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(54) **REKEYABLE LOCK CYLINDER WITH
ENHANCED TORQUE RESISTANCE**

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(71) Applicant: **ASSA ABLOY Americas Residential
Inc.**, New Haven, CT (US)

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(72) Inventors: **Hanna Farag**, Riverside, CA (US);
Jack Zhang, Xiamen (CN); **Mark S.
Bloom**, Ladera Ranch, CA (US); **James
Lin**, Laguna Niguel, CA (US)

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(73) Assignee: **ASSA ABLOY Americas Residential
Inc.**, New Haven, CT (US)

(57)

ABSTRACT

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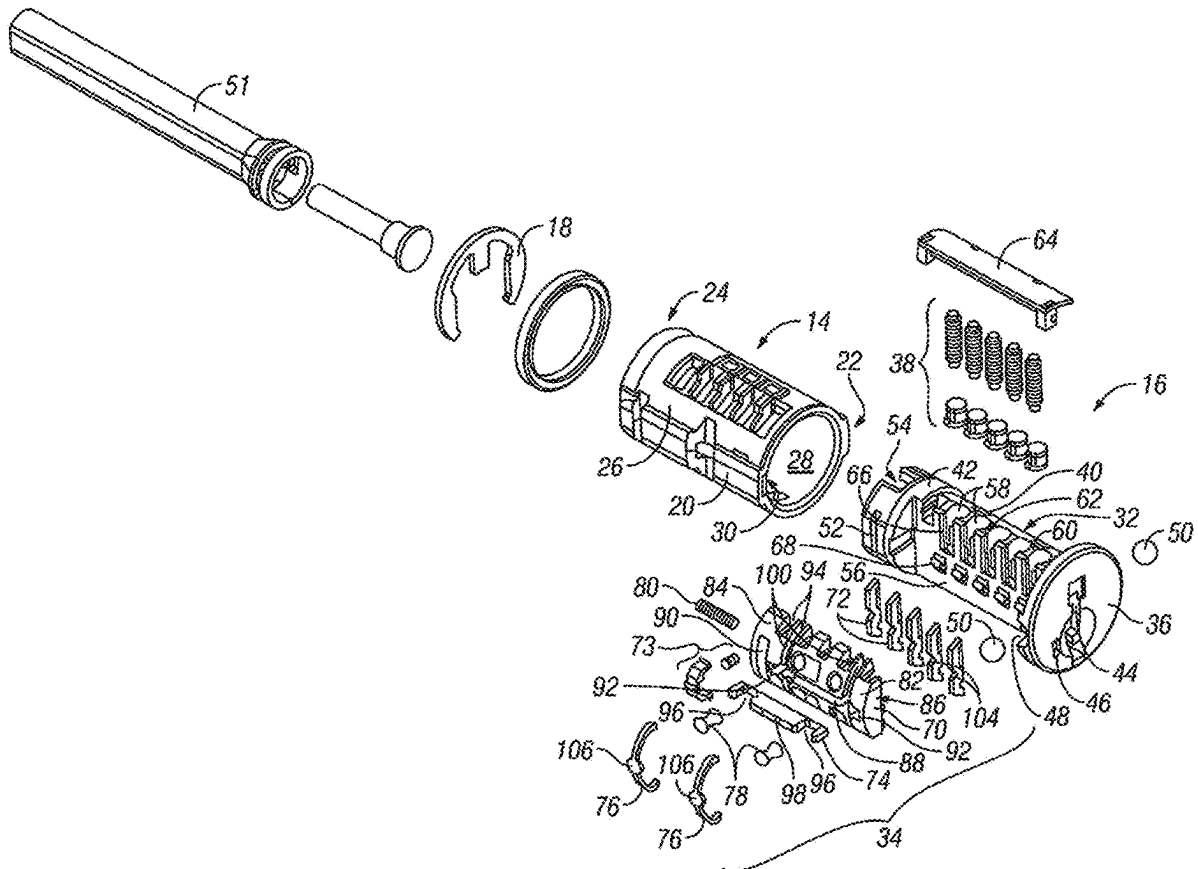
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(63) Continuation of application No. 18/616,508, filed on
Mar. 26, 2024, which is a continuation of application
No. 16/825,817, filed on Mar. 20, 2020, now Pat. No.
11,988,018, which is a continuation of application
No. 15/172,206, filed on Jun. 3, 2016, now Pat. No.
10,612,271.

(60) Provisional application No. 62/180,339, filed on Jun.
16, 2015.

A rekeyable lock cylinder with a cylinder body and a plug assembly. The lock cylinder includes a plurality of key followers and a corresponding plurality of racks disposed in the plug assembly. The lock cylinder includes, for example, a locking bar for blocking rotation of the plug assembly with respect to the cylinder body to prevent unlocking of the rekeyable lock cylinder with an unauthorized object. In some embodiments, the locking bar is configured such that torquing the plug assembly with an unauthorized object applies force to the locking bar without translating such force to the plurality of racks. This type of arrangement enhances torque resistance of the lock cylinder against attempted forced entry.



