CYLINDER PLUG RETAINER FOR PADLOCK

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Fig. 6.

Fig. 7.

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CYLINDER PLUG RETAINER FOR PADLOCK

A padlock body constructed of multiple laminations has a chamber occupied by a pin tumbler lock for locking and unlocking a shackle. Inwardly facing notches in respective long and short legs of the shackle are engaged by locking lugs of a locking plate which is rotated to locked position by an extension on a rotating cylinder plug in the lock. The extension protrudes through an opening in the locking plate and opposite outwardly facing undercut segments of the cylinder plug overlie the locking plate to hold the pin tumbler lock in the chamber. Stops respectively on the cylinder plug prevent rotation of the cylinder plug to a position of potential disengagement when they engage in one direction shoulders formed in the opening in the cylinder plug and in the opposite direction a shoulder forming part of one of the end laminations.

Many forms of padlocks and their related components have been conceived and patented encompassing various concepts of case construction, shackle locking means by single or multiple reciprocating or rotating members, and actuation of such members by devices such as combination dials, magnetic force, and key controlled mechanism having levers, wards or pin tumbler cylinder assemblies. For construction of a padlock containing the pin tumbler type cylinder assembly, it is normal to provide some means of retaining the plug within the cylinder assembly, and additionally provide some means for locking the shackle.

Although padlocks which make use of a pin tumbler-type assembly may be considered more secure, the construction necessary to make use of such devices tends to be somewhat more complicated and as a result, more expensive. In an effort to lower manufacturing costs reports have been had to padlocks of laminated structure but such a structure needs special modification when making use of the pin tumbler-type cylinder assemblies in order to keep such locks in a class competitive with others.

It is therefore one of the objects of the invention to provide a new and improved padlock construction wherein the number of parts has been reduced by so constructing and arranging the parts that they can perform multiple functions.

Another object of the invention is to provide a new and improved padlock construction wherein a single element has been provided capable of the dual functions of controlling the locking and unlocking of the padlock shackle while at the same time providing an axial retention for the cylinder plug within the housing.

Still another object of the invention is to provide a new and improved padlock construction featuring a shackle locking means having more than one point of locking engagement with the shackle and which at the same time is of improved and simple construction such as to not only reduce the number of necessary parts but to also reduce the steps necessary for assembling.

With these and other objects in view, the invention consists in the construction, arrangement, and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a side perspective view of a typical laminated padlock with which the invention is incorporated.

FIG. 2 is a longitudinal sectional view of the padlock taken on the line 2—2 of FIG. 1 showing the shackle in locked position.

FIG. 3 is a longitudinal sectional view of the padlock taken on the line 3—3 of FIG. 2.

FIG. 4 is a cross-sectional view of the padlock taken on the line 4—4 of FIG. 2.

FIG. 5 is a plan view of the cylinder plug assembly in an engagement with the locking plate.

FIG. 6 is a longitudinal sectional view similar to FIG. 2 but showing the shackle in release position.

FIG. 7 is a cross-sectional view of the padlock taken on the line 7—7 of FIG. 6.

FIG. 8 is a side elevational exploded perspective view of the cylinder plug assembly and locking plate.

In the embodiment of the invention taken for the purpose of illustration there is shown a padlock of laminated construction indicated by the reference character 10, consisting in the main of a case or body 11 and a shackle 12. The case is made up of a multiple number of laminations 13 held together by rivets 14. Openings 15 in the laminations 13 and similar openings 16 in laminations 13' join when the device is assembled to form a chamber 17. A bottom plate 18 closes the lower end of the chamber 17 and a top plate 19 closes the other end. Intermediate the top plate 19 and the next adjacent laminations 13 is an intermediate laminations 20.

For manipulation of the locking and unlocking of the padlock 10 there is provided a cylinder assembly indicated generally by the reference character 25 adapted to fit within the chamber 17. The cylinder assembly 25 is substantially conventional and consists of a cylinder plug housing 26, a pin tumbler housing 27, and a cylinder plug 28. In the cylinder plug 28 is a keyway 29 and access is held to the keyway 29 through a opening 30 in the bottom plate 18 to accommodate a key 31.

