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LOCKING AND UNLOCKING MECHANISM FOR CYLINDER LOCKS

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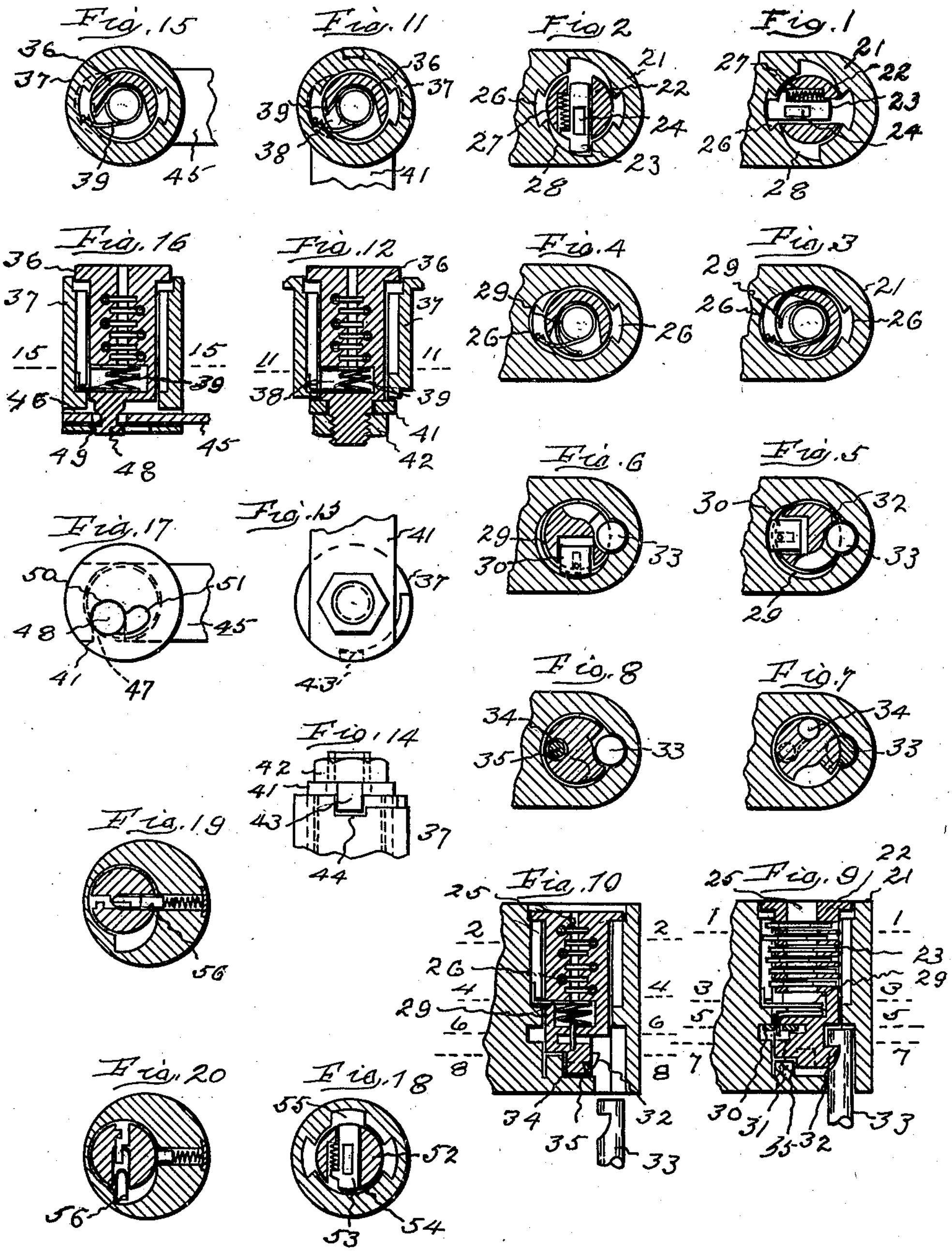

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LOCKING AND UNLOCKING MECHANISM FOR CYLINDER LOCKS

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1

This invention relates to the locking and unlocking elements employed in disk and pin tumbler cylinder locks.

The object of the invention is to reduce the number of parts, lower the cost of manufacture, and improve the action of the locking and unlocking means of such locks, primarily those locks which may be locked without the employment of a key, as are padlocks, although the improvement is applicable to other types of locks, as indicated by the modified forms illustrated.

