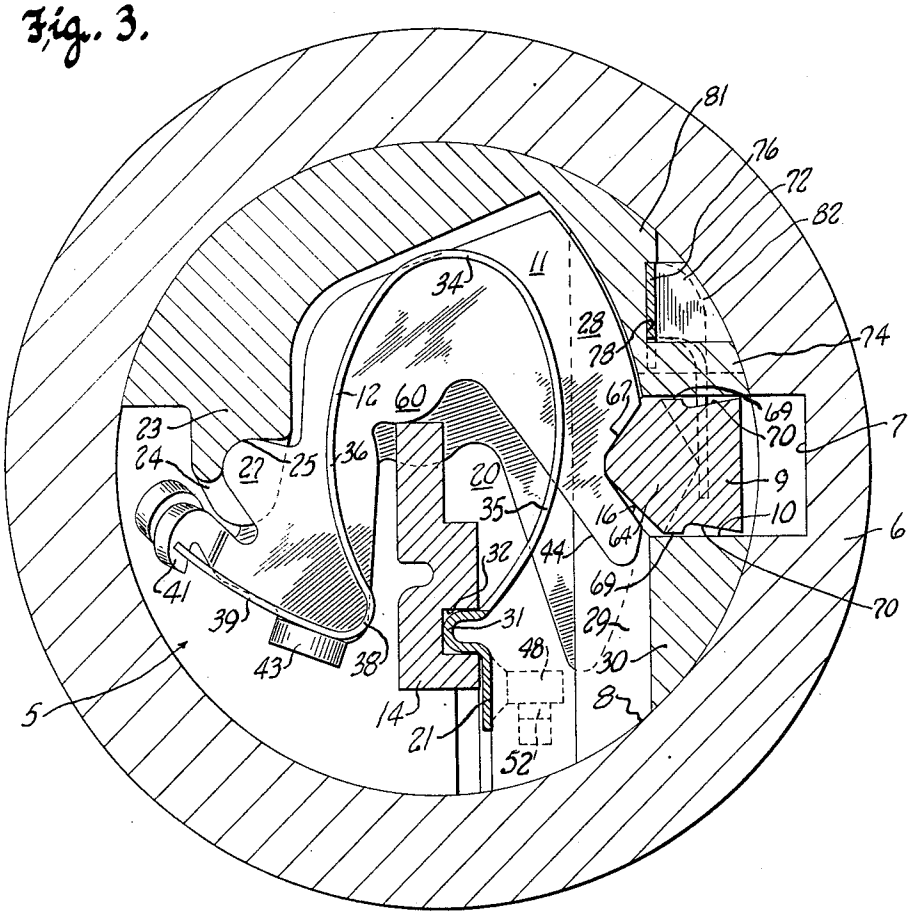


Fig. 7.

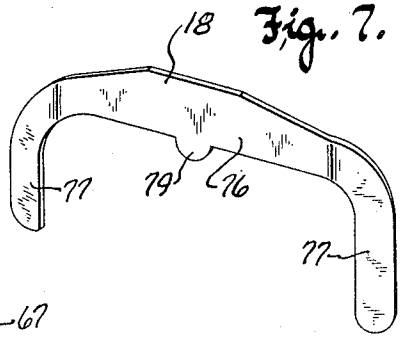
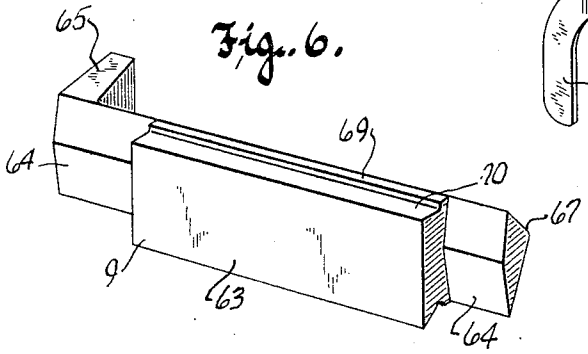


Fig. 6.



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SIDE BAR LOCK WITH LEVER TUMBLERS

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Fig. 4.

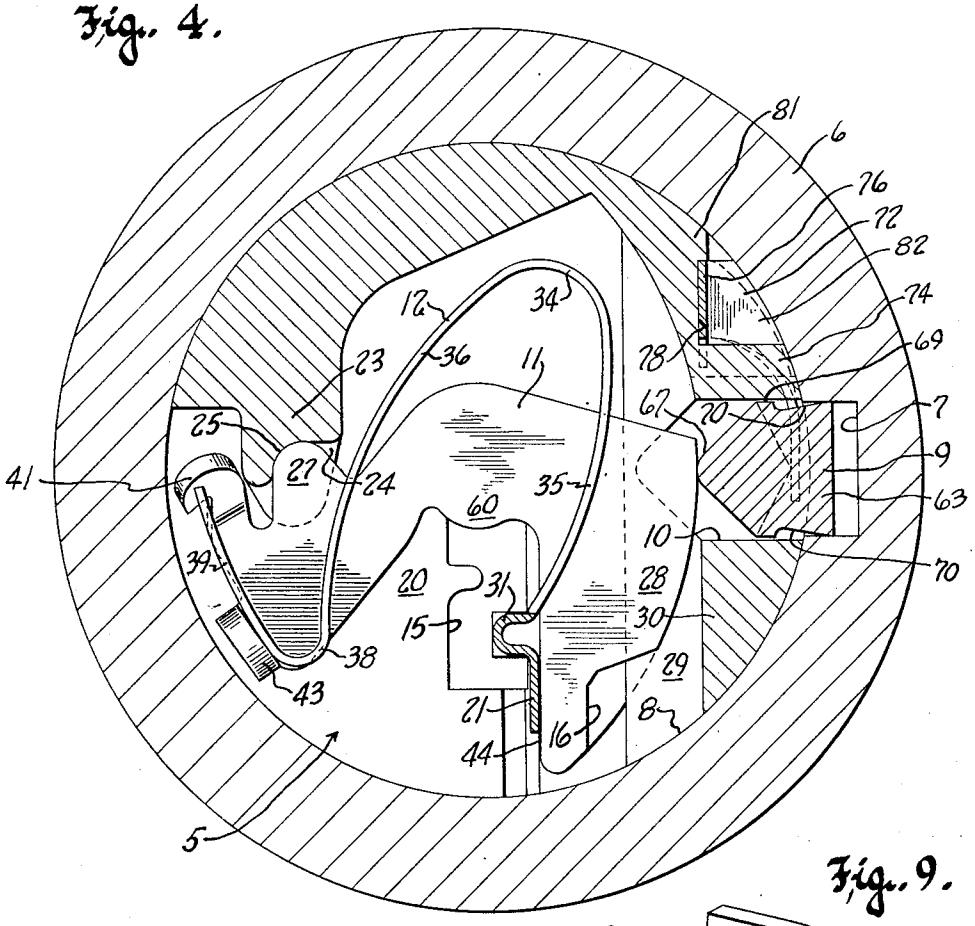


Fig. 9.

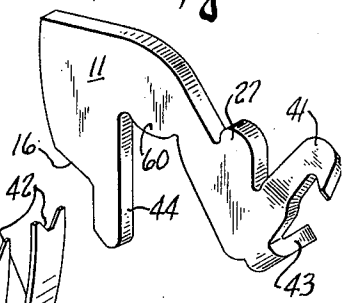
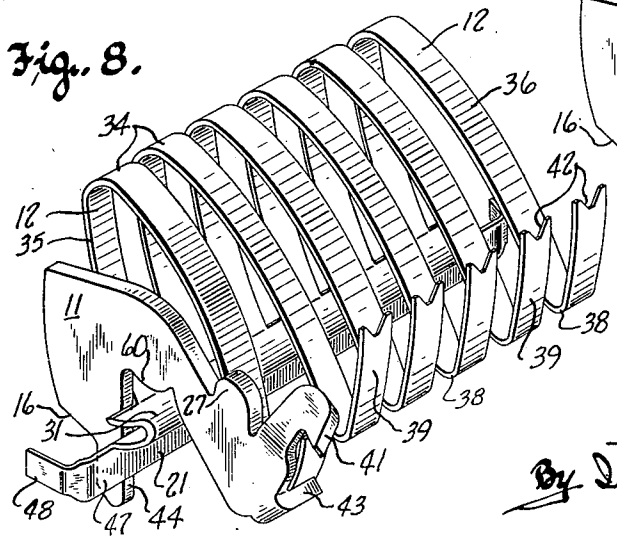


Fig. 8.