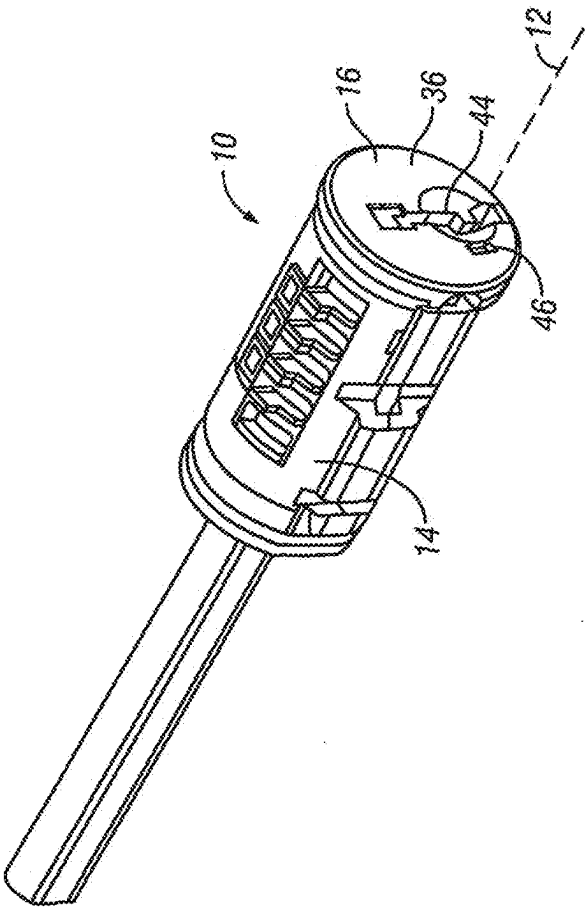


FIG. 1

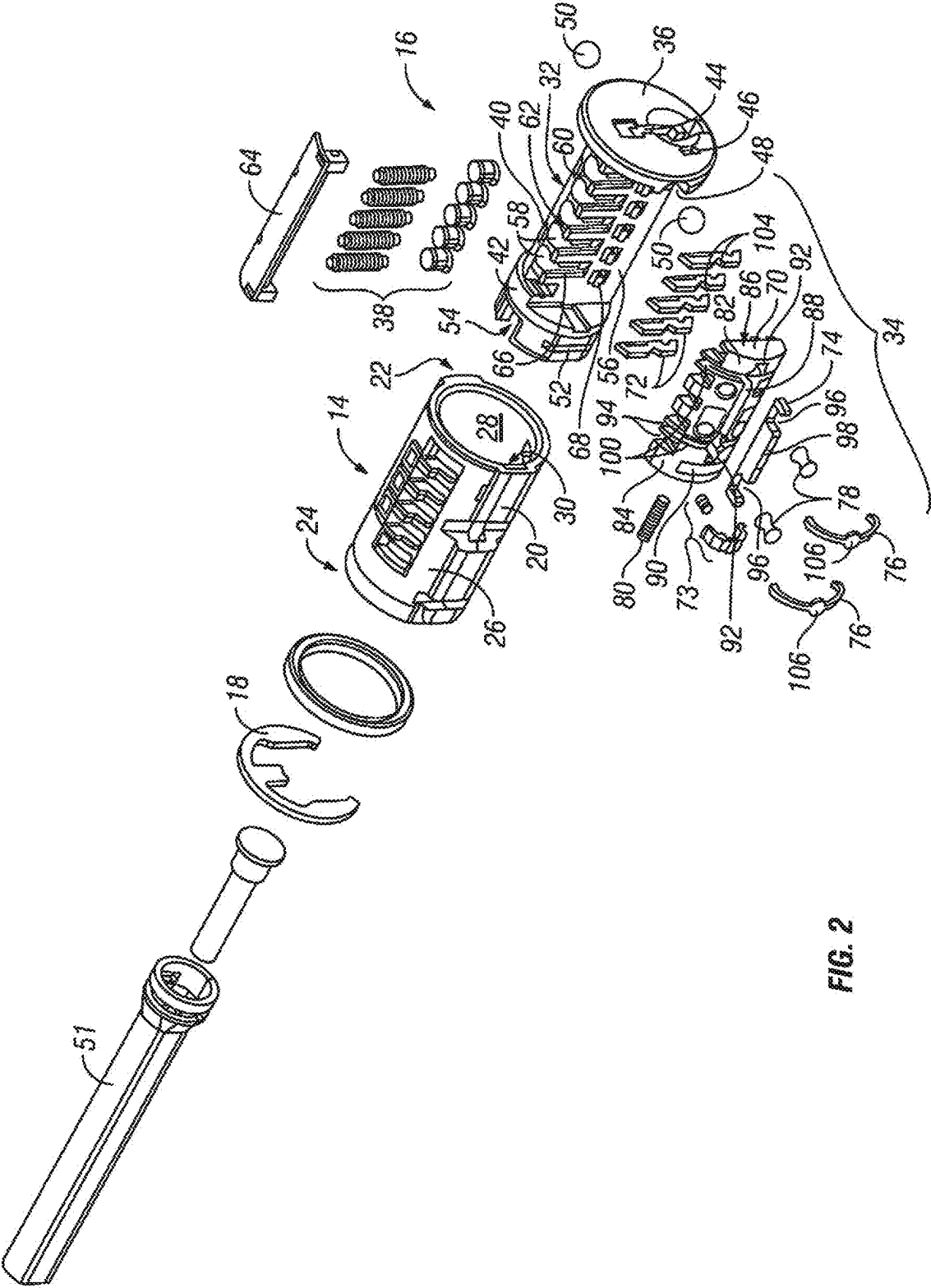


FIG. 2

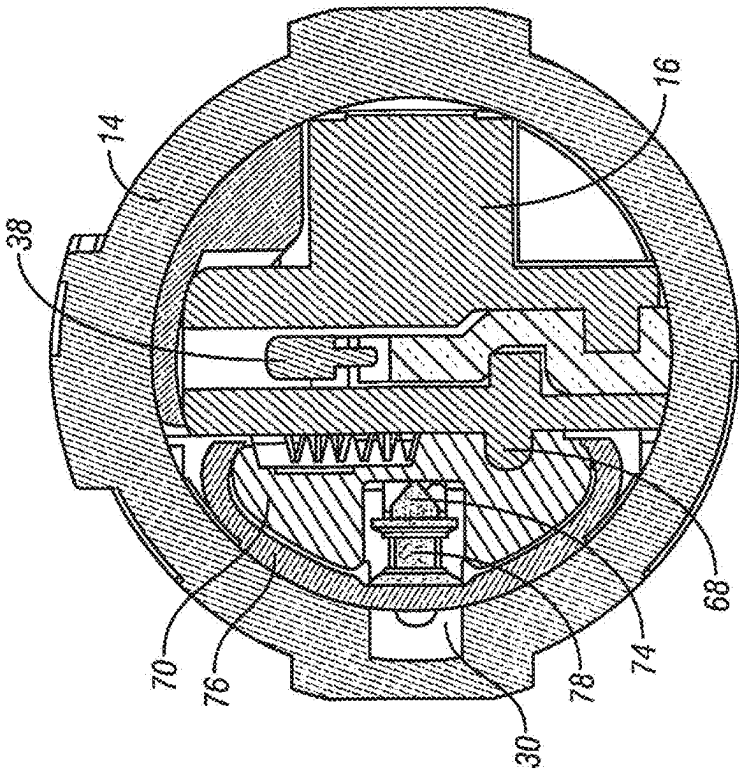


FIG. 3

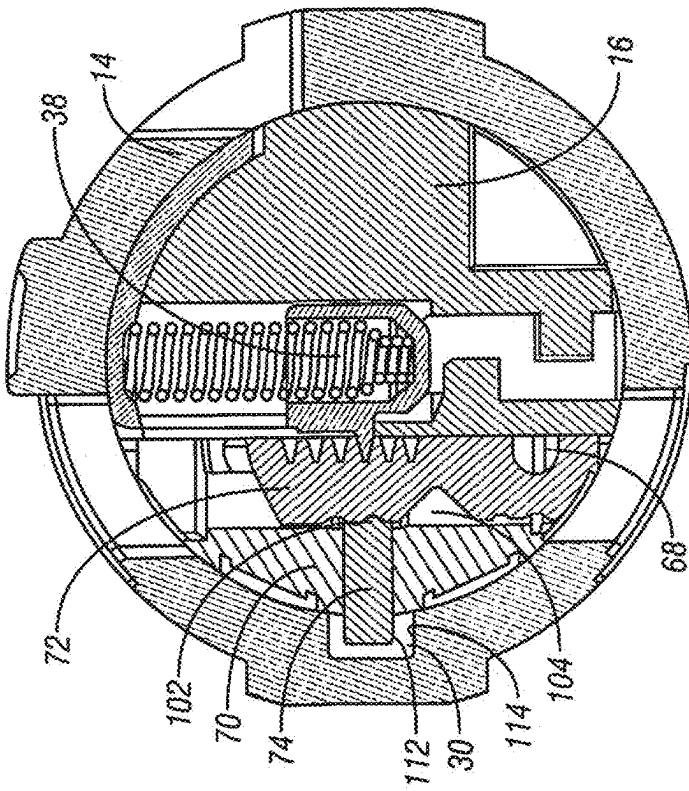


FIG. 6

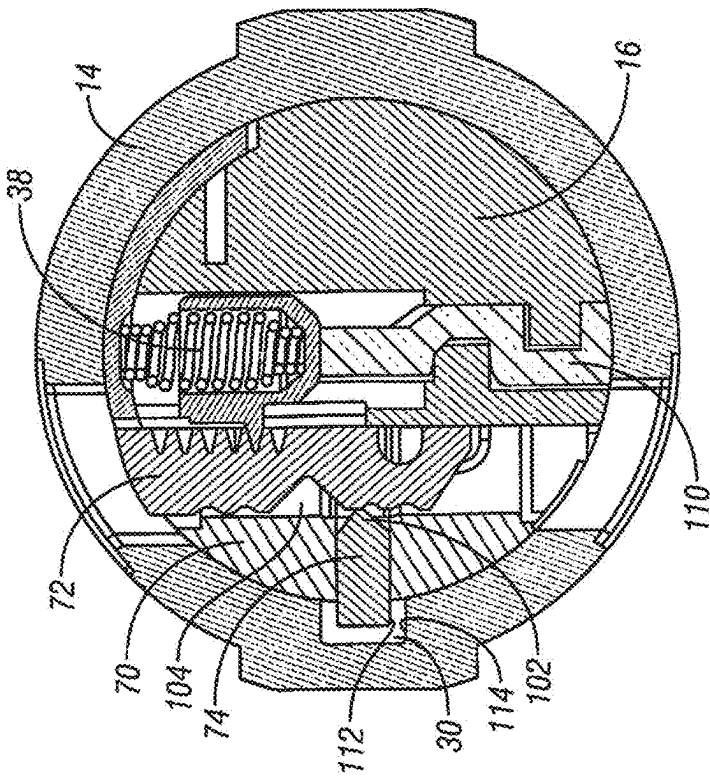


FIG. 5

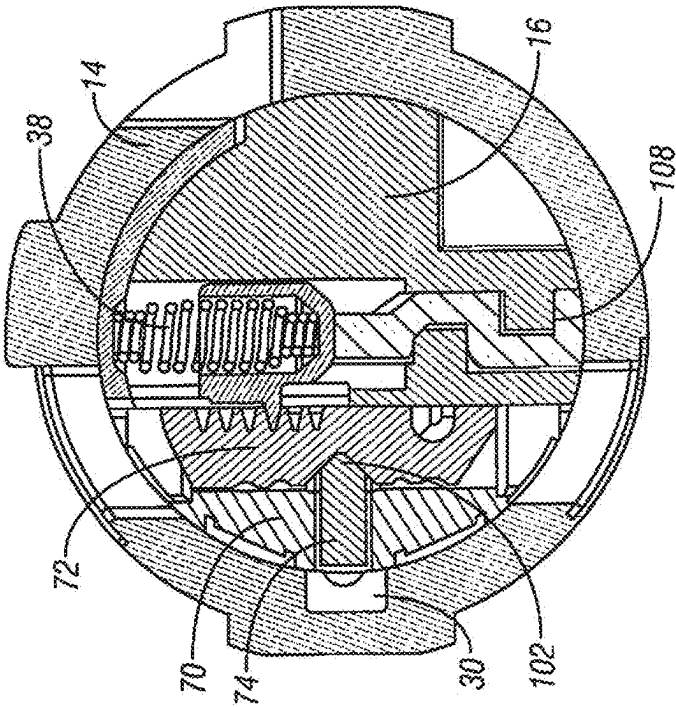


FIG. 4

REKEYABLE LOCK CYLINDER WITH ENHANCED TORQUE RESISTANCE

RELATED APPLICATIONS

[0001] This application is a continuation of U.S. patent application Ser. No. 18/616,508, filed Mar. 26, 2024, which is a continuation of U.S. patent application Ser. No. 16/825,817, filed Mar. 20, 2020, now U.S. Pat. No. 11,988,018, which is a continuation of U.S. patent application Ser. No. 15/172,206, now U.S. Pat. No. 10,612,271, filed Jun. 3, 2016, which claims the benefit of U.S. Provisional Application No. 62/180,339, filed Jun. 16, 2015, and which applications are hereby incorporated by reference in their entireties.

TECHNICAL FIELD

[0002] This disclosure relates generally to locks; in particular, this disclosure relates to a lock with a rekeyable lock cylinder having enhanced torque resistance.

BACKGROUND AND SUMMARY

[0003] Lock cylinders that can be rekeyed without removal of the cylinder plug are known. For example, U.S. Pat. No. 8,033,150 describes a rekeyable lock cylinder. These types of locks are highly beneficial to consumers because the locks can be easily rekeyed without use of a locksmith.

[0004] Although the plug cylinder should freely rotate when an authorized key is inserted into the keyway, the lock cylinder should be configured to resist rotation of the plug when torque is applied by an unauthorized key (or other object). A high amount of torque resistance for the lock cylinder is key to reducing forced entry. Therefore, there is a need for a rekeyable lock with enhanced torque resistance.