This object is attained in the illustrated embodiment of the invention by forming recesses in the inner wall of the casing of such shape that the cylinder can be turned from unlocked to locked position without tumbler interference if no key is employed to act on the tumblers, and having the locking catch integral with the cylinder and both cylinder and catch rotatably and longitudinally movable together in the casing which permits tensioning a single spring in or about the cylinder that will normally press the cylinder axially to a position in which the cylinder will be retained from rotation with its locking catch in unlocked position, and yet will yield and allow the cylinder to be pushed axially for releasing it from the retaining means and at the same time rotate the cylinder so that its locking catch will be in locking position. The spring may also be engaged with means for retaining the cylinder in the casing.

In the accompanying drawings Figs. 1 to 10, inclusive, illustrate the invention as embodied in a padlock.

Fig. 1 is a transverse section on the dotted line 1—1 on Fig. 9 showing the tumblers in locked position.

Fig. 2 shows the tumblers in unlocked position, the section being on dotted line 2—2 of Fig. 10.

Fig. 3 is a transverse section on the dotted line 3—3 of Fig. 9, showing the spring as it rests in the cylinder and casing in locked position.

Fig. 4 is a transverse section on dotted line 4—4 on Fig. 10, showing the spring under tension for both turning and moving the cylinder endwise.

Fig. 5 is a transverse section on dotted line 5—5 on Fig. 9 showing the plate for holding the cylinder in the casing and the spring engaged therewith, the cylinder being turned to locked position.

Fig. 6 is a transverse section on dotted line 6—6 on Fig. 10 with the cylinder and holding plate turned to unlocked position.

Fig. 7 is a transverse section on dotted line 7—7 showing a section of the end of a padlock shackle locked by the cylinder catch.

2

Fig. 8 is a transverse section on dotted line 8—8 on Fig. 10 showing the shackle unlocked from the locking catch.

Fig. 9 is a longitudinal section of the padlock embodiment showing the shackle locked in the casing.

Fig. 10 is a longitudinal section of the same showing the parts in unlocked relation.

Figs. 11 to 14 inclusive illustrate the invention as applied to a lock having a rotary bolt.

Fig. 11 is a transverse section on plane indicated by dotted line 11 on Fig. 12.

Fig. 12 is a longitudinal section of this modification.

Fig. 13 is an end view and Fig. 14 is a side view illustrating the means for connecting the bolt to the cylinder.

Figs. 15 to 17, inclusive, illustrate the invention as applied to a lock having a slide bolt.

Fig. 15 shows a transverse section on dotted line 15—15 on Fig. 16.

Fig. 16 is a longitudinal section of this modified form.

Fig. 17 is an end view of Fig. 16.

Fig. 18 is a transverse section of a modification which shows the interior wall of the casing shaped to permit the withdrawal of the key when the cylinder is in unlatched position, and to hold the tumblers in unlatched alignment.

Figs. 19 and 20 are transverse sections of a modification illustrating a pin tumbler construction in which the casing has a sweep in its interior wall that allows the key to be removed in unlocked position and the tumblers to be returned to locked position when the key is removed.

Referring to the padlock adaptation of the invention illustrated by Figs. 1 to 10, inclusive, 21 indicates the casing and 22 the cylinder which is rotatably and longitudinally movable in the casing. Movable transversely of the cylinder are the locking tumblers 23 which have key slots 24 that align with the key slot 25 in the cylinder. In the wall of the casing are slots 26 into which the tumblers will be projected by springs 27 when the cylinder is turned to lock it to the casing (Fig. 1). The wall of the casing has also recesses 28 into which the tumblers will be projected when the key is withdrawn in unlocked position (Fig. 2). The outer walls of these recesses are curved on an arc that is eccentric to the axis of the cylinder and so actuate the tumblers that the cylinder can be turned from unlocked to locked position without the insertion of a key. A locking catch 32 is provided which is rotatable in the casing opening between an unlocking position and a locking position. This catch may advantageously be formed integrally with the cylinder 22. A spring means is provided which serves to bias the locking catch 32 for rotative movement from its unlocking position to its locking position. When the catch is formed integrally with the cylinder, the spring means serves to also bias the cylinder for movement from its unlocking position to its locking position. The catch 32 is preferably movable longitudinally in the casing opening and when the catch is integral with the cylinder, the said cylinder is also movable longitudinally. A spring means is provided for biasing the catch and cylinder for rotative movements from their unlocking positions to their locking positions, and when the said parts are movable longitudinally the spring means also biases them for such movement in one direction. As shown, the spring means is a single coil spring 29 located in a recess within the cylinder 22. The spring has one end bent so as to project into one of the casing slots 26 and the other end bent and extended through a disk 30 that lies in a slot 31 in the cylinder (Fig. 9). This spring is tensioned so that it tends to press the cylinder inward and at the same time tends to rotate the cylinder and turn the locking catch 32, which is formed at the inner end of the cylinder, into position to engage the end of a fastening element or shackle 33 (Fig. 9). The fastening element 33 may be regarded as a "free" fastening element, as it is not permanently located within the casing.