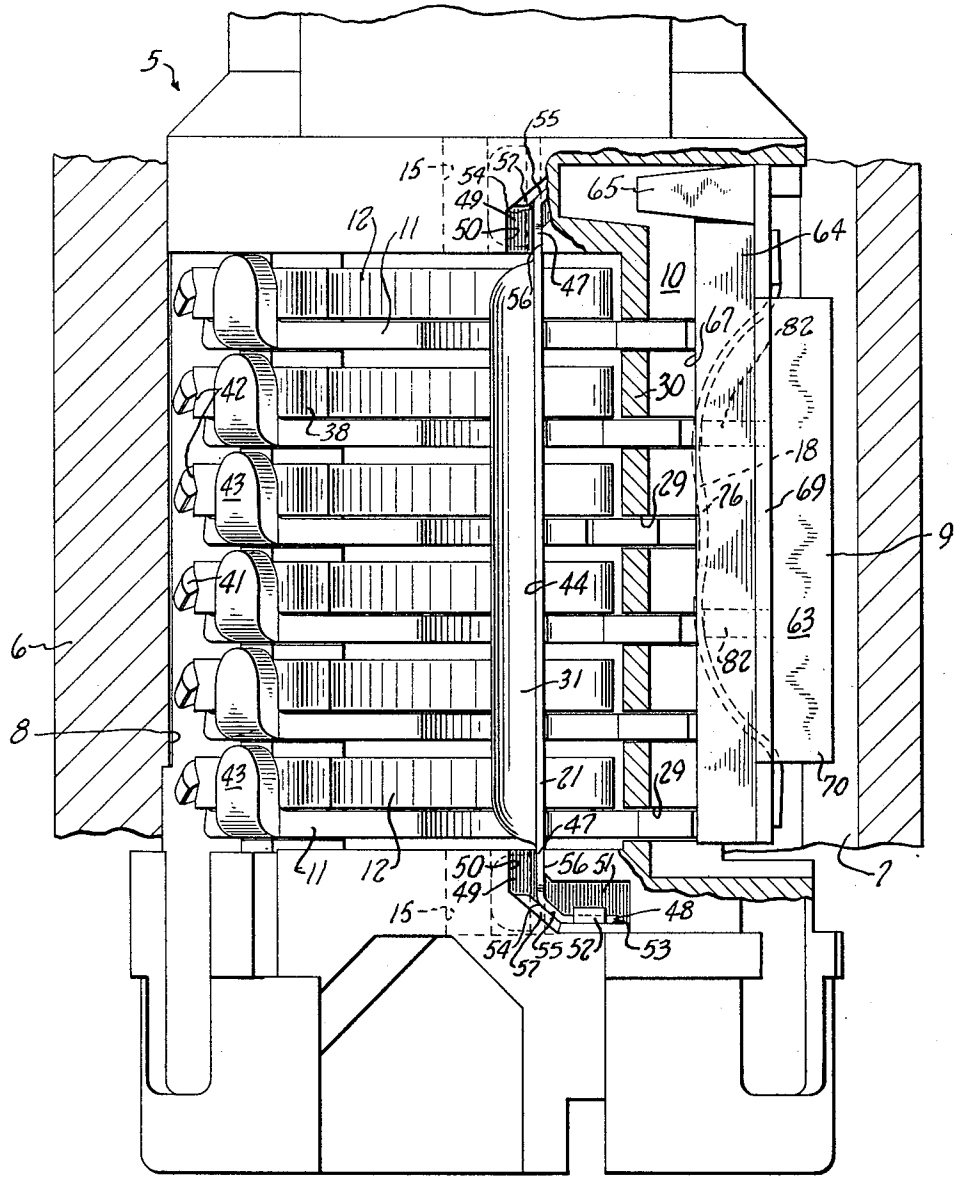
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SIDE BAR LOCK WITH LEVER TUMBLERS

Filed July 17, 1953 5 Sheets-Sheet 4

Fig. 5.



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SIDE BAR LOCK WITH LEVER TUMBLERS

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Fig. 10.

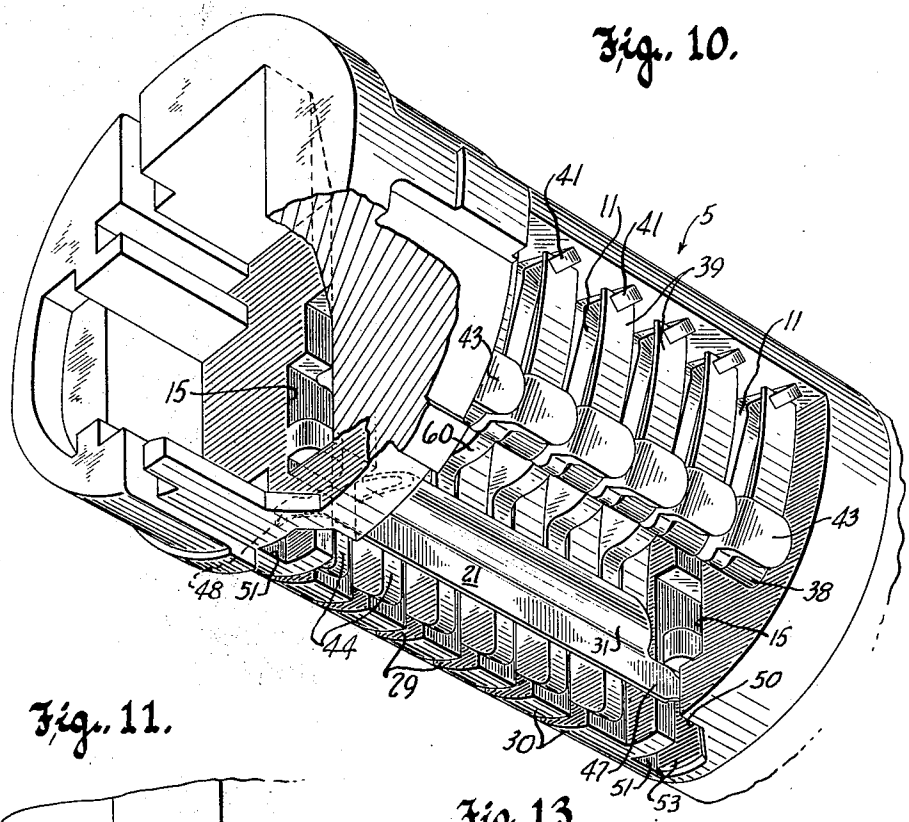


Fig. 11.

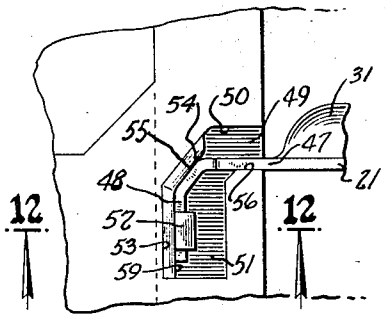


Fig. 13.

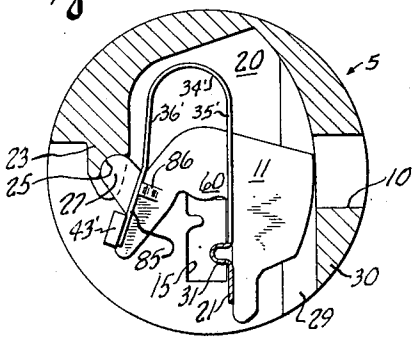
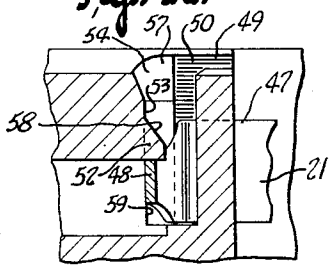


Fig. 12.



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United States Patent Office

2,808,717

Patented Oct. 8, 1957

2,808,717

SIDE BAR LOCK WITH LEVER TUMBLERS

Edward N. Jacobi, Milwaukee, Wis., assignor to Briggs & Stratton Corporation, Milwaukee, Wis., a corporation of Delaware

Application July 17, 1953, Serial No. 368,613

34 Claims. (Cl. 70—366)

This invention relates to cylinder locks and has more particular reference to improvements in cylinder locks of the rocking tumbler side bar type disclosed in Patent No. 2,182,588, issued to Edward N. Jacobi, December 5, 1939.

In a side bar lock of this type, the tumblers normally hold the locking bar on the side of the cylinder in a radially projected position engaging in a locking recess in the lock casing to preclude rotation of the cylinder in its casing. The insertion of a proper key into the cylinder, however, causes the tumblers to be moved to unlocking positions in which notches in one edge thereof align with the locking bar and allow it to be retracted from the locking recess under spring bias to free the cylinder for rotation.

In the lock of the aforesaid patent, the tumblers are mounted on a common pivot pin to swing to and from their unlocking positions about an axis parallel to that of the lock cylinder and remote from the notched edges of the tumblers; and they are engaged by the key at locations intermediate their pivot axis and their notched edges so that the extent of motion imparted to the tumblers by the key is greater at the notched free ends of the tumblers than at the intermediate portions thereof directly engaged by the bitting of the key. The chief advantage of this rocking tumbler feature, as explained at greater length in the aforesaid patent, is that in multiplying the effect of the key bittings on the tumblers, it provides greater assurance against response of the lock to different keys having only slightly different bittings for one or two tumblers.

In general, the purposes of this invention are the same as those of the aforesaid Jacobi patent, namely to provide a rocking tumbler side bar lock of the character described, wherein the action of its rocking tumblers multiplies the key differences.