[0005] According to one aspect, this disclosure provides a rekeyable lock cylinder with a cylinder body and a plug assembly. The cylinder body defines a longitudinal axis and includes a groove. The plug assembly is disposed in the cylinder body and is rotatable about the longitudinal axis. The lock cylinder includes a plurality of key followers and a corresponding plurality of racks disposed in the plug assembly. At least one of the plurality of racks is selectively disengageable from at least one of the plurality of key followers responsive to application of a force by an object inserted into the rekeyable lock cylinder to facilitate rekeying to a new key. The lock cylinder includes means for blocking rotation of the plug assembly with respect to the cylinder body to prevent unlocking of the rekeyable lock cylinder with an unauthorized object. In some embodiments, the blocking means is configured such that torqueing the plug assembly with an unauthorized object applies force to the blocking means without translating such force to the plurality of racks. This type of arrangement enhances torque resistance of the lock cylinder.

[0006] In some embodiments, the blocking means includes a locking bar movable transversely with respect to the longitudinal axis between a locked position into the groove of the cylinder body and an unlocked position out of the groove of the cylinder body. For example, the locking bar could include a surface that engages a surface of the groove when in the locked position. In some illustrative embodiments, the respective surfaces of the locking bar and groove that engage when the locking bar is in the locked

position are in approximately parallel planes. Depending on the circumstances, the surface of the locking bar that engages the groove in the cylinder body when the locking bar is in the locked position is not a ramped surface. For example, the surfaces could be flat with respect to each other. In some cases, the edge of the locking bar is substantially squared off, such as having an approximately rectangular cross-section.