A suitable means is provided for holding the catch 32 in its unlocking position in opposition to the rotative bias of the spring means, and when the catch and the cylinder are integral both of them are so held. This holding means is adapted to be released upon inward movement of the shackle and such release may be effected by longitudinally moving the catch and the cylinder in opposition to the longitudinal bias of the spring means. As shown, a socket 34 is provided in the inner end and near the edge of the cylinder and extending from the inner end of a cylinder recess in the casing is a stud 35. When the cylinder is turned to unlocked position the spring 29 pressing the cylinder inward causes the stud 35 to enter the socket 34 and retain the cylinder in that position (Figs. 8 and 10), and when the cylinder is pushed outward it is disengaged from the retaining stud and rotated by the spring to locking position (Figs. 7 and 9).

With the padlock described and unlocked the cylinder is retained in unlocked position by the projection of the stud 35 into the socket 34 in the cylinder (Fig. 10). When the end of the shackle is thrust into the casing the cylinder is pushed back so as to disengage the retaining means and allow the cylinder to be turned by the spring 29 so that its catch 32 will engage with and lock the shackle (Fig. 9), the recesses 28 in the casing being so shaped, as before described, to permit this turning of the cylinder without tumbler interference. To unlock this padlock a key which will withdraw the tumblers from the casing slot is inserted into the key slot 25 and turned so as to release the cylinder catch from the shackle. Then the cylinder is turned to unlocked position and pressed inward by the spring 29 so it is retained in the position shown in Fig. 10 as described, in which position the key can be withdrawn.

In the modified form illustrated by Figs. 11–14 the cylinder 36 is rotatably and longitudinally movable in the casing 37, and the cylinder has a cavity 38 in which the spring 39 is located with one end engaged with the tumbler recess 40 in the casing and the other end engaged with the cylinder, substantially the same as in the padlock construction previously described.

On the extended inner end of the cylinder 36 is a bolt 41, and a clamping nut 42. Projecting inward from the bolt is a lug 43 adapted to enter a slot 44 in the casing.

In this form when the cylinder is pushed inward the lug 43 is pushed out of the slot 44, leaving the cylinder and the bolt attached to it free to be turned to locked position by the key or by the spring 39 if the key has been withdrawn.

In the modification illustrated by Figs. 15, 16, 17 the casing 37, cylinder 36 carrying the locking tumblers, and the spring 39 are substantially the same as and cooperate the same as do the corresponding elements in the forms above described.

In this form, however, there is a sliding bolt 45 loosely supported in a transverse opening 46 across the casing near its inner end. In the bolt is a slot 47 and projecting eccentrically from the inner end of the cylinder and through a slot in the end wall of the casing is a stud 48. This stud a short distance from its inner end has a circumferential groove designed to produce a section 49 of the stud of less diameter than the remaining section of the stud. The slot in the end wall of the casing, through which the stud extends, has two widths, one 50 of a size sufficiently large to receive the section of the stud of large diameter, and the other 51 of a size to receive the section of the stud of small diameter only.

When the cylinder is in unlocked position and is pressed outward by the spring 39 the end section of the stud 48 of large diameter lies in the wider part of the slot and the section of the stud of small diameter is in alignment with the bolt (Fig. 16). When the cylinder is pressed inward the large section at the end of the stud is moved out of the slot in the casing wall, the reduced section of the stud is moved into alignment with the slot in the casing, and an enlarged section of the stud is carried into the opening in the bolt, so that the cylinder is free to be turned for actuating the bolt to locked position with a key or by the action of the spring.