More specifically it is a purpose of this invention to provide a rocking tumbler side bar lock of the character described in which the pivot pin customarily employed to mount the tumblers for rocking motion is eliminated along with the difficult and time consuming assembling operation of threading such a pin through aligning holes in the cylinder and tumblers.

In this respect, it is another object of this invention to provide tumbler springs in the form of blades so shaped and biased that they serve both to hold the rocking tumblers seated upon fulcrums formed on the lock cylinder and to yieldingly resist key produced rocking movement of the tumblers on their fulcrums in the unlocking direction.

A further purpose of this invention resides in the provision of a unique tumbler spring unit and tumblers capable of being subassembled therewith prior to insertion into the lock cylinder.

In this connection it is a more specific object of this invention to provide a tumbler spring unit comprising an elongated plate having a series of spaced spring blades integrally joined to one edge thereof, the blades being bowed in such a manner that their resiliency is utilized to normally hold the tumblers subassembled therewith

by force applied to the spring blades transverse to their bowed portions and which force is relieved upon securement of the subassembly in the lock cylinder, the spring blades thereafter being subjected only to a pure bending by couples applied to the extremities of the blades.

With the spring blades formed in this manner it is possible for the first time to achieve a uniform bending moment therein from one end of the blades to the other, obviating the need for tapering the blades as might otherwise appear necessary. In addition, the tumbler spring unit of this invention utilizes the space inside the tumbler cavity in a lock cylinder to the best advantage, while the sheet material from which the tumbler spring is made is used more efficiently than is possible when the bending moment on the blades varies from end to end thereof.

It is a further purpose of this invention to provide a rocking tumbler lock of the character described having a tumbler spring unit, the base plate of which is formed as a spring clip capable of being snapped into place on the lock cylinder to retain it and the rocking tumblers of the lock assembled in the tumbler cavity without the need for staking operations on the cylinder as were frequently necessary in the past.

Other objects of this invention reside in the provision of a novel side bar and one piece spring for yieldingly urging the side bar inwardly of its slot in the lock cylinder to its retracted position; the spring being in the form of a V-shaped spring clip capable of being snapped into place on the lock cylinder and held assembled therewith entirely without the need for staking operations such as were previously used for this purpose.

Still another object of this invention resides in the provision of a lock of the character described wherein the cavity in the side of the lock cylinder is relatively large and limits guiding engagement between a key and the key slot of the cylinder to the end portions of the cylinder lying ahead of and behind the cavity; and wherein the base plate of the tumbler spring unit is secured to the cylinder to lie directly alongside a key in the key slot and is provided with a longitudinal bead adapted to engage in a groove in the key to guide the rearward travel of the key through the cavity and into the section of the key slot in the portion of the cylinder rearwardly of the cavity.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiment of the invention constructed in accordance with the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side elevational view of the cylinder lock of this invention, with the cylinder shown removed from its casing and having a proper key inserted therein;

Figure 2 is a perspective view of the lock cylinder shown in Figure 1 looking at the opposite side thereof and indicating the front portion of the key in construction lines;

Figure 3 is a cross sectional view through the lock cylinder taken along the plane of the line 3—3 of Figure 1, but showing the cylinder in place in its casing and the tumblers in their unlocking positions;

Figure 4 is a cross sectional view similar to Figure 3 but showing the key removed and the tumblers in their locking positions;

Figure 5 is a bottom view of the lock cylinder, portions thereof being broken away and shown in section;

Figure 6 is a perspective view of the locking bar per se;

Figure 7 is a perspective view of the locking bar spring;

Figure 8 is a perspective view of the tumbler spring unit showing one of the lever tumblers subassembled therewith;

Figure 9 is a perspective view of one of the tumblers;

Figure 10 is a perspective view of the lock cylinder looking at the same from the front and partly from beneath the cylinder and from the side thereof seen in Figure 1, portions of the front of the cylinder being broken away and shown in section;

Figure 11 is an enlarged fragmentary detail view looking at the underside of the cylinder and showing the manner in which the tumbler spring unit is snapped into place on the lock cylinder;

Figure 12 is a fragmentary sectional view taken through Figure 11 along the plane of the line 12—12, and

Figure 13 is a cross sectional view similar to Figure 4 but illustrating a slightly modified embodiment of the invention.

Referring now more particularly to the accompanying drawings in which like reference characters indicate like parts throughout the several views, the numeral **5** generally designates the plug or cylinder and the numeral **6** the casing or lock body in which the lock cylinder is rotatably received. The casing, which may be of tubular construction as indicated in Figures 3 and 4, has a longitudinal recess **7** opening to its bore **8** to receive the locking bar **9** of the cylinder in the locked condition thereof seen in Figure 4 to preclude rotation of the cylinder in its casing.

The locking bar **9** is controlled by a series of tumblers **11** of the lever type, generally on the order of those disclosed in the aforementioned Jacobi Patent No. 2,182,588. Springs **12** normally urge the tumblers toward locking positions seen in Figure 4 in which they hold the locking bar projected radially outwardly from its longitudinal slot **10** in the side of the lock cylinder and engaged in the longitudinal recess **7** of the casing.

Insertion of a proper key **14** rearwardly into a key slot **15** in the cylinder, opening to the front thereof, causes the tumblers **11** to be rocked about their axes to unlocking positions seen in Figure 3 in which notches **16** in the peripheries of the tumblers align within the inner edge of the locking bar **9** to allow the locking bar to be retracted from the recess **7** in the casing under spring force. In the present case the bias on the locking bar is afforded by a novel spring clip **18** to be described in greater detail later.

According to this invention the tumblers **11** and their springs **12** are so formed that they may be subassembled as a unit securable in a relatively large and deep cavity **20** in the cylinder opening generally to the underside thereof intermediate the ends of the cylinder, entirely without the need for performing staking operations on the cylinder to hold these parts against displacement. Moreover, the tumblers are formed to cooperate with the cylinder in such a manner that the customary pivot pin conventionally employed to pivotally mount the tumblers on the cylinder is eliminated; while the tumbler springs **12** are integrally joined at one end to a common elongated base plate **21** to obviate the need for difficult and time consuming individual handling and installment of the springs.

Referring now to Figures 3 and 4 which show the cross sectional shape of the cavity **20**, it will be noted that a longitudinal ridge **23** projects up from the bottom of the cavity adjacent to the side of the lock cylinder diametrically opposite the locking bar **9**. The edge of this ridge has a series of slits or grooves **24** therein, equispaced along the length of the ridge, and having concave bottoms **25**. The centers of curvature of the bottoms **25** of these slits lie in a common plane containing the axis of the cylinder and passing centrally through the locking bar **9**. The slits **24** with their concave bottoms **25** define

bearing sockets which open downwardly and inwardly, generally toward the mouth of the cavity **20** at the opposite side of the cylinder, in which portions of the tumbler **11** may be received to provide fulcrums for the tumblers.

The tumblers **11** are stamped from flat sheet metal and are received in the cavity **20** with their flat sides substantially normal to the axis of the cylinder, substantially edgewise with respect to the bottom of the cavity. Each of the tumblers extends transversely across the cavity and has a bearing projection **27** on one end portion received in the socket provided by one of the slits **24** of the ridge **23**. The opposite end portion **28** of each tumbler is received in a groove **29** in the side wall **30** of the cavity remote from the ridge **23**.

The bearing projections **27** have rounded ends which seat on the concave bottoms **25** of the bearing sockets defined by the slits **24** so that the tumblers are supported on the cylinder for edgewise rocking motion toward and from locking positions seen in Figure 4 at which their outer ends **28** hold the locking bar **9** projected radially from the cylinder and engaged in the recess **7** of the lock body or casing **6**. It will be noted, of course, that the outer ends **28** of the tumblers are generally arcuate and concentric to the common axis about which the tumblers fulcrum; and that the tumblers are guided for edgewise rocking motion in the cavity by the engagement of their opposite end portions in the slits **24** at one side of the cavity and the grooves **29** at the opposite side of the cavity.

From the description thus far, it will be appreciated that the tumbler springs **12** and the base plate **21** to which they are joined constitute a tumbler spring unit. The tumbler spring unit, as shown best in Figure 8, is stamped and formed from a single sheet of spring metal, and the tumbler springs are in the form of bowed blades.

The base plate **21** of the tumbler spring unit, when secured to the lock cylinder in a manner which will be brought out at greater length hereinafter, extends longitudinally through the cavity **20** edgewise with respect to and near the mouth of the cavity. As seen best in Figure 4, the base plate is positioned to lie between the side wall **30** of the cavity and the adjacent side of a key **14** in the key slot. Also, the base plate flatwise overlies the lower portion of said adjacent side of the key **14**, and at its inner edge, the base plate is provided with a longitudinal rib **31** projecting toward the median plane of the key slot to not only reinforce the base plate but to engage in a longitudinal groove **32** in the adjacent side of the key to guide the rearward travel of the key through the cavity **20** and into the portion of the key slot in the end of the cylinder therebehind.