[0007] In some embodiments, there are one or more biasing members urging the locking bar towards the plurality of racks. With this arrangement, the biasing members urge the locking bar out of the groove in the cylinder body when an authorized key is inserted into the keyway. In some illustrative embodiments, a spring force of the biasing member is less than a spring force of the spring-loaded key followers. As such, the spring-loaded key followers will overcome the spring force of the biasing member to lock the lock cylinder when a key is not inserted into the keyway.

[0008] Additional features and advantages of the disclosure will become apparent to those skilled in the art upon consideration of the following detailed descriptions exemplifying the best mode of carrying out the disclosure as presently perceived.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present disclosure will be described hereafter with reference to the attached drawings which are given as non-limiting examples only, in which:

[0010] FIG. 1 is a perspective view of an example lock cylinder according to an embodiment of this disclosure;

[0011] FIG. 2 is an exploded view of the example lock cylinder shown in FIG. 1;

[0012] FIG. 3 is a cross-sectional view of the example lock cylinder shown in FIG. 1 showing the springs urging the locking bar towards the racks;

[0013] FIG. 4 is a cross-sectional view of the example lock cylinder shown in FIG. 1 showing the interface between the locking bar and cylinder body with an authorized key in the keyway;

[0014] FIG. 5 is a cross-sectional view of the example lock cylinder shown in FIG. 1 showing the interface between the locking bar and cylinder body with an unauthorized key in the keyway; and

[0015] FIG. 6 is a cross-sectional view of the example lock cylinder shown in FIG. 1 showing the interface between the locking bar and cylinder body without a key in the keyway.