The shackle 12 has a long leg 32 and a short leg 33. The long leg 32 remains in engagement with the case 11 at all times and is adapted to swivel in bearing apertures 34 and 35, respectively, in the top plate 19 and intermediate laminations 20, as shown in FIGS. 2 and 6. Access apertures 36 and 37, respectively, in the top plate 19 and intermediate laminations 20 accommodate the end of the short leg 33. At the lower end of the long leg 32 is a spring keeper 38 in engagement with a spring 39, the spring 39 being biased normally to extend the shackle 12 outwardly when it is unlocked as shown in FIG. 6. A stop lug 40 prevents the long leg 32 from being disengaged from the case 11 upon engagement of the stop lug 40 with the inside face of the intermediate laminations 20, as shown in FIG. 6.

To provide a means for locking the shackle 12 a heel notch 41 is formed in the long leg 32 and a toe notch 42 is formed in the short leg 33, the notches 41, 42 facing inwardly opposite each other.

To perform the multiple function of locking the shackle 12 and retaining the cylinder assembly 25 in its position in the padlock and retaining the cylinder plug 28 in the cylinder assembly 45, there is provided a locking plate 45, the form of which is shown in FIG. 8 and the location.
of which is shown to good advantage in FIGS. 2 and 3. In making use of the locking plate 45 to retain the cylinder plug 28 in its proper place, there is a controlled space between the plug diameter 44 with a head 44' at the lower end and the lower face of the locking plate 45, in cooperation with the length of the cylinder plug housing 26. When the locking plate 45 is in engagement with undercut 60 and 61 as shown the cylinder plug 28 is securely held in the cylinder plug housing 26.

In the locking plate 45 is an opening 46 through which extends a projection 47 at the inside end of the cylinder plug 28 and forming part of the cylinder plug 28. Parallel surfaces 48 and 49 on opposite sides of the projection 47 are adapted, in one position of rotation to engage stops 50 and 51, respectively, within the opening 46 of the locking plate 45, as shown in FIG. 5. When rotated in the opposite direction the surface 48 is adapted to be brought to a stop against a tab 52 which in an inwardly bent portion of the intermediate lamination 20.

In locked position, as shown in FIGS. 2, and 4, a toe locking lug 53 is in engagement with the toe notch 42 at the short leg 33 and a heel locking lug 54 is in engagement with the heel notch 41 of the long leg 32. The locking plate 45 and its locking lugs are normally held in locking position as shown by action of a torsion spring 55, one end 55' of which bears against the body 11 within the chamber 17, as shown in FIG. 4. To hold the torsion spring 55 in position there is a boss 56 provided with an annular groove 57 in which the torsion spring 55 is located, as best seen in FIGS. 2 and 3.

In order to utilize the locking plate 45 as a means for returning the cylinder assembly 25 in its position within the body 11 there are provided on the projection 47 opposite facing segments 58 and 59 providing previously identified respective undercut 60 and 61. In assembled condition the segments of 48 are adapted to overlie arcuate surfaces 62 and 63 of the locking plate 45, the opening 46 being long enough in a direction ninety degrees removed from the arcuate surfaces 62, 63 to admit insertion of the projection 47 and its segments 58 and 59 just described.

In operation it is to be assumed that the shackle 12 is in the locked position shown in FIG. 2, with the locking lugs 53, 54 in engagement with the notches 41, 42 of the shackle legs. Stops 64 and 65 by engagement with respective walls of the chamber 17 prevent the locking lugs 53, 54 from being pushed out of engagement by action of the torsion spring 55.

When the cylinder is inserted so as to rotate the cylinder plug 28, in a counterclockwise direction as viewed in FIGS. 4 and 7, the locking plate 45 is moved against tension of the torsion spring 55 until the locking lugs 53, 54 clear the notches 41, 42. The spring 39 then acts to extend the shackle 12 outwardly to the position of FIG. 6. During this movement of the locking plate 45 the projection 47 remains in engagement with the locking plate 45 by the overlapping relationship of the segments 58 and 59 with the locking plate 45, the parallel surfaces 48 and 49 bearing against the stops 50 and 51 as previously described.

Once the shackle 12 is unlocked the cylinder plug 28 can be returned in a clockwise direction as viewed in FIGS. 4 and 7 to the initial position in which the key 31 can be withdrawn. Even though the key and the cylinder plug 28 might be rotated beyond initial position, there can not be rotation to such an extent that the cylinder plug 28 becomes disengaged because rotation of the cylinder plug 28 is limited by either the end of the key with the stop 50 or, when the key is short, engagement of the parallel surfaces 48, with the tab 52.

While the shackle 12 is in unlocked position the torsion spring 55 is not able to return the locking plate 45 to locked position because of contact of the heel locking lug 54 with the round portion of the long leg 32 below the heel notch 41.