This is an important feature of the lock of this invention, for the cavity **20** in effect interrupts the key slot **15** so that the key **14** receives direct support from the cylinder only at those end portions thereof lying forwardly of and behind the cavity. Without the guiding action of the base plate **21** and its rib **31**, therefore, considerable difficulty might be experienced in properly inserting the key into the key slot **15**, and especially in getting the extremity of the key to enter the rear section of its slot.

Each of the spring blades **12** edgewise overlies one flat face of one of the tumblers, and accordingly, the tumblers and the spring blades are alternately arranged in the cavity **20**. Each spring blade has an inwardly bowed portion **34** received in and extending across the bottom portion of the cavity **20**. Opposite, transversely spaced spring arms **35** and **36** project outwardly from the bowed portion toward the mouth of the cavity. The outer end of the arm **35**, of course, is integrally joined to the base plate **21** at the upper edge thereof, while the arm **36** extends across the inner side of the ridge **23** in the bottom of the cavity, substantially close thereto.

At their outer ends each of the arms **36** of the spring blades is bent back upon itself to provide an outwardly

bowed portion 38, near the mouth of the cavity, having a part of the arm 36 as one of its legs and having an opposite leg 39 extending generally toward the bottom of the cavity but passing on the outside of the ridge 23. The leg 39, of course, defines the free end of each spring blade, and in the locking positions of the tumblers, these legs occupy positions close to the surface of the cylinder and nearly concentric thereto.

Referring to Figure 4, it will be noted that the outwardly bowed free end portion 38 of each spring blade substantially overlies and embraces the ridge 23 along the bottom of the cavity and the bearing seats 25 therein. It will also be noted that each of the spring blades overlies the rear face of its adjacent tumbler, and that each of the tumblers has an outwardly facing hook 41 on its fulcrumed end bent rearwardly therefrom along the exterior of the ridge 23 and engaging in a V-shaped notch 42 in the extremity of the leg 39 of its spring blade. In addition, each of the tumblers has a tab 43 thereon bent rearwardly to overlie the exterior of the leg 39 of its spring blade at a location thereon spaced from the V-shaped notch in its extremity and preferably closely adjacent to the bow 38 by which it is joined with the arm 36 of the blade.

Since the arms 35 and 36 of the spring blades are normally biased away from one another, the spring force of the spring blades is utilized to hold the inner end portion of the legs 39 thereof pressed against the tabs 43 on the tumblers and to maintain the notched extremities at the free ends of the legs 39 engaged with the hooks 41 on the tumblers. Due to their shape and mounting, therefore, the spring blades exert a force on the tumblers along transverse lines substantially joining the rib 31 on the base plate with the centers of curvature of the tumbler bearing sockets 25 to hold the tumbler projections 27 seated in their bearing sockets. At the same time, the tumbler springs yieldingly resist edgewise rocking motion of the tumblers on their fulcrums toward their unlocking positions adjacent to the bottom of the cavity, as seen in Figure 3.

Attention is directed to the fact that because of the shape and location of the bearing sockets 25 with respect to the locking bar 9, forces exerted on the locking bar 9 tending to retract the same when the tumblers are in their locking positions cannot produce rocking of the tumblers toward their unlocking positions.

From the description of the tumblers and their springs thus far it will be apparent that the spring blades, through the interconnection of their free end portions with the tumblers, yieldingly urge the locking ends of the tumblers toward the mouth of the cavity 20, to their locking positions. The outer or locking ends 28 of the tumblers, however, have extensions thereon projecting downwardly between the side wall 30 of the cavity and the base plate to overlie the outer side of the latter. Each of these extensions provides a shoulder 44 on the locking end of the tumbler normally held engaged with the adjacent side of the base plate, as seen in Figures 4 and 8, under the force of the tumbler spring. Such engagement, of course, defines the locking positions of the tumblers and, according to this invention, enables subassembly of the tumblers with the spring unit in the manner indicated in Figure 8, before their insertion into the cavity in the lock cylinder.

This is one of the major features of the invention since it eliminates the difficult and time consuming task of individual assembly of each spring and tumbler into the lock cylinder, as was usually the case in the past. Moreover, the tumblers may be assembled to the tumbler spring unit in an assembling machine or jig provided for that purpose to reduce assembly time to a minimum.

Attention is directed to the fact that the subassembly of the tumblers with the blades of the tumbler spring unit produces a bending moment in the blades which varies throughout their length, and is therefore objectionable. In other words, prior to securement of the subassembly in the cavity of the cylinder, the tumblers hold the spring blades with their opposed ends drawn part way together, thereby placing objectionable stress upon their bowed portions which connect the arms 35 and 36 together. If this stress was not relieved, the springs would have a relatively short life, since they would tend to break at their inwardly bowed portions adjacent to the bottom of the cavity 20.

However, when the subassembly is inserted into the cavity 20 in the cylinder, the bearing projections 27 on the tumblers seat in their sockets before the base plate 21 of the spring unit reaches its final position seen in Figures 3 and 4, at which it is secured to the cylinder. Thus, during the final motion of the spring unit into the cavity, its blades are further loaded by the engagement of their legs 39 with the hooked ends of the tumblers, with the result that when properly secured to the cylinder, the forces to which the spring blades were initially subjected are relieved and the spring blades are subjected substantially only to a pure bending by couples applied to each end thereof.

In other words, the blades are being held bent or flexed by the application of force couples to their legs 39 at the tumbler hooks 41 and the tumbler tabs 43, and by the application of other force couples to their opposite ends at the inner and outer edge portions of the base plate 21.

The highly desirable result of a substantially uniform bending moment throughout the length of the blades is thereby achieved, to assure long life of the blades, and to preclude their being thrown into engagement with the sides of the cavity during rocking of the tumblers about their fulcrums.

The unique shape of the blades of the spring unit and the manner in which they are loaded, therefore, eliminates the need for providing them with a taper along their length, as would otherwise appear necessary; and enables the material from which the blades are formed to be used most efficiently in the relatively small space within the cavity 20.

According to this invention the tumbler spring unit may be readily snapped into place on the lock cylinder, and held assembled with the cylinder entirely without the need for any staking operations or other securing devices to prevent disassembly of the spring unit from the cavity. As best shown in Figures 10, 11 and 12, the opposite ends of the base plate 21 of the tumbler spring unit are extended, as at 47, and have their extremities bent flatwise toward the side wall 30 of the cavity to provide hooks 48 normal to the plane of the base plate. The hooked ends of the base plate are received edgewise in recesses 49 in the front and rear end portions of the cylinder, at its underside. These recesses are angle-shaped for this purpose, having longitudinal branches 50 opening into the opposite ends of the cavity to receive the flat end portions of the base plate, and circumferential branches 51 leading from the longitudinal branches 50 and in which the angularly bent hooks 48 are received.

Lugs 52 projecting toward one another from the remote walls 53 of the circumferential branches 51 of the recesses overlie the outer edges of the hooks 48 to hold the base plate of the spring unit against edgewise movement in the cavity and against displacement radially out of the mouth thereof. The outer surfaces on the hooks 48, of course, bear flatwise against the walls 53 to preclude endwise movement of the base plate relative to the cylinder. In addition, diagonal surfaces 54 in the recesses engage cooperating surfaces 55 on the hooked ends of the base plate to hold the outer face of its end portions flatwise against shoulders 56 in the recesses, each defining one side wall of its longitudinal branches 50, to thus preclude flatwise movement of the base plate relative to the cylinder.

From this it will be seen that the spring unit, with tumblers subassembled thereto in the manner hereinbefore described can be inserted into the cavity **20** from the underside of the lock cylinder, with the base plate **21** of the spring unit held edgewise with respect to the bottom of the cavity; and that the hooked ends of the base plate will be flexed toward one another as they pass over the lugs **52** in the recesses **51** and will then snap apart to engage beneath these lugs as seen in Figure 11, the lugs cooperating with the surfaces **54** to firmly hold the spring unit in place on the lock cylinder.

The insertion of the hooked ends of the base plate into the angle-shaped recesses, of course, may be facilitated by chambering the remote edges of the recesses at their junctions with the cylindrical exterior surfaces of the cylinder, as at **57**, and by providing an inclined surface **58** on the lugs **52** to insure that the hooked ends of the spring unit will be cammed toward one another as they are pressed into the recesses **49**.

When properly engaged under the lugs **52**, the inner edges of the flat end portions of the base plate are held against shoulders **59** in the bottoms of the recesses **49** by the lugs **52**.

Except for the locations of the notches **16** in their locking ends, all of the tumblers **11** have the same size and shape. A central portion **60** of each extends across the median plane of the key slot to be engaged by the bittings of the key, and the outwardly facing edge of the portion **60** has a convex shape to facilitate passage of the key bittings thereunder during insertion of the key into the cylinder.

Each tumbler is adapted to be rocked edgewise toward the bottom of the cavity a distance depending upon the height of the corresponding bitting on the key, which, of course, is determined by the location of the notch **16** in the tumbler. As stated previously, when all of the tumblers are swung by the key to their unlocking positions seen in Figure 3, the notches **16** in the outer arcuate edges thereof align longitudinally and receive the inner edge of the locking bar. The locking bar is retracted from the locking recess **7** in the casing and propelled into the notches **16** of the tumblers by its spring **18** to free the lock cylinder for rotation by the key.