[0016] Corresponding reference characters indicate corresponding parts throughout the several views. The exemplification set out herein illustrates an embodiment of the invention in one form, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION

[0017] This disclosure relates to a rekeyable lock cylinder that can be rekeyed without removal of the cylinder plug. The operation for rekeying the lock cylinder is similar to that described in U.S. Pat. No. 8,033,150, which is hereby incorporated by reference. While the rekeying operation operates similarly, the present lock cylinder includes an enhanced torque resistance. In some embodiments, this enhanced torque resistance is configured in a manner that

isolates torque on the plug cylinder from the racks, which increases durability of the lock cylinder.

[0018] An illustrative lock cylinder 10, according to an embodiment of the present disclosure, is illustrated in FIGS. 1 and 2. The lock cylinder 10 includes a longitudinal axis 12, a cylinder body 14, and a plug assembly 16. A retainer clip 18 (FIG. 2) couples together the cylinder body 14 with the plug assembly 16.

[0019] The cylinder body 14, as best seen in FIG. 2, illustratively includes a generally cylindrical body 20 having a front end 22, a back end 24 and a cylinder wall 26 defining an interior surface 28. The cylinder wall 26 includes an interior, locking bar-engaging groove 30 (best seen in FIGS. 4, 5, 6). In some embodiments, the locking bar-engaging groove 30 has a generally rectangular-shaped cross-section and extends longitudinally along a portion of the cylinder body 14, typically from the front end 22.

[0020] The plug assembly 16 includes a plug body 32, a carrier subassembly 34 and a plurality of spring-loaded pins 38 (also called key followers). The plug body 32 illustratively includes a plug face 36, an intermediate portion 40 and a drive portion 42. The plug face 36 defines a keyway opening 44, a rekeying tool opening 46, and a pair of channels 48 extending radially outwardly for receiving anti-drilling ball bearings 50. The drive portion 42 is configured to drive a torque blade 51, which could be coupled with a latch assembly (not shown). The drive portion 42 further includes a pair of slots 52 formed in its perimeter and a central groove 54 for receiving the retainer clip 18 to retain the plug body 32 in the cylinder body 14.

[0021] The intermediate portion 40 includes a main portion 56 formed as a cylinder section and having a plurality of channels 58 for receiving the spring-loaded pins 38. The channels 58 illustratively extend transversely to the longitudinal axis of the plug body 32.

[0022] A planar surface 60 defines a recess 62 for receiving a retaining cap 64. The channels 58 extend partially through the plug body 32, with the sidewalls of the channels open to a planar surface 66. The planar surface 66 illustratively includes a plurality of bullet-shaped, rack-engaging features 68.

[0023] The carrier subassembly 34 includes a carrier 70, a plurality of racks 72, a spring catch 73, a locking bar 74, a pair of clips 76 for holding corresponding biasing members 78 against the locking bar 74 to urge the locking bar 74 against the racks 72, and a return spring 80. The carrier 70 includes a body 82 in the form of a cylinder section that is complementary to the main portion 56 of the plug body 32, such that the carrier 70 and the main portion 56 combine to form a cylinder that fits inside the cylinder body 14. The carrier 70 includes a curved surface 84 and a flat surface 86. The curved surface 84 includes a locking bar slot 88, a spring catch recess 90, and a pair of clip receiving recesses 100 for receiving the clips 76. The locking bar slot 88 illustratively includes a pair of biasing member-receiving bores 92 for receiving the biasing members 78. In the embodiment shown, the locking bar 74 includes a corresponding pair of recessed areas 96 for receiving the biasing members 78.

[0024] The spring-loaded locking bar 74 is sized and configured to fit in the locking bar slot 88 in the carrier 70. The locking bar 74 illustratively includes a blocking portion 98 that is received in the locking bar engaging groove 30 in the cylinder body 14 when in the locked position (FIGS. 5

and 6) and extends out of the locking bar engaging groove 30 when in an unlocked position (FIG. 4). In some embodiments, as illustratively shown, the blocking portion 98 has a squared-off edge that forms a rectangular cross-section.

[0025] This squared-off surface stands in contrast to the triangular-shaped edge of the locking bar described in U.S. Pat. No. 8,033,150, which moves out of the groove in the cylinder body via a camming action. By using the urging of biasing members 78 to move the blocking portion 98 out of the groove 30 in the cylinder body 14, a squared-off edge can be used with a corresponding flat surface in the locking bar engaging groove 30, thereby increasing torque resistance of the lock cylinder 10 compared to the triangular-shaped edge and corresponding triangular-shaped locking bar engaging groove described in U.S. Pat. No. 8,033,150. Moreover, this relieves stress on the racks 72 because torque applied by an unauthorized key (or other object) will not be translated from the locking bar 74 to the racks 72 via a camming action; instead, the locking bar 74 interface with the locking bar engaging groove 30 will isolate the torque from the racks 72. Opposite the squared-off edge of the blocking portion 98, the locking bar 74 includes a flange 102 configured to engage locking bar-engaging grooves 104 formed in the racks 72 (FIGS. 4, 5, 6). The flat surface 86 of the carrier 70 includes a plurality of parallel rack-receiving slots 94 extending perpendicular to the longitudinal axis of the carrier 70.

[0026] FIG. 3 is an illustrative cross-sectional view of the lock cylinder 10 transversely cut through one of the clips 76. In this view, it can be seen that the clips 76 extend around the carrier 70. One end of the biasing member 78 is fixed against a receiving portion 106 of the clip 76 and the other end is received in the recessed area 96 of the locking bar 74 and urges the locking bar 74 against the racks 72. In this embodiment, the locking bar 74 is continuously urged by the biasing members 78 against the racks 72.

