ABSTRACT OF THE DISCLOSURE

A fence-type tumbler for use in a lock assembly such as a combination shackle lock to release the shackle without the necessity of dialing the proper combination thereof. The fence tumbler lock utilizes a key of a generally cruciform cross section which is conformably received in the wall of a lock casing to actuate radially reciprocable tumblers to a position where the tumblers and their rotatable tumbler guide are free to rotate with the key relative to the lock casing. The tumbler guide is operatively connected to a lock bolt for actuation thereof where the lock is actuated by the proper key. A combination shackle lock is provided with a shackle bolt which is allowed to rotate and release a shackle upon the actuation of combination disks to align a gate formed thereby with a fence integral with a fence bolt which is both rotatable and reciprocable in the combination lock housing. The fence bolt and shackle bolt rotate simultaneously upon dialing of the proper combination and pulling of the shackle, and the fence bolt may be reciprocated to a second position by a key-actuated lock in the combination lock housing. A recess is formed in the shackle bolt to be aligned with the fence when the fence bolt is in its second position; the recess allowing rotation of the shackle bolt relative to the fence bolt relative to the fence bolt to release the shackle.

The present invention relates to a novel fence-type tumbler, its application to any lock and its potential keying for pass and master keys. Also, this invention relates to a novel lock bolt arrangement for a combination shackle lock utilizing a rotatable shackle bolt and a rotatable and reciprocable fence bolt; the fence bolt being actuated for reciprocation by a tumbler lock to allow actuation of the shackle bolt independently of the combination disks. Among the objects of the present invention is the provision of a lock assembly having a short cylinder length utilizing a fence-type tumbler with a suitable key for actuation of the radially reciprocable tumblers. A casing for the lock has an opening complementary to the cross section of the key to orient and receive the key, and a rotatable tumbler guide is mounted in the casing to guide and carry the tumblers. A plurality of tumblers are received in radially extending grooves in the tumbler guide and are inwardly biased toward the key entering at the center of the lock casing. The inner end of each tumbler has a camming edge adapted to cooperate with an actuating shoulder of the key to provide outward movement of the tumblers to a position where the tumblers and the tumbler guide are allowed to rotate within the casing. The tumblers have variable camming edges to vary the engagement of the key so that the outward movement of each tumbler will be specific to the point where rotation of the tumbler guide is actuated.

Another object of the present invention is the provision of a lock assembly having fence-type tumblers carried by a tumbler guide that is operatively connected to a suitable lock bolt for rotation or reciprocation thereof. Each tumbler is provided with a depending lug or fence on the tumbler which reciprocates in an aligned radial slot formed in the tumbler guide and extends through the guide slot into a slot in the lock casing. The rear wall of the casing is provided with a plurality of T-shaped slots therein with each slot receiving a depending fence on a tumbler. The crossbar of the T allows radial movement of the tumblers only when a proper key is in operation; the crossbar allowing movement to a position aligned with the stem of the T to allow accurate movement of the tumblers upon rotation of the tumbler guide. If an improper key acts upon the tumblers, the fence will not be aligned with the stem of the T but will either be raised short of the stem or be moved in the crossbar beyond the stem; either position preventing accurate movement of the tumbler. Thus, the tumblers and the T slots function to provide anti-picking notches for the lock.

The present invention also comprehends the provision of a combination shackle lock that is capable of actuation to release the shackle without actuation of the combination disks. The combination shackle lock includes a pivotally mounted shackle bolt which cooperates with the fence of the lock, and a fence bolt which is both pivotal about the pivot pin for the shackle bolt and is movable relative to the pivot pin upon actuation of a tumbler lock mounted in the combination lock casing. The fence bolt includes an integral fence adapted to be received in a gate formed by aligned notches in the combination disks, and the fence bolt and shackle bolt pivot simultaneously to move the fence into the gate when the shackle is withdrawn from the lock casing.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawings:
FIG. 1 is a rear elevational view of a combination shackle lock showing the fence tumbler lock key opening therein.
FIG. 2 is a rear elevational view of the combination shackle lock with the cover removed to expose the tumblers of the fence tumbler lock.
FIG. 3 is a fragmentary view similar to FIG. 2 but with the key inserted and the tumbler guide rotated carrying the tumblers to the unlocked position.
FIG. 4 is a cross sectional view taken on the line 4—4 of FIG. 1 but with the key inserted and the key and tumblers rotated to the unlocked position.
FIG. 5 is a top plan view of the fence tumbler lock of FIG. 1 with the fence and shackle bolts; the combination shackle lock casing shown in dotted outline.
FIG. 6 is a front elevational view of the combination shackle lock with the front wall and dial omitted and the combination disks shown in dotted outline, the fence tumbler lock being shown in locked position.
FIG. 7 is a side elevational view of the fence tumbler lock and fence and shackle bolts taken on the left-hand side of FIG. 6 with the combination shackle lock casing shown in dotted outline.
FIG. 8 is a view similar to FIG. 6 with the combination lock casing and shackle omitted, but showing the position of the arms 25. Also shown are the tumbler heads 27 and 28 in their normal positions. The combination lock is shown in dotted outline.