The locking bar **9** and its spring **18** are of novel design, particularly since the spring **18** comprises a single blade stamped from flat spring stock and formed to snap into place on the lock cylinder and be retained in its proper position thereon entirely without resorting to staking of portions of the cylinder either over the spring or the locking bar. The locking bar is best illustrated in Figure 6 while its spring is seen best in Figure 7.

The locking bar per se is formed as an elongated pad **63** on the exterior of a bar **64** having a substantially diamond-shaped cross section. The ends of the bar project beyond the ends of the pad **63**, and at its rear end, the bar has a toe **65** extending inwardly therefrom behind the cavity **20**, to prevent rocking of the bar about its longitudinal axis in its slot **10**. Only the pad **63** projects outwardly beyond the cylindrical outline of the cylinder in the locking position of the side bar seen in Figure 4, the end portions of the bar being at all times received in the radially opening longitudinal slot **10** in the cylinder in which the locking bar operates.

The inner edge **67** of the locking bar has converging or bevelled sides engageable in the notches **16** of the tumblers when the latter are rocked to their unlocking positions, and the inner side edges of the notches cooperate with the adjacent converging side of the locking bar in its retracted position to enable the locking bar to be cammed outwardly in its slot and into the locking recess in the casing by the action of the tumbler springs on the tumblers upon withdrawal of the key from the lock cylinder.

In order that it may slide radially inwardly and outwardly of its slot **10** with the least amount of friction, the locking bar is provided with narrow lands **69** along its opposite sides to minimize surface-to-surface engagement of the bar with the sides of its slot. In addition, the opposite side surfaces of the pad **63** are undercut so as to converge toward the lands, as at **70**.

At a location above the locking bar slot **10**, the exterior of the lock cylinder is formed with a recess **72**, the longitudinal ends **73** of which communicate with the ends of the slot **10** for the locking bar. Intermediate its ends, the recess **72** is separated from the locking bar slot **10** by a horizontal rib **74**, the underside of the latter thereby defining one of the side surfaces of the locking bar slot.

The locking bar spring **18** is stamped from flat spring stock and has a substantially inverted U-shape. Its bight end **76** is elongated and is received in the recess **72** while its relatively short opposite arms **77** are received in the end sections **73** of the recess **72** and project downwardly therein into the ends of the locking bar slot **10** to embrace the length of the pad **63** on the locking bar and to press against the opposite ends of the locking bar adjacent to each end of the pad. The bight end **76** of the spring, of course, is disposed edgewise over the horizontal rib **74** and flatwise overlies the bottom **78** of the recess **72**. Centrally of its bight end the spring has a tongue **79** thereon projecting from its lower edge and received in a substantially radially disposed groove **80** on the upper surface of the rib **74** to hold the spring against shifting longitudinally of the cylinder.

A nose **81** projecting outwardly from the bottom of the recess **72** overlies the upper edge of the bight of the spring **18** to hold the togue thereof engaged in the groove **80**, and to preclude edgewise displacement of the spring from its recess.

To prevent the bight end portion of the spring from accidentally tilting outwardly from under the nose **81**, longitudinally spaced upright standards **82** are provided on the upper surface of the rib **74** at equal distances from the nose **81**, and these standards engage the flat outer side of the bight of the spring to hold the same flexed or bowed slightly inwardly at each side of a fulcrum defined by a ridge **83** projecting outwardly from the bottom of the recess beneath the nose **81**. In this manner, the arms **77** of the spring are caused to engage the ends of the locking bar under suitable tension.

In assembly, after the locking bar has been inserted into its slot **10** in the cylinder, the arms **77** on the locking bar spring are first engaged in the ends **73** of the recess **72** and the bight end portion of the spring is thereafter pushed edgewise between the standards **82** and the nose **81** on the side of the lock cylinder. During such insertion of the bight end of the spring into the recess, the outer ends of the spring arms ride onto the ends of the locking bar, and the tongue **79** engages in the groove **80** in the rib **74**. When the upper edge of the spring snaps beneath the nose **81**, the spring automatically assumes its assembled position in which it is securely held assembled on the side of the cylinder without the need for staking any portions of the cylinder thereover.

The opposite end portions of the spring adjacent to its arms **77**, of course, are sufficiently flexible as to be overcome by the expensive force of the tumbler spring blades acting on the tumblers to allow the locking bar to be cammed outwardly in its slot and projected into the locking recess of the casing when the key **14** is withdrawn from the cylinder.

In Figure 13 a slightly modified form of tumbler and spring blade is illustrated, which, however, retains all of the advantages of the previously described construction. The spring blades feature a simpler shape in that while they are provided with inwardly bowed portions **34'** adjacent to the bottom of the cavity **20**, the outer ends of their arms **36'** terminate at points directly beneath the sockets **25** in which the bearing projections **27** of the tumblers seat. Moreover, in the locking positions

of the tumblers, the arms 35' and 36' of the spring blades are substantially straight and parallel.

The outer end portions 85 of the arms 36', however, are bent slightly outwardly away from the base plate 21 and the extremity of each bears flatwise against the inner surface of a tab 43' on its tumbler similar to those on the tumblers previously described. Each spring blade is held against its tab 43' and consequently interconnected with its tumbler by a tang 86 struck from the body of the tumbler adjacent to the base of its bearing projection 27. The tangs engage the inner faces of the end portions 85 of the spring blades, and likewise allow the tumblers to be subassembled with the tumbler spring unit prior to insertion into the cavity 20 in the cylinder.

The use of the tangs 86, of course, obviates the need for providing hooked ends on the tumblers, as was the case in the first described embodiment of the invention; and in addition has the advantage of effecting savings in the material from which the tumblers and the tumbler spring unit are made.

From the foregoing description taken together with the accompanying drawings it will be readily apparent to those skilled in the art that this invention provides a rocking tumbler side bar lock featuring ease of assembly of the component parts of the lock mechanism since it allows the tumblers to be subassembled with the tumbler spring unit prior to insertion into the lock cylinder; and since both the tumbler spring unit and the side bar spring may be readily snapped into place on the lock cylinder and held assembled therewith entirely without the need for staking operations of the type previously required to hold these parts against displacement.

What I claim as my invention is:

1. In lock mechanism of the character described: a rotatable cylinder having a cavity the mouth of which opens to the cylindrical surface of the cylinder; a longitudinal ridge in the bottom of the cavity near one side of the cylinder; means on the outer portion of said ridge defining bearing sockets spaced from one another lengthwise of said ridge and opening toward the mouth of the cavity; and a plurality of tumblers in said cavity extending transversely thereacross and each having a rounded projection thereon seating in one of said bearing sockets to fulcrum the tumbler for rocking motion between locking and unlocking positions about an axis parallel to that of the cylinder.

2. In lock mechanism of the character described: a rotatable cylinder having a cavity the mouth of which opens to the cylindrical surface of the cylinder; a longitudinal ridge in the bottom of the cavity near one side of the cylinder, said ridge having a plurality of slots therein spaced from one another lengthwise of said ridge and opening toward the mouth of the cavity, the sides of said slots lying in planes substantially normal to the cylinder axis and the bottoms of the slots being concave to provide sockets; and a plurality of relatively flat tumblers in said cavity extending transversely thereacross and each having a rounded projection thereon received in one of said slots in the ridge and seating in the socket at the bottom of said slot to fulcrum the tumbler for rocking motion about an axis parallel to that of the cylinder with the sides of the tumbler substantially normal to the cylinder axis.

3. In lock mechanism of the character described: a rotatable cylinder having a cavity the mouth of which opens to the cylindrical surface of the cylinder; a longitudinal ridge in the bottom of the cavity near one side of the cylinder, said ridge having a plurality of slots therein spaced from one another lengthwise of said ridge and opening toward the mouth of the cavity, the sides of said slots lying in planes substantially normal to the cylinder axis and the bottoms of the slots being concave to provide sockets; a plurality of relatively flat tumblers in said cavity extending transversely thereacross and each having a rounded projection thereon received in one of said slots in the ridge and seating in the socket at the bottom of said slot to fulcrum the tumbler for rocking motion about an axis parallel to that of the cylinder with the sides of the tumbler substantially normal to the cylinder axis, said tumblers having portions adjacent to the side wall of the cavity remote from the ridge; and ribs on said side wall of the cavity defining slots opposite those in said ridge to receive and guide the adjacent portions of the tumblers.

4. Lock mechanism of the character described, comprising: a rotatable cylinder having a cavity in its side; a plurality of tumblers in said cavity; an integral projection on each tumbler extending generally toward the bottom of said cavity; means on the cylinder in said cavity defining bearing sockets opening generally toward the mouth of said cavity and in which said tumbler projections engage to support the tumblers for rocking motion about an axis parallel to that of the cylinder; and spring means reacting between the cylinder and the tumblers in a direction to hold the tumbler projections in their sockets and to yieldingly resist rocking motion of the tumblers in one direction.