[0027] FIGS. 4, 5, and 6 are illustrative cross-sectional views of the lock cylinder 10 transversely cut along the blocking portion 98 of the locking bar 74. In FIG. 4, which shows an authorized key 108 inserted into the keyway opening 44, the key cut of the authorized key 108 is such to move the spring-loaded pins 38 and thereby the racks 72 to a position in which the flange 102 of the locking bar 74 is received into the respective locking bar engaging grooves 104 of the racks 72 via the urging of the biasing members 78. This positions the blocking portion 98 of the locking bar 74 to its unlocking position out of the locking bar engaging groove 30, thereby allowing free rotation of the plug assembly 16 with respect to the cylinder body 14 to unlock the lock cylinder 10. This use of biasing members 78 to urge locking bar 74 out of locking bar engaging groove 30 stands in contrast to the camming action to move locking bar out of a groove in the cylinder body described in U.S. Pat. No. 8,033,150. FIG. 5 illustrates an example in which an unauthorized key 110 is inserted into the keyway opening 44. Since the key cut of the unauthorized key 110 is "unauthorized," the locking bar engaging groove 104 of at least one of the racks 72 is not aligned with the flange 102 of the locking bar 74. As such, the locking bar 104 cannot be urged out of the locking bar engaging groove 30 of the cylinder body 14, which means the blocking portion 98 prevents rotation of the plug assembly 16 with respect to the cylinder body 14. In the embodiment shown, the edge of the blocking portion 98 is squared-off and the locking bar engaging groove 30 of the

cylinder body **14** has a corresponding shape. This means that the force caused by torqueing the plug assembly **16** with respect to the cylinder body **14** will be applied to a flat surface **112** of the blocking portion **98** with respect to a flat interior surface **114** of the locking bar engaging groove **30**. Since the surfaces **112**, **114** are flat with respect to each other, this enhances torque resistance compared to a ramped surface, such as the triangular edge of the locking bar and corresponding triangular groove in the cylinder body of U.S. Pat. No. 8,033,150. Moreover, unlike the flat surfaces **112**, **114**, the ramped surfaces described in U.S. Pat. No. 8,033,150 creates a camming action that applies force to the racks, which in some cases can deform the racks, or otherwise reduce durability of the racks. FIG. 6 illustrates an example in which there is no key in the lock cylinder **10**. The springs of the spring-loaded pins **38** have a higher spring force than the biasing members **78**. Accordingly, without a key in the keyway, the spring-loaded pins **38** drive the racks **72** downward, overcoming the force of biasing members **78**, so that the flange **102** of the locking bar **74** is not received in the locking bar engaging grooves **104** of the racks **74**. This forces the blocking portion **98** of the locking bar **74** into the locking bar engaging groove **30** of the cylinder body **14**, which prevents rotation of the plug assembly **16** with respect to the cylinder body **14**.

EXAMPLES

[0028] Illustrative examples of the rekeyable lock cylinder disclosed herein are provided below. An embodiment of the rekeyable lock cylinder may include any one or more, and any combination of, the examples described below.

[0029] Example 1 is a rekeyable lock cylinder with a cylinder body having a longitudinal axis and including a groove. The lock cylinder includes a plug assembly disposed in the cylinder body that is rotatable about the longitudinal axis. A plurality of key followers with a corresponding plurality of racks are disposed in the plug assembly. At least one of the plurality of racks is selectively disengageable from at least one of the plurality of key followers responsive to application of a force by an object inserted into the rekeyable lock cylinder to facilitate rekeying to a new key. The lock cylinder includes means for blocking rotation of the plug assembly with respect to the cylinder body to prevent unlocking of the rekeyable lock cylinder with an unauthorized object. The blocking means is configured such that force from torqueing the plug assembly with an unauthorized object is primarily distributed between the cylinder body and blocking means compared with any force translated to the plurality of racks, thereby enhancing torque resistance of the rekeyable lock cylinder.

[0030] In Example 2, the subject matter of Example 1 is further configured such that the blocking means comprises at least one locking bar movable transversely with respect to the longitudinal axis between a locked position into the groove of the cylinder body and an unlocked position out of the groove of the cylinder body.

[0031] In Example 3, the subject matter of Example 2 is further configured such that the at least one locking bar includes a surface that engages a surface of the groove when in the locked position. The respective surfaces of the at least one locking bar and groove engage when the at least one locking bar is in the locked position are in approximately parallel planes.

[0032] In Example 4, the subject matter of Example 3 is further configured such that the surface of the at least one locking bar that engages the groove in the cylinder body when the at least one locking bar is in the locked position is not a ramped surface.

[0033] In Example 5, the subject matter of Example 3 is further configured such that the surface of the at least one locking bar that engages the groove in the cylinder body when the at least one locking bar is in the locked position is a flat surface.

[0034] In Example 6, the subject matter of Example 3 is further configured such that the surface of the at least one locking bar that engages the groove in the cylinder body is in a plane that is approximately parallel to an axis radial to the longitudinal axis.

[0035] In Example 7, the subject matter of Example 2 is further configured such that an edge of the at least one locking bar is received in the groove of the cylinder body when in the locked position.

[0036] In Example 8, the subject matter of Example 7 is further configured such that the edge of the at least one locking bar is substantially squared off.

[0037] In Example 9, the subject matter of Example 7 is further configured such that the edge of the at least one locking bar has an approximately rectangular cross-section.

[0038] In Example 10, the subject matter of Example 1 is further configured to include a biasing member urging the blocking means towards the plurality of racks.