FIG. 9 is a view similar to FIG. 6 but showing the position of the shackle bolt 29 and the lock bolt 10 upon actuation of the lock. The shackle is withdrawn, and the combination lock casing and shackle shown in dotted outline.

FIG. 10 is a cross sectional view similar to FIG. 4 but showing a cross sectional view of the shackle bolt 29 and related parts of the housing. FIG. 11 is a perspective view of the actuating end of the key for the fence tumbler lock.

FIG. 12 is a front elevational view of the fence tumbler lock casing removed from the combination lock assembly. FIG. 13 is a front elevational view of the tumbler guide. FIG. 14 is a perspective view of a tumbler in the fence tumbler lock.

FIG. 15 is a front elevational view of the shackle bolt. FIG. 16 is a side elevational view of the shackle bolt taken from the left-hand side of FIG. 15.

FIG. 17 is a front elevational view of the fence bolt. FIG. 18 is a side elevational view of the fence bolt taken from the right-hand side of FIG. 17.

Referring more particularly to the disclosure in the drawings wherein are shown illustrative embodiments of the present invention. FIG. 1 discloses a combination lock 10 having a lock casing or housing 11 and a reciprocable and rotatable shackle 12 having a short leg and a long leg, each leg being of such length that the lock is operable in an open position.

The locking mechanism 14 includes a combination lock assembly 15 and a master key 39 for actuating the fence tumbler lock. The key 39 is utilized in the factory to orient the key in the lock. As factory, a master key 39 is utilized to actuate the tumbler 29.

On the inner surface 46 of the back plate 15 is an integral tumbler post 47 extending forwardly with its axis aligned with the axis of the rotatable dial 13. The post provides an axis of rotation for and receives the plurality of combination disks 48 (three disks shown in FIG. 4) and spacer disks 49 therebetween of the combination lock assembly 18. The upper tumbler 48 will be operatively connected to the rotatable dial 13. Each tumbler 48 (FIG. 8) has a gate notch 51 in the periphery thereof and may have a disperser notch 52 if a disk disperser is utilized in the lock.

A pivot post 53 extends between the front wall and back plate 15 of the casing 11 and receives thereon a fence bolt 54 and a shackle bolt 61. The fence bolt 54 has a slightly curved bolt body 55 (FIGS. 17 and 18) and is provided adjacent its outer end with an elongated arcuate slot 56 receiving the pivot post 53; the slot allowing movement of the bolt 54 relative to the post. Adjacent the opposite end of the bolt is a laterally and forwardly extending fence plate 57 integral with the bolt 54 on the inner curved edge 58 thereof. The fence bolt 54 is positioned adjacent the back plate 15 and has a rearwardly extending integral projection or pin 59 substantially aligned with and opposite the fence plate 57 and extending through the L-shaped slot 21 in the back plate 15 and into the slot 35 in the tumbler guide 22.

The arcuate leg of the slot 21 allows for rotational movement of the fence bolt 54 with the tumbler guide 22 and relative to the post 53. The radial leg of the slot 21 and the aligned slot 35 in the tumbler guide 22 allow for pivotal movement of the fence bolt 54 around the pivot post 53.