5. Lock mechanism of the character described, comprising: a rotatable lock cylinder having a cavity opening to its cylindrical surface; a tumbler spring unit in said cavity including an elongated base plate secured to the cylinder and extending lengthwise through the axial dimension of said cavity, near the mouth thereof, substantially edgewise with respect to the bottom of the cavity, and a plurality of springs comprising spaced spring blades joined at one end to said base plate, each of said spring blades having an inwardly bowed portion projecting toward the bottom of the cavity and having an outwardly bowed portion at its free end projecting toward the mouth of the cavity and biased toward a position spaced away from one side of the base plate; a plurality of relatively flat tumblers in said cavity extending transversely thereacross, edgewise between the bottom of the cavity and the base plate of the spring unit, and in alternate relationship with the spring blades so that each spring blade overlies one flat face of one of the tumblers; bearing means on the cylinder projecting up from the bottom of the cavity therein, beneath the outwardly bowed end portions of the spring blades, and providing fulcrums engaged by the tumblers to support the same for edgewise rocking motion about an axis parallel to that of the cylinder; a connection between the free end portion of each spring blade and an adjacent tumbler whereby the biasing force of the spring blades is utilized to retain the tumblers on their fulcrums and to exert a torsional force on the tumblers tending to rock the same edgewise toward the base plate of the spring unit; and a shoulder on each tumbler normally held in engagement with the base plate by the expansive force of the spring blades to limit spring propelled rocking motion of the tumblers in one direction.

6. Lock mechanism of the character described, comprising: a rotatable cylinder having a cavity opening to its cylindrical surface; a tumbler spring unit in said cavity including a plurality of spring blades spaced from one another longitudinally of the cylinder and each having a bowed portion extending transversely across the bottom of the cavity and spaced apart opposing spring arms joined with the ends of said bowed portion and biased away from one another, said spring arms extending outwardly toward the mouth of the cavity, and an elongated base plate secured to the cylinder and extending lengthwise thereof through the cavity, near the mouth thereof at one side of the cavity, and joined at one longitudinal edge to the ends of the adjacent spring arms; a plurality of relatively flat tumblers in said cavity extending transversely thereacross, edgewise with respect to the bottom of the cavity, and in alternate relationship with the spring blades so that each spring blade overlies one flat face of one of the tumblers; bearing seats on the cylinder in

said cavity adjacent to the outer ends of the other arms of the spring blades, said bearing seats providing fulcrums engaged by the tumblers to support the same for edgewise rocking motion between locking and unlocking positions about an axis parallel to that of the cylinder; and connections between the outer end portions of said other spring arms and their respective tumblers whereby the biasing force of the spring blades is utilized to retain the tumblers on their fulcrums and to exert a torsional force on the tumblers tending to rock the same edgewise toward their locking positions.

7. The lock mechanism set forth in claim 6 wherein the opposing spring arms of the spring blades are substantially parallel to one another; and further characterized by the fact that the spring arms which lie adjacent to said side of the cavity are substantially straight and coplanar with the base plate.

8. Lock mechanism of the character described, comprising: a rotatable cylinder having a cavity opening to its cylindrical surface; a tumbler spring unit in said cavity including a plurality of spring blades spaced from one another longitudinally of the cylinder and each having a bowed portion extending transversely across the bottom of the cavity and spaced opposing spring arms joined with the ends of said bowed portion and biased away from one another, said spring arms extending outwardly toward the mouth of the cavity, and an elongated base plate secured to the cylinder and extending lengthwise thereof through the cavity, near the mouth thereof at one side of the cavity, and joined at one longitudinal edge to the ends of the adjacent spring arms; a plurality of relatively flat tumblers in said cavity extending transversely thereacross, each of said tumblers overlying one of said spring blades and said tumblers having a central portion edgewise interposed between the base plate and the bottom of the cavity and opposite end portions projecting toward the mouth of the cavity and lying at opposite sides of the base plate; bearing seats on the cylinder in said cavity at the other side thereof, said bearing seats providing fulcrums engaged by the adjacent end portions of the tumblers to support the same for edgewise rocking motion toward and from locking positions defined by the engagement of the other end portions of the tumblers with the adjacent side of the base plate; and connections between the outer end portions of the other arms of the spring blades and the first designated end portions of the tumblers whereby the biasing force of the spring blades is utilized to retain the tumblers on their fulcrums and to exert a torsional force on the tumblers tending to rock the same edgewise toward their locking positions.

9. Lock mechanism of the character described, comprising: a rotatable cylinder having a cavity therein opening to one side of the cylinder intermediate its ends; a plurality of tumblers in said cavity spaced from one another longitudinally of the cylinder and movable between locking and unlocking positions; a tumbler spring unit in said cavity comprising an elongated substantially flat base plate extending through the cavity lengthwise of the cylinder and edgewise with respect to and near the mouth of the cavity, and a plurality of spring blades joined to the inner edge of the base plate and each connected to one of said tumblers to yieldingly resist motion of the same toward its unlocking position; and means for retaining said tumbler spring unit in place on the cylinder comprising hooked ends on the extremities of the base plate bent flatwise therefrom and edgewise received in correspondingly shaped recesses opening to said side of the cylinder and into the opposite ends of the cavity therein, said hooked ends having flatwise engagement with walls of the recess which are generally radial to the cylinder axis to preclude flatwise and lengthwise motion of the base plate relative to the cylinder, and ledges on certain of said radially disposed walls of the recesses engaging over the outer edges of the hooked ends on the base plate to hold said hooked ends against the bottoms of the recesses and thus prevent edgewise motion of the base plate relative to the cylinder, said hooked ends being resilient to allow flexure thereof past said ledges during insertion of the spring unit into the cavity.

10. In a lock of the character described: a rotatable cylinder having a cavity therein intermediate its ends and opening to the side of the cylinder; a plurality of relatively flat tumblers in said cavity extending thereacross transversely of the cylinder, with one edge of each tumbler facing the bottom of said cavity; interengaging means on the cylinder and tumblers adjacent to one side of the cavity providing fulcrums to support the tumblers for edgewise rocking motion toward and from the bottom of the cavity about a common axis spaced from but parallel to the cylinder axis; bowed tumbler springs in said cavity, one for each tumbler and each having its bow extending toward the bottom of the cavity and having opposed arms extending from the ends of the bow across one flat side of its tumbler toward the mouth of said cavity, in spaced relation to one another transversely of the cylinder, one of said arms lying adjacent to the fulcrum for its tumbler; means for anchoring the outer end portion of the other arm of each tumbler spring to the cylinder; and a connection between the first designated arm of each tumbler spring and its tumbler whereby the springs hold the tumblers on their fulcrums and yieldingly resist rocking motion of the tumblers toward the bottom of the cavity.

11. In a lock of the character described: a rotatable lock cylinder having a relatively large cavity in its side intermediate the front and rear end portions of the cylinder, and having longitudinally aligning key slots in its end portions opening to said cavity so that a key inserted into said slots from the front of the cylinder is directly supported only by the end portions of the cylinder; tumblers in said cavity movable between locking and unlocking positions in consequence of insertion of a proper key into said key slots; spring arms in said cavity each having one end bearing against one of said tumblers and its other end fixed to the cylinder at a location directly adjacent to one side of a key in said key slots; and guide means on said fixed ends of the spring arms engageable with a straight guideway on the adjacent side of a key inserted into the slot in the front end portion of the cylinder for guiding the rearward passage of the key through the cavity and into the slot in the rear portion of the cylinder.

12. Lock mechanism of the type including a rotatable key controlled lock cylinder having an elongated relatively large cavity in its side, intermediate the ends of the cylinder and the key slot therein, so that a key in the slot receives direct support only from the end portions of the cylinder forwardly and rearwardly of said cavity, said cavity containing the tumblers and the tumbler springs of the lock mechanism: characterized by the fact that the tumbler springs are blades each having one end portion fixed with respect to the cylinder at a location directly alongside a key in the key slot; and further characterized by the provision of key guiding means integral with the fixed end portions of the springs and comprising guide means extending continuously through the longitudinal dimension of the cavity and engageable with a straight guideway on the adjacent side of a key inserted into the key slot from the front of the cylinder to guide the rearward passage of the key through the cavity and into its slot in the rear end portion of the cylinder.

13. In a side bar lock of the character described: a rotatable lock cylinder; key controlled tumblers in the cylinder movable between locking and unlocking positions; an elongated locking bar controlled by said tumblers, said locking bar extending lengthwise of the cylinder and operating in a substantially radial slot in the cylinder opening to one side thereof, and the locking bar being retractable from a locking position projected outwardly beyond the surface of the cylinder whenever the

tumblers are moved to their unlocking positions; said cylinder having a recess in its side, circumferentially adjacent to the mouth of the locking bar slot, the longitudinal ends of said recess opening into the ends of the locking bar slot from one side thereof; a longitudinally extending rib on the side of the cylinder separating the intermediate portions of the recess and slot, one face of said rib providing a side wall of the recess and the other face of said rib providing one side wall of the locking bar slot; a substantially U-shaped spring blade having its bight received in said recess edgewise with respect to said side wall of the recess, and having its opposing arms embracing the length of said rib and projecting from the longitudinal ends of the recess into the adjacent ends of the locking bar slot and flatwise overlying the end portions of the locking bar; a ridge on the bottom of said recess medially of the ends thereof and engaged with the flat underside of the bight of the spring to hold the same spaced from the bottom of the recess; a pair of abutments on said side wall of the recess equispaced from said ridge and engaged with the flat outer face of the bight of the spring to hold its end portions flexed toward the bottom of the recess about the fulcrum provided by said ridge, and thus maintain the arms of the spring yieldingly pressed against the opposite end portions of the locking bar; and a nose on said ridge engaged over the outer edge of the bight portion of the spring and co-operating with said abutments to hold the spring against displacement from its recess.