Fig. 18 illustrates a modified shape of the interior wall of the casing. In this form when the cylinder 52 is in unlocked position the tumblers 53 are retained in unlocked relation by resting on the interior wall 54 of the casing, and there is a slot 55 in the opposite side of the casing wall into which the ends of the tumblers can enter when a key is inserted or removed.

Figs. 19 and 20 illustrate modifications of the form shown by Figs. 1–10, provided with pin tumblers 56 instead of disk tumblers 23 shown in those views. The other elements and their co-action are substantially as previously described.

The invention claimed is:

1. A cylinder lock comprising a casing having recesses in its inner wall, a cylinder with a key slot fitted to move rotatably and longitudinally in the casing, the said cylinder having an interior recess open at one side, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said wall recesses, and a spring

positioned in the cylinder recess and tensioned to move the cylinder rotatably and longitudinally.

2. A cylinder lock comprising a casing having recesses in its inner wall, a cylinder with a key slot fitted to move rotatably and longitudinally in the casing, the said cylinder having an interior recess open at one side, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said wall recesses, and a spring positioned in the cylinder recess and tensioned to rotate the cylinder when the cylinder is moved longitudinally.

3. A cylinder lock comprising a casing having recesses in its inner wall, a cylinder with a key slot fitted to move rotatably and longitudinally in the casing, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said recesses, and a spring tensioned to move the cylinder rotatably and longitudinally, at least one of said casing recesses being shaped to cause the withdrawal of the tumblers from the recess into the cylinder when the cylinder is turned from unlocked to locked position.

4. A cylinder lock comprising a casing having recesses in its inner wall, a cylinder with a key slot fitted to move rotatably and longitudinally in the casing, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said recesses, and a spring tensioned to move the cylinder rotatably and longitudinally, at least one of said recesses being shaped to cause the withdrawal of the tumblers from the recesses into the cylinder and allow the cylinder to be turned by the spring from unlocked to locked position, when the cylinder is moved longitudinally.

5. A cylinder lock comprising a casing having recesses in its inner wall, a cylinder fitted to move rotatably and longitudinally in the casing, said cylinder having a key slot and a locking catch that is formed integrally therewith, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said tumbler recesses, a fastening element movable longitudinally in the casing and engageable with the locking catch when the latter is in locking position, and a spring tensioned to move the cylinder and locking catch rotatably and turn the cylinder and locking catch from unlocking to locking position.

6. A cylinder lock comprising a casing having recesses in its inner wall, a cylinder fitted to move rotatably and longitudinally in the casing, said cylinder having a key slot and a locking catch that is integral with its inner end, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said tumbler slots, complementary means at the inner ends of the cylinder and cylinder opening in the casing adapted to retain the cylinder and locking catch from rotation in unlocked position when the cylinder is in its inner position and to release the cylinder from the casing and allow it to be turned when the cylinder is moved outward, and a spring tensioned to turn the cylinder and locking catch to locking position when the cylinder and catch are moved outward.

7. A cylinder lock comprising a casing having recesses in its inner wall, a cylinder fitted to move rotatably and longitudinally in the casing, said cylinder having a key slot and a locking catch that is integral with its inner end, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said tumbler slots, a socket in the inner end of the cylinder, a stud at the inner end of the casing adapted to enter the cylinder socket and retain the cylinder and locking catch in unlocked position when the cylinder is in its inner position and adapted to release the cylinder from the casing when the cylinder is moved outward, and a spring tensioned to turn the cylinder and locking catch into unlocking position when said socket and stud are disengaged.

8. A cylinder lock comprising a casing having tumbler slots in its inner wall, a cylinder with a key slot fitted to move rotatably and longitudinally in the casing, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said tumbler slots, a spring tensioned to move the cylinder rotatably and longitudinally, said cylinder having near its inner end a peripheral slot and said casing having in its inner wall a complementary slot, and a disk loosely located in said slots and biased thereinto and retained therein by the end of said spring.

9. A cylinder lock comprising a casing having tumbler slots in its inner wall, a cylinder with a key slot fitted to move rotatably and longitudinally in the casing, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said tumbler slots, and a spring tensioned to move the cylinder rotatably and longitudinally, said casing having in its inner wall recesses shaped to receive the tumblers when the cylinder is in unlocked position and allow the cylinder to be turned to locked position without the insertion of a key into the key slot.