[0039] In Example 11, the subject matter of Example 10 is further configured such that the plurality of key followers are spring-loaded and wherein a spring force of the biasing member is proportional to a spring force of the spring-loaded key followers to ensure any key follower will not be lifted by the at least one locking bar.

[0040] Example 12 is a rekeyable lock cylinder including a cylinder body with a longitudinal axis including a groove. The lock cylinder includes a plug assembly disposed in the cylinder body and being rotatable about the longitudinal axis. A carrier assembly is provided that includes a plurality of racks and at least one locking bar. The lock cylinder includes a plurality of key followers disposed in the plug assembly. At least one of the plurality of racks is selectively disengageable from at least one of the plurality of key followers responsive to application of a force by an object inserted into the rekeyable lock cylinder to facilitate rekeying to a new key. The at least one locking bar is movable transverse to, and rotationally about the longitudinal axis. At least a portion of the at least one locking bar is movable between a locked position in the groove of the cylinder body and an unlocked position out of the groove in the cylinder body. The at least one locking bar is configured to prevent unlocking of the rekeyable lock cylinder with an unauthorized object. The at least one locking bar is configured such that force from torqueing the plug assembly with an unauthorized object is primarily distributed between the cylinder body and carrier assembly compared to any force translated to the plurality of racks.

[0041] In Example 13, the subject matter of Example 12 is further configured such that a biasing member urges the at least one locking bar towards the plurality of racks.

[0042] In Example 14, the subject matter of Example 12 is further configured such that the plurality of key followers are spring-loaded and a spring force of the biasing member is less than a spring force of the spring-loaded key followers.

[0043] Example 15 is a rekeyable lock cylinder that includes a cylinder body with a longitudinal axis including a groove. A plug assembly is disposed in the cylinder body and is rotatable about the longitudinal axis. The lock cylinder includes a plurality of key followers and a corresponding plurality of racks disposed in the plug assembly. At least one of the plurality of racks is selectively disengageable from at least one of the plurality of key followers responsive to application of a force by an object inserted into the rekeyable lock cylinder to facilitate rekeying to a new key. At least one locking bar is movable transverse to, and rotationally about the longitudinal axis. At least a portion of the at least one locking bar is movable between a locked position in the groove of the cylinder body and an unlocked position out of the groove in the cylinder body. The portion of the at least one locking bar is received into the groove has an approximately rectangular cross-section. The lock cylinder includes a biasing member that urges the at least one locking bar towards the plurality of racks.

[0044] In Example 16, the subject matter of Example 15 is further configured such that the plurality of key followers are spring-loaded and a spring force of the biasing member is less than a spring force of the spring-loaded key followers.

[0045] Although the present disclosure has been described with reference to particular means, materials, and embodiments, from the foregoing description, one skilled in the art can easily ascertain the essential characteristics of the invention and various changes and modifications may be made to adapt the various uses and characteristics without departing from the spirit and scope of the invention.

1. (canceled)

2. A rekeyable lock cylinder comprising:

a cylinder body extending along a longitudinal axis, the cylinder body defining an interior surface having a first engaging groove extending along the longitudinal axis; and

a plug assembly at least partially disposed within the cylinder body and selectively rotatable around the longitudinal axis, the plug assembly comprising:

a plug body;

a plurality of spring-loaded key followers slidably mounted on the plug body, each of the plurality of spring-loaded key followers having at least one rack engagement feature;

a carrier subassembly supported on the plug body, the carrier subassembly comprising:

a carrier slidably supported on the plug body;

a plurality of racks slidably mounted on the carrier, each of the plurality of racks having a plurality of key follower engagement features defined on a first side and configured to selectively engage the at least one rack engagement feature of a corresponding spring-loaded key follower, wherein each of the plurality of racks is selectively disengageable from the plurality of spring-loaded key followers via longitudinal movement of the carrier relative to the plug body to facilitate rekeying of the lock cylinder, each of the plurality of racks also having a second engaging groove recessed within a second side opposite the first side; and

a locking bar supported on the carrier and movable between at least a locked position, whereby the plug assembly is blocked from rotating around the longitudinal axis, and an unlocked position

whereby the plug assembly is allowed to rotate around the longitudinal axis, the locking bar having a first side and an opposite second side extending transversely relative to the longitudinal axis, the locking bar biased so that the second side is urged toward the plurality of racks and toward the unlocked position,

wherein in the locked position, at least one of the second engaging grooves of the plurality of racks is not aligned with the locking bar and the first side of the locking bar is disposed at least partially within the first engaging groove of the cylinder body,

wherein when the locking bar is in the locked position, engagement between the first side of the locking bar and the first engaging groove of the cylinder body substantially isolates rotational force applied to the plug assembly from the plurality of racks, and

wherein when the locking bar is moved from the unlocked position toward the locked position, one or more of the second engaging grooves cams the locking bar at least partially into the first engaging groove and into a position in which the locking bar blocks the rotation of the plug assembly around the longitudinal axis.

3. The rekeyable lock cylinder of claim 2, wherein the first engaging groove includes opposing parallel planar surfaces and the first side of the locking bar includes corresponding opposite parallel planar surfaces.

4. The rekeyable lock cylinder of claim 3, wherein when the locking bar is in the locked position, the opposing parallel planar surface of the first engaging groove and the opposite parallel planar surface of the first side of the locking bar restricts rotation of the locking bar relative to the plurality of racks when the rotational force is applied to the plug assembly.

5. The rekeyable lock cylinder of claim 3, wherein the first side of the locking bar includes a sidewall extending between the opposite parallel planar surfaces, and wherein edges connecting the sidewall to the opposite parallel planar surfaces are squared-off.