14. The side bar lock set forth in claim 13 further characterized by the provision of a tongue and groove connection between said rib and the inner edge of the bight portion of the spring for precluding longitudinal shifting of the spring relative to the cylinder.

15. The side bar lock set forth in claim 13 further characterized by the fact that said abutments face the bottom of the recess and are spaced therefrom a distance slightly less than the distance said ridge and its nose project from the bottom of the recess, whereby during installation of the spring on the cylinder the bight of the spring is edgewise insertable between said abutments and the nose on the ridge while the central portion of the bight is bowed outwardly away from the bottom of the recess an extent greater than when the bight of the spring is in its proper assembled position between the abutments and said ridge, whereby the bight of the spring will automatically snap into place beneath said nose and against said ridge as the spring reaches its proper assembled position on the cylinder to be held against displacement from the recess by said nose.

16. In a side bar lock of the character described: a rotatable cylinder having key controlled tumblers therein; an elongated locking bar controlled by said tumblers, said locking bar extending lengthwise of the cylinder and operating in a substantially radial slot in the cylinder opening to one side thereof, said locking bar being retractable inwardly of its slot from a locking position whenever the tumblers are moved to unlocking positions; the cylinder having a recess in its side adjacent to the mouth of the locking bar slot and communicating therewith adjacent to the ends of the locking bar slot; a substantially U-shaped spring in said recess having its bight extending generally lengthwise of the cylinder and its opposing arms extending into the locking bar slot and over the opposite end portions of the locking bar; and means securing the bight of the spring to the cylinder, said means tensioning the spring to cause its arms to yieldingly press against the end portions of the locking bar so that the spring resists outward projection thereof to its locking position.

17. A tumbler and tumbler spring subassembly, comprising: a tumbler spring unit including an elongated relatively flat base plate, and a plurality of identical spring blade bent flatwise to substantially U-shape to provide opposing spaced apart arms of substantial length, each of said blades having the extremity of one arm thereof integrally joined to only one longitudinal edge of the base plate, and the blades being arranged edge to edge in longitudinally spaced relation to one another along the length of the base plate, the bights of said blades opening toward said edge of the base plate and aligning with one another along an axis parallel to the plane of the base plate, and the outer end portions of the other arms of the blades being spaced from and substantially opposite the joints between the first designated arms and the base plate; a plurality of relatively flat tumblers each positioned adjacent to one of the spring blades with both arms of the latter extending across one flat face of the tumbler, said tumblers edgewise overlying the base plate; and means defining spaced opposing shoulders on each tumbler having the base plate therebetween and engaged by one of said shoulders, and the other of said shoulders on the tumbler being engaged by a portion at the outer end of said other arm of its spring blade, and said shoulders holding the arms of the spring blades drawn part way together and under compression so that the expansive force of the spring blades is employed to maintain their tumblers subassembled with the spring unit.

18. A tumbler and tumbler spring subassembly, comprising: a tumbler spring unit including an elongated relatively flat base plate, and a plurality of identical spring blades bent flatwise to substantially U-shape to provide opposing spaced apart arms of substantial length, each of said blades having the extremity of one arm thereof integrally joined to only one longitudinal edge of the base plate, and the blades being arranged edge to edge in longitudinally spaced relation to one another along the length of the base plate, the bights of said blades opening toward said edge of the base plate and aligning with one another along an axis parallel to the plane of the base plate, and the outer end portions of the other arms of the blades being spaced from and substantially opposite the junctions of said first designated arms with the base plate; a plurality of relatively flat lever type tumblers each having bearing means at one end portion to provide for edgewise swinging of the tumbler, and a locking bar notch in its opposite end portion, each of said tumblers being positioned adjacent to one of the spring blades with the intermediate portion of the tumbler extending edgewise across the base plate, and said other arm of the adjacent spring blade extending across one flat face of the tumbler at the bearing end portion thereof while the first designated arm of said adjacent spring blade extends across said flat face of the tumbler adjacent to said notched opposite end portion thereof; means on the bearing end portion of each tumbler connecting the same with a portion of said other arm of the adjacent spring blade and by which the tendency of said arms of the blade to spread apart toward relaxed positions imposes a thrust upon the tumbler tending to move it endwise in a direction to carry said notched opposite end portion thereof toward the base plate; and an extension on said notched opposite end portion of each tumbler projecting edgewise therefrom toward the base plate and providing a shoulder spaced from and so located with respect to said connecting means on the bearing end of the tumbler that the shoulder is held engaged with the base plate in consequence of said end thrust imposed upon the tumbler by its spring blade, whereby each spring blade is held under compression by its tumbler and the expansive force of the spring blades is utilized to hold the tumblers subassembled with the spring unit.

19. The tumbler and tumbler spring subassembly set forth in claim 18 wherein each of said other arms of the spring blades has a portion at its outer end bent flatwise back upon itself to provide a leg spaced from but overlying the outer side of said other arm, the extremity of said leg having a notch therein; and wherein said connecting means on the bearing end portion of each tumbler comprises a part on the tumbler having a surface normal

to the flat sides of the tumbler and substantially facing the bight of its spring blade, and engaged with the outer side of said leg at a location spaced from the extremity thereof, and a hook engaged in said notch in the extremity of said leg.

20. The tumbler and tumbler spring subassembly set forth in claim 18, wherein said first designated arms of the spring blades are relatively straight and substantially coplanar with the base plate so as to extend across the intermediate portions of their tumblers, while said other arms of the spring blades have relatively straight inner portions nearly parallel to the first designated arms and outer end portions bent flatwise out of the plane of their inner portions and in divergent relationship to the first designated arms; and wherein said connecting means on the bearing end portion of each tumbler comprises a part on the tumbler having a surface substantially normal to the flat sides of the tumbler and substantially facing the base plate of the spring unit and engaged with the outer side of said divergent outer end portion of the other arm of its spring blade, near the extremity thereof, and a tang struck up from the adjacent side of the tumbler and engaged with the inner surface of said divergent outer end portion of the other arm of its spring blade at a location spaced from the extremity of said divergent portion.

21. An elongated locking bar of the type which slides inwardly of a substantially radial slot through the side of a lock cylinder to free the same for rotation: characterized by the provision of an elongated raised pad on the outer surface of the bar for engagement in a locking recess, said pad extending along the major length of the bar but terminating a distance short of the extremities of the bar to provide space along said surface of the bar adjacent to both ends of the pad for biasing means to act upon the bar, the opposite longitudinal sides of said pad converging toward the junction of the pad with the bar and each terminating in a longitudinally extending relatively narrow bearing land at said junction; and further characterized by the provision of a toe at one end of the bar projecting from its inner surface substantially perpendicular to the longitudinal axis of the bar and having opposite surfaces cooperable with said lands to stabilize the bar against tilting motion about its longitudinal axis when the bar is operating in its slot in the lock cylinder.

22. A tumbler and tumbler spring subassembly comprising: a tumbler spring unit including an elongated base plate, and a plurality of identical spring blades each having a substantially U-shape to provide opposing spaced apart arms of substantial length, each of said blades having the extremity of one arm thereof integrally joined to only one longitudinal edge of the base plate, and the blades being arranged in longitudinally spaced relation to one another along the length of the base plate, the bights of said blade opening toward said edge of the base plate and aligning with one another along an axis lengthwise of the base plate, and the outer end portions of the other arms of the blades being spaced from and substantially opposite the joints between the first designated arms and the base plate; a plurality of relatively flat lever-type tumblers each having bearing means on one end portion thereof providing for edgewise rocking of the tumbler, and each tumbler being positioned adjacent to one of the spring blades and overlying the same with the intermediate portion of the tumbler extending edgewise across the base plate; means defining a shoulder on the other end portion of each tumbler engaging the base plate; and a pair of spaced abutments on the bearing end portion of each tumbler engaged with the outer end portion of said other arm of its spring blade at areas of said outer end portion of the blade spaced along the length thereof, one of said abutments engaging the outer surface of said outer end portion of the spring blades so as to receive the expansive force thereof and cooperating with said shoulder on the other end portion of the tumbler to hold the arms of the spring blade drawn part way together and under compression, whereby the expansive force of the spring blades is employed to maintain their tumblers subassembled with the spring unit, and the other of said abutments on each tumbler serving to hold the outer end portion of its spring blade against the first designated abutment and cooperating with the latter to provide for the application of a force couple to said outer end portion of the spring blade during rocking of its tumbler about its bearing means in a direction to move said shoulder on the other end portion of the tumbler away from the base plate.