10. A cylinder lock comprising a casing having tumbler slots in its inner wall, a cylinder with a key slot fitted to move rotatably and longitudinally in the casing, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said tumbler slots, and a spring tensioned to move the cylinder rotatably and longitudinally, said casing having in its inner wall recesses shaped to receive the tumblers when the key is withdrawn and the cylinder is in unlocked position and allow the cylinder to be turned to locked position without the insertion of a key into the key slot.

11. A cylinder lock comprising a casing having tumbler slots in its inner wall, a cylinder fitted to move rotatably in the casing, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said tumbler slots, a free fastening element movable longitudinally in the casing, and a spring tensioned to move the cylinder rotatably, said cylinder at its inner end having a lateral extension shaped to engage and lock the fastening element within the casing.

12. A cylinder lock comprising a casing having tumbler slots in its inner wall, a cylinder fitted to move rotatably and longitudinally in the casing, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said tumbler slots, and a spring tensioned to move the cylinder rotatably and longitudinally, said cylinder at its inner end having an integral extension shaped to engage and lock a fastening element within the casing.

13. A cylinder lock comprising a casing having tumbler slots in its inner wall, a cylinder fitted to move rotatably in the casing, tumblers carried by the cylinder and adapted to be projected into and withdrawn from said tumbler slots, a disk extending into slots in the casing and cyl-

inder for holding the cylinder in the casing, and a spring tensioned to move the cylinder rotatably and also to retain said disk in said slots.

14. A cylinder lock having a casing with a slot and a recess in its inner wall, and a cylinder rotatable in the casing and carrying locking tumblers that are projected into said slot when the cylinder is turned to locking position and that are projected into said recess when the cylinder is turned to unlocking position, said recess having a wall that pushes the tumblers out of said recess when the cylinder is turned from unlocking to locking position.

15. The construction described in claim 14 characterized by having a spring for turning the cylinder from unlocking position to locking position.

16. The construction described in claim 14 characterized by having the cylinder provided with a locking catch.

17. The construction described in claim 14 characterized by having means for temporarily retaining the cylinder in unlocked position.

18. The construction described in claim 14 characterized by having yielding means projected into the casing by a spring tensioned to rotate the cylinder for retaining the cylinder in the casing.

19. The construction described in claim 14 characterized by having the recess and said casing wall so related that the key can be inserted and removed when the cylinder is in unlocked position.

20. A cylinder lock having a casing with a slot and a recess in its inner wall, and a cylinder rotatable in the casing and carrying locking tumblers that are projected into said slot when the cylinder is turned to locking position and that are projected into said recess when the cylinder is turned to unlocking position, said casing having a wall that aligns the tumblers within the periphery of the cylinder to permit free turning of the cylinder from unlocking to locking position.

21. A cylinder lock comprising a casing having a cylinder receiving opening with tumbler receiving recesses therein, a cylinder in the casing opening, spring means tensioned to move the cylinder rotatably in the said opening from unlocking position to locking position and also tensioned to move the cylinder longitudinally, tumblers carried by the cylinder and adapted to be projected into or withdrawn from the aforesaid recesses when the cylinder is in locking position, and interengaging retaining means on the casing and cylinder and within the projected cylindrical outline of the cylinder for holding the cylinder in unlocking position when the cylinder is held by the spring means in one extreme position of longitudinal movement, the said retaining means being disengaged upon longitudinal movement of the cylinder in opposition to the spring means and the said cylinder being thereupon rotatably moved by the spring means to locking position.

22. A cylinder lock comprising a casing having a cylinder receiving opening with tumbler receiving recesses therein, a cylinder in the casing opening, spring means tensioned to move the cylinder rotatably in the said opening from unlocking position to locking position and also tensioned to move the cylinder longitudinally, tumblers carried by the cylinder and adapted to be projected into or withdrawn from the aforesaid recesses when the cylinder is in locking position, retaining means formed integrally on the

cylinder within the projected cylindrical outline thereof, and means on the casing engageable with the retaining means on the cylinder for holding the cylinder in unlocking position when it is held by the spring means in one extreme position of longitudinal movement, the said retaining means on the cylinder being disengaged upon longitudinal movement in opposition to the spring means and the said cylinder being thereupon rotatably moved by the spring means to locking position.