When the padlock 10 is to be locked the legs are aligned with their respective apertures and the shackle 12 pushed against action of the spring 39 until the locking lugs 53, 54 align with the notches 41, 42. When this happens the torsion spring 55 takes over and rotates the locking plate 45 back into locked position reengaging locking lugs 53, 54 with the notches 41, 42. In this position it is still not possible to inadvertently disengage the cylinder plug 28 from the padlock body 11 because rotation in a clockwise direction as viewed in FIGS. 4 and 7 is limited by engagement of the parallel surface 48 with the tab 52. In this position the segments 48 and 49 remain in a position overlapping the arcuate surfaces 62 and 63 by the expedient just described. Therefore, the locking plate 45 serves the multiple functions of controlling locking and unlocking of the shackle 12, the cylinder plug in the cylinder housing, and also retention of the cylinder assembly 25 in the body 11.

While the invention has herein been shown and described in what is conceived to be a practical and effective embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace equivalent devices.

Having described the invention, what is claimed is:

1. In a padlock adapted to be operated by a pin tumbler cylinder assembly and a cylinder plug rotatably retained in operating engagement with said pin tumbler cylinder assembly, the combination of a case comprising a multiple number of parallel body laminations having respective interior open portions jointly forming a chamber in said case, a shackle having a long leg and a short leg, at least one of said laminations having a bearing bore for reception of the long leg and a second bore for reception of the short leg, at least one of said legs having an inwardly facing notch, a locking plate having a locking lug rotatably engageable with said notch and having an opening therethrough, a projection at the inside end of said plug extending into said opening and having at least one radially outwardly facing undercut segment in overlying interlocking engagement with said locking plate throughout a selected angle of rotation of less than 180°, said means respectively on said projection and said locking plate limiting rotation of the plug to said selected angle, said locking lug being rotatable throughout an angular distance less than said selected angle, said lug being in shackle locking position at one angular position and in shackle released position at another angular position.

2. A padlock as in claim 1 wherein each of said legs has an inwardly facing notch therein and said locking plate has two opposite radially outwardly extending locking lugs releasably engageable respectively with said notches when in locked condition.

3. A padlock as in claim 1 wherein there are two outwardly facing undercut segments in interlocking engagement with the locking plate.

4. A padlock as in claim 1 wherein said selected angle is greater than the angular distance through which said locking plate is rotatable.

5. A padlock as in claim 1 wherein there is an axially extending boss at the inner end of said cylinder plug having a circumferentially extending recessed portion and a torsion spring in said recessed portion having one end in engagement with said case and another end in engagement with said locking plate whereby to bias said locking plate.

6. A padlock as in claim 1 wherein there is a tab on one of said laminations engageable with said projection at one extreme position of said plug.

7. A padlock as in claim 1 wherein there is a tab on one of said laminations engageable with one side of said projection at one extreme position of the plug and with
an opposite side of said projection at another extreme position of the plug.

8. A padlock as in claim 1 wherein there are two shoulders in the opening of said locking plate engageable with opposite sides of said projection at one extreme of rotation, said projection being engageable with a portion of the body at the other extreme of rotation whereby to maintain engagement of said cylinder assembly with said case.

9. In a padlock by a pin tumbler cylinder assembly including a housing and a cylinder plug rotatably mounted in said housing in a case comprising a multiple number of parallel body laminations having respective interior open portions jointly forming a chamber in said case, a shackle having a long leg and a short leg, at least one of said laminations having a bearing bore for reception of the long leg and a second bore for reception of the short leg, at least one of said legs having an inwardly facing notch, a locking plate having a locking lug rotatably engageable with said notch and having an opening therethrough, a projection at the inside end of said plug extending into said opening and having at least one radially outwardly facing undercut segment in overlying interlocking engagement with said locking plate throughout a selected angle of rotation of less than 180°, stop means respectively on said projection and said locking plate limiting rotation of the plug to said selected angle, said locking lug being rotatable throughout an angular distance less than said selected angle, said lug being in shackle locking position at one angular position and in shackle released position at another angular position, and means establishing the position of said cylinder plug in said housing comprising a first shoulder on the end of said cylinder plug remote from said projection, a complementary second shoulder on an adjacent portion of said housing, the distance between said undercuts and said first shoulder being substantially equal to the distance between said second shoulder and the end of the housing adjacent said undercut whereby said cylinder plug is retained in place by said locking plate when in position beneath said undercut.

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