23. In a side bar lock of the character described: a rotatable lock cylinder; key controlled tumblers in the cylinder movable between locking and unlocking positions; an elongated locking bar controlled by said tumblers, said locking bar extending lengthwise of the cylinder and being operatively guided in a longitudinally extending slot in the cylinder opening radially to one side thereof, and the locking bar being retractable from a locking position projected outwardly beyond the surface of the cylinder whenever the tumblers are moved to their unlocking positions; said cylinder having a recess in its side adjacent to the mouth of the locking bar slot and said recess having branches extending circumferentially from its ends and communicating with the ends of the locking bar slot from one side thereof; a longitudinally extending rib on the side of the cylinder separating the intermediate portions of the recess and the slot; a substantially U-shaped spring having its bight received in the intermediate portion of said recess and having its opposing arms received in the circumferential branches of the recess and projecting into the adjacent ends of the locking bar slot and overlying the end portions of the locking bar; abutments on the cylinder in said recess interengaged with the bight of the spring to hold the opposing arms of the spring yieldingly pressed against the end portions of the locking bar; and retaining means on the cylinder engaged with the bight of the spring to hold the same against displacement from the recess.

24. In a lock of the character described: a lock cylinder having a slot opening to its side; a locking bar slidably received in said slot for motion between an outwardly projected locking position and a retracted unlocking position; the cylinder having a recess in its exterior to one side of the mouth of the locking bar slot; and a spring carried by the cylinder, in said recess, for holding the locking bar assembled with the cylinder and for yieldingly urging the locking bar inwardly of its slot, said spring having a middle portion extending alongside the locking bar, and having arms at the ends of said middle portion projecting into the locking bar slot and pressing upon the end portions of the locking bar; and abutment means on the cylinder, in said recess, interengaged with the middle portion of the spring to hold the same flexed, to thus tension the arms of the spring into pressure engagement with the end portions of the locking bar, said abutment means being so located in said recess as to constrain the spring to sliding assembling motion into the recess in a direction substantially normal to the middle portion of the spring, toward the locking bar from said side of its slot.

25. Lock mechanism of the type comprising a rotatable cylinder and a plurality of tumblers in the cylinder movable between locking and unlocking positions: characterized by bearing means on each tumbler interengaged with cooperating bearing means on the cylinder to provide fulcrums about which the tumblers may rock between their locking and unlocking positions; one of said bearing means comprising projections and the other bearing means comprising concavities in which the projections seat.

26. Lock mechanism of the character described, comprising: a rotatable cylinder; a plurality of tumblers in the cylinder; an integral bearing projection on each tumbler; concavities in the cylinder providing bearing

seats engaged by said bearing projections on the tumblers to support the tumblers for rocking motion about an axis parallel to that of the cylinder; and spring means reacting between the cylinder and the tumblers in the direction of the bearing seats to hold the bearing projections of the tumblers on their seats and to yieldingly resist rocking motion of the tumblers in one dierction.

27. Lock mechanism of the character described, comprising: a rotatable cylinder having a cavity in its side; a plurality of tumblers in said cavity; bearing means on said tumblers formed integrally therewith; bearing means on the cylinder engaged by said bearing means on the tumblers and cooperating therewith to provide fulcrums upon which the tumblers may rock between locking and unlocking positions; one of said bearing means comprising projections and the other of said bearing means comprising concavities each having one of said projections seated therein; and spring means reacting between the cylinder and tumblers in a direction to hold the projections engaged in their concavities and to yieldingly resist rocking motion of the tumblers in the unlocking direction.

28. Lock mechanism of the character described, comprising: a rotatable cylinder having a cavity therein, the mouth of which opens to the side of the cylinder; a plurality of substantially flat tumblers in said cavity extending thereacross transversely of the cylinder; guide means on the cylinder constraining the tumblers to edgewise motion in planes spaced apart along the axis of the cylinder and normal thereto; open bearing sockets in the wall of the cylinder cavity loosely engaged by an edge portion on the exterior of each tumbler to provide for back and forth edgewise tilting motion of the tumblers between locking and unlocking positions about an axis parallel to that of the cylinder; and tumbler springs in the cavity, one for each tumbler, connected between the cylinder and the tumblers to yieldingly urge the latter toward their locking positions, said tumbler springs having elongated spring arms extending across one flat side of their respective tumblers entirely to one side of the axis about which the tumblers tilt.

29. A tumbler spring unit for cylinder locks comprising: an elongated relatively flat base plate; a plurality of identical spring blades bent flatwise to substantially U-shape to provide opposing spaced apart resilient arms of substantial length, each of said blades having the extremity of one arm thereof joined to only one longitudinal edge of the base plate, and the blades being arranged in edgewise spaced relation to one another lengthwise of the base plate, the bights of all of the blades opening towards said edge of the base plate, and said opposing arms being substantially equal in length so that the end portion of each of the other arms of the blades is substantially opposite the junction of the first designated arms with the base plate and capable of being connected with the tumbler of a lock at two spaced points remote from the bight of the blade; means on the base plate providing for attachment of the spring unit to a lock cylinder; and a longitudinal bead projecting from one side of the base plate to have guiding engagement with a groove in one side of a key for the lock, said bead also reinforcing the base plate against flatwise flexure.

30. A tumbler spring unit for cylinder locks comprising: an elongated relatively flat base plate; a plurality of identical spring blades bent flatwise to substantially U-shape to provide opposing spaced apart resilient arms of substantial length, each of said blades having the extremity of one arm thereof joined to only one longitudinal edge of the base plate, and the blades being arranged in edgewise spaced relation to one another lengthwise of the base plate, the bights of all of the blades opening towards said edge of the base plate, and said opposing arms being substantially equal in length so that the end portion of each of the other arms of the blades is substantially opposite the junction of the first designated arms with the base plate and capable of being connected with the tumbler of a lock at two spaced points remote from the bight of the blade, each of said other arms of the spring blades having a portion at its outer end bent flatwise back upon itself to substantially U-shape to provide a leg spaced from the outer side of and substantially shorter than said other arm, the extremities of said legs having notches therein to receive edge portions of lock tumblers and thus provide for connection of the spring blades thereto; and means on the base plate providing for attachment of the spring unit to a lock cylinder.

31. A relatively flat lever type tumbler for a side bar cylinder lock, characterized by: bearing means on an upwardly facing edge of one end portion of the tumbler to define a fulcrum providing for edgewise rocking of the tumbler; a locking bar notch in an edge of another end portion of the tumbler which is remote from said bearing means, said other end portion of the tumbler having a shoulder thereon adapted for engagement with a fixed part on the cylinder of a lock in which the tumbler is installed to limit rocking motion of the tumbler in one direction; spring seat means on said one end portion of the tumbler, projecting from one side thereof to lie outside the plane of the tumbler; an intermediate portion of the tumbler having a notch opening to its lower edge; and a downwardly facing key engaging edge at the bottom of said notch.

32. The lever tumbler set forth in claim 31 wherein said spring seat means comprises a hook bent from the upper part of said one end portion of the tumbler and having an edge facing downwardly, and a flange-like tab bent from the lower part of said one end portion of the tumbler and having a surface substantially normal to the plane of the tumbler and substantially facing said key engaging edge of the tumbler.

33. The lever tumbler set forth in claim 31 wherein said spring seat means comprises a tab bent from the lower part of said one end portion of the tumbler and having a surface substantially normal to the plane of the tumbler and facing the shoulder on said other end portion of the tumbler, and a tang struck from said one end portion of the tumbler and providing an abutment near the upper edge of the tumbler and substantially in line with said surface of the tab.

34. A tumbler spring unit for cylinder locks comprising: an elongated relatively flat base plate; a plurality of identical spring blades bent flatwise to substantially U-shape to provide opposing spaced apart resilient arms of substantial length, each of said blades having the extremity of one arm thereof joined to only one longitudinal edge of the base plate, and the blades being arranged in edgewise spaced relation to one another lengthwise of the base plate, the bights of all of the blades opening towards said edge of the base plate, and said opposing arms being substantially equal in length so that the end portion of each of the other arms of the blades is substantially opposite the junction of the first designated arms with the base plate and capable of being connected with the tumbler of a lock at two spaced points remote from the bight of the blade; and extensions on the base plate projecting longitudinally from opposite ends thereof and having hooks thereon providing for attachment of the spring unit to a lock cylinder.

References Cited in the file of this patent

UNITED STATES PATENTS

688,070	Denn	Dec. 3, 1901
1,875,209	Baldwin	Aug. 30, 1932
1,965,336	Fitzgerald	July 3, 1934
2,182,588	Jacobi	Dec. 5, 1939
2,206,539	Swanson	July 2, 1940
2,405,911	Swanson	Aug. 13, 1946
2,460,551	Swanson	Feb. 1, 1949
2,648,972	Diesel	Aug. 18, 1953
2,666,322	Uher	Jan. 19, 1954