23. A cylinder lock comprising a casing having a longitudinal opening with tumbler receiving recesses therein and also having a longitudinal hole intersecting the opening, a cylinder rotatable in the casing opening between an unlocking position and a locking position, tumblers carried by the cylinder and adapted to be projected into or withdrawn from the aforesaid recesses when the cylinder is in its locking position, a fastening element longitudinally movable in the hole in the casing, a locking catch rotatable in the casing opening between an unlocking position and a locking position and adapted when in its locking position to engage the fastening element to prevent longitudinal movement thereof, the said locking catch being held in its locking position by the cylinder when the cylinder is in its locking position, a spring for biasing the rotatable catch for movement from unlocking position to locking position, and means for holding the catch in its unlocking position in opposition to the rotative bias of the spring, the last said means being released by the fastening element upon movement thereof into the hole in the casing and the said catch being then rotated by the spring to its locking position wherein it engages the fastening element.

24. A cylinder lock comprising a casing having a longitudinal opening with tumbler receiving recesses therein and also having a longitudinal hole intersecting the opening, a cylinder rotatable in the casing opening between an unlocking position and a locking position, tumblers carried by the cylinder and adapted to be projected into or withdrawn from the aforesaid recesses when the cylinder is in its locking position, a fastening element longitudinally movable in the hole in the casing, a locking catch rotatable in the casing opening between an unlocking position and a locking position and also movable longitudinally in the said opening, the said catch being adapted when in its locking position to engage the fastening element to prevent longitudinal movement thereof and the said locking catch being held in its locking position by the cylinder when the cylinder is in its locking position, spring means for biasing the rotatable catch for movement from unlocking position to locking position and for also biasing the catch for longitudinal movement, means serving when the catch is in one extreme position of longitudinal movement to hold it in its unlocking position in opposition to the rotative bias of the spring, and means enabling the fastening element upon movement thereof into the hold in the casing to move the locking catch longitudinally in opposition to the longitudinal bias of the spring means and thereby release the catch holding means, and the said catch being then rotated by the spring means to its locking position wherein it engages the fastening element.

25. A cylinder lock comprising a casing having a longitudinal opening with tumbler receiving recesses therein and also having a longitudinal

hole intersecting the opening, a cylinder rotatable in the casing opening between an unlocking position and a locking position, tumblers carried by the cylinder and adapted to be projected into or withdrawn from the aforesaid recesses when the cylinder is in its locking position, a fastening element longitudinally movable in the hole in the casing, a locking catch carried by the cylinder and adapted when in the locking position to engage the fastening element to prevent longitudinal movement thereof, a spring for biasing the rotatable cylinder and catch from unlocking position to locking position, and means for holding the cylinder and catch in the unlocking position in opposition to the rotative bias of the spring, the last said means being released by the fastening element upon movement thereof into the hole in the casing and the said cylinder and catch being then rotated by the spring to the locking position wherein the catch engages the fastening element.

26. A cylinder lock comprising a casing having a cylinder receiving opening with tumbler receiving recesses therein, a cylinder in the casing opening, spring means tensioned to move the cylinder rotatably in the said opening from unlocking position to locking position and also tensioned to move the cylinder longitudinally, tumblers carried by the cylinder and adapted to be projected into or withdrawn from the aforesaid recesses when the cylinder is in locking position, interengaging retaining means on the casing and cylinder for holding the cylinder in unlocking position when the cylinder is held by the spring means in one extreme position of longitudinal movement, and a longitudinally movable fastening element engageable with the cylinder to move it longitudinally in opposition to the spring means sufficiently to disengage the retaining means and permit the cylinder to be rotatably moved by the spring means to locking position, the said fastening element and cylinder being so formed that the cylinder upon movement to locking position engages the fastening element to prevent longitudinal movement thereof.

27. A cylinder lock comprising a casing having a cylinder receiving opening with tumbler receiving recesses therein, a cylinder in the casing opening, spring means tensioned to move the cylinder rotatably in the said opening from unlocking position to locking position and also tensioned to move the cylinder longitudinally and inwardly with respect to the casing, tumblers carried by the cylinder and adapted to be projected into or withdrawn from the aforesaid recesses when the cylinder is in locking position, interengaging retaining means on the casing and cylinder for holding the cylinder in unlocking position when the cylinder is held by the spring means in its inner position, and a longitudinally movable fastening element adapted to extend into the casing at the inner end thereof and engageable with the cylinder to move it longitudinally and outwardly in opposition to the spring means sufficiently to disengage the retaining means and permit the cylinder to be rotatably moved by the spring means to locking position, the said fastening element and cylinder being so formed that the cylinder upon movement to locking position engages the fastening element to prevent longitudinal movement thereof.

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