6. The rekeyable lock cylinder of claim 2, wherein the carrier subassembly further includes at least one biasing member biasing the locking bar towards the plurality of racks.

7. The rekeyable lock cylinder of claim 2, wherein the second side of the locking bar includes a flange and the second engaging groove of each of the plurality of racks has a corresponding flange shape, and wherein a size of the flange shape of the second engaging groove is larger than the flange of the second side of the locking bar.

8. The rekeyable lock cylinder of claim 7, wherein when the locking bar is in the unlocked position, the flange of the second side of the locking bar is completely disposed within the second engaging groove of each of the plurality of racks and with additional groove space above and below the flange.

9. The rekeyable lock cylinder of claim 7, wherein misalignment between the second engaging groove of at least one of the plurality of racks relative to the second side of the locking bar causes the second engaging groove to retain the flange of the locking bar in the locked position.

10. The rekeyable lock cylinder of claim **7**, wherein the second side of the locking bar defines a first height of the locking bar, the flange tapering inwards from the first height of the locking bar, and wherein the second engaging groove has a second height defined at the second side of each of the plurality of racks, the second height of the second engaging groove greater than the first height of the locking bar.

11. The rekeyable lock cylinder of claim **10**, wherein the flange has an extension length transverse to the first height of the locking bar and the second engaging groove has a recessed length transverse to the second height of the second engaging groove, and wherein the recessed length of the second engaging groove is greater than the extension length of the flange.

12. A rekeyable lock cylinder comprising:

- a cylinder body extending along a longitudinal axis, the cylinder body defining an interior surface having a first engaging groove extending along the longitudinal axis, the first engaging groove having opposing parallel planar surfaces; and
- a plug assembly at least partially disposed within the cylinder body and selectively rotatable around the longitudinal axis, the plug assembly comprising:
 - a plug body;
 - a plurality of key followers slidably mounted on the plug body, the plurality of key followers selectively movable in a first transverse direction that is orthogonal to the longitudinal axis, each of the plurality of key followers having at least one rack engagement feature;
 - a plurality of springs corresponding to the plurality of key followers and biasing the plurality of key followers along the first transverse direction;
 - a carrier subassembly supported on the plug body, the carrier subassembly comprising:
 - a carrier slidably supported on the plug body;
 - a plurality of racks supported on the carrier and slidable along the first transverse direction, each of the plurality of racks having a first side defining a plurality of key follower engagement features configured to selectively engage the at least one rack engagement feature of a corresponding key follower and a second side defining a second engaging groove, wherein each of the plurality of racks are selectively disengageable from the plurality of key followers via longitudinal movement of the carrier relative to the plug body to facilitate rekeying of the lock cylinder; and
 - a locking bar supported on the carrier and slidable relative to the carrier along a second transverse direction orthogonal to both the first transverse direction and the longitudinal axis between at least a locked position and an unlocked position, the locking bar having a first side and an opposite second side extending along the second transverse direction, the first side having opposite parallel planar surfaces, the second side defining a flange, and wherein when the locking bar is in the locked position, the first side of the locking bar is at least partially received within the first engaging groove of the cylinder body for engagement between corresponding planar surfaces, and wherein when

the locking bar is in the unlocked position, the flange of the locking bar is received within the second engaging groove of the plurality of racks allowing rotation of the plug assembly around the longitudinal axis; and

at least one biasing member biasing the locking bar towards the unlocked position.

13. The rekeyable lock cylinder of claim **12**, wherein the opposite parallel planar surfaces of the first side of the locking bar define a first height of the locking bar along the first transverse direction, and the second engaging groove on each of the plurality of racks has a second height extending along the first transverse direction and on the second side of each of the plurality of racks, and wherein the second height is greater than the first height.

14. The rekeyable lock cylinder of claim **12**, wherein the opposite parallel planar surfaces of the first side of the locking bar extend to the flange and the flange tapers inward from the opposite parallel planar surfaces, and wherein when the locking bar is in the unlocked position, a portion of the opposite parallel planar surfaces extend into the second engaging groove on each of the plurality of racks.

15. The rekeyable lock cylinder of claim **12**, wherein the flange has a substantially triangular cross-sectional shape with opposite oblique surfaces, the second engaging groove on each of the plurality of racks has a corresponding triangular shape with opposing oblique surfaces, and wherein a length of the opposing oblique surfaces of the second engaging groove is greater than a length of the opposite oblique surfaces of the flange.

16. The rekeyable lock cylinder of claim **15**, wherein the corresponding oblique surfaces of the second engaging groove and the flange cam so as to move the locking bar along the second transverse direction and into the locked position.

17. The rekeyable lock cylinder of claim **12**, wherein the flange defines an extension length along the second transverse direction and the second engaging groove on each of the plurality of racks define a depth length along the second transverse direction, the extension length of the flange less than the depth length of the second engaging groove.

18. The rekeyable lock cylinder of claim **12**, wherein the locking bar has a first longitudinal end and an opposite second longitudinal end defining a longitudinal length and extending along the longitudinal axis, and wherein the first side of the locking bar includes at least one recessed area for receiving the at least one biasing member, the at least one recessed area spaced apart from the first and second longitudinal ends of the locking bar.

19. The rekeyable lock cylinder of claim **18**, wherein the flange of the locking bar extends uniformly between the first and second longitudinal ends of the locking bar.

20. The rekeyable lock cylinder of claim **12**, wherein in the locked position of the locking bar, the engagement between corresponding planar surfaces restricts the flange from rotating the plurality of racks.

21. The rekeyable lock cylinder of claim **12**, wherein in the locked position of the locking bar, a portion of the flange is partially disposed within the second engaging groove of at least one of the plurality of racks.

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