In front of the fence bolt 54 is the shackle bolt 61 which has an opening 62 to conformably receive the pivot post 53 for pivotal movement thereabout. The bolt 61 is provided with a hook 63 at its upper end cooperating with a hook 64 on the short leg of the shackle 12 and a wedge-shaped portion 65 adjacent the lower end to cooperate with a wedge-shaped recess 66 in the long leg of the shackle. At the lower end of the shackle bolt 61 is an undercut projection for a disk disperser (not shown). On the inner curved edge 67 of the bolt 61 is a two-step recess having a shallow recess 68 and a deep recess 69 above the shallow recess 68. The bolt 61 is cut away at 71 (FIG. 16) to allow for movement of the fence bolt 54 relative thereto, and the fence 57 extends into and is normally positioned in the shallow recess 68 so that the bolts 54, 61 act together.

Considering operation of the lock, the shackle 12 can be released by the dialing of the proper combination setting 28, which will align the 38 and subsequently move the fence bolt 54 when the combination disk 48 is the path of travel of the fence 57. Upon withdrawal of the shackle 12, the shackle lock bolt 61 is pivoted and the recess 68 engaging the fence 57 causes simultaneous pivotal movement of the fence bolt 54, the slot 35 in the tumbler guide 22 and the aligned radial portion of the L-shaped slot 21 in the movement of the pin 59 on the fence bolt 54. This operation is independent of the fence tumbler lock 16.

If the lock is to be opened by authorized personnel without the combination setting, such as in a school or factory, a master key 39 is utilized to actuate the fence
tumbler lock 16. The cruciform key 39 is inserted into the housing formed by the flange 14 through the opening 37 in the cover 36 and into the opening 23 in the tumbler guide 22 with the end 40 of the key 39 abutting the back plate 15. Upon counterclockwise rotation (as seen in FIGS. 1 to 3) of the key 39 engaging the shoulders 44 and cam the tumblers 29 outward against the force of the springs 27. The crossbar of each T-slot 19 allows for radial movement of the tumbler 29 with the tongue 33 thereof moving in the crossbar of said slot 19.

With the proper key 39, the shoulders 44 will cam the tumblers 29 outward to a point where the tongue 33 of each tumbler 29 will be aligned with the main leg 19 of each slot 19. At that point, the end portions 43 of the key 39 contact the actuating arms 25 of the tumbler guide 22 between the arcuate opening portions 24 so that the tumbler guide 22 will rotate simultaneously with the key 39. Limited rotation of the tumbler guide 22 and limited arcuate movement of the fence bolt 54 is allowed by the pin 59 in the arcuate portion of the L-shaped slot 21. Also, movement of the fence bolt 54 is limited by the pivot post 53 acting in the arcuate slot 56 of the fence bolt 54. Rotation of the tumbler guide 22 causes movement of the fence bolt 54 relative to the shackle bolt 61 to align the fence 57 with the deeper recess 65 in the edge 67 of the shackle bolt 61. Withdrawal of the shackle bolt 12 will cause pivotal movement of the shackle bolt 61 relative to the fence bolt 54 with the recess 69 receiving the fence 57. Thus, the shackle can be withdrawn, and to lock the shackle, the above steps are reversed so that the key 39 can be withdrawn from the fence lock assembly.

FIG. 10 discloses an alternate embodiment of tumbler lock 16 illustrating a slightly different method of assembly. In this embodiment, the fence lock casing 72 and cover 73 are formed integral with the back plate 15. The casing 72 houses the tumbler guide 22, tumblers 29, and compression springs 27, and the cover 73 contains an opening 38 to receive a cruciform key 39*. The partition 74 separating the fence tumbler lock 16 from the combination shackle lock 18 is separate from the back plate 15 and is secured in a recess 75 in the casing 72. The partition 74 contains the T-shaped slots 19 and the L-shaped slot, and the tumbler post 47 is integral with the partition 74 and carries the combination disks 48 and the spacers 49 of the combination shackle lock 18.

While the lock assembly utilizing the fence type tumblers has been shown and described as being applicable to actuate the fence bolt in a combination shackle lock, it is not my desire or intent to limit the scope or the utility of the improved features of the present invention, as the lock assembly having fence-type tumblers could obviously be utilized to actuate other lock bolts or mechanisms, and the combination shackle lock utilizing a shackle bolt and fence bolt could be provided with other types of key-operated tumbler locks to actuate and reciprocate the fence bolt. Furthermore, the key does not have to be cruciform in cross section, but could have more or less than four arms.

Having thus disclosed the invention, I claim:

1. A lock assembly utilizing a fence type tumbler, comprising a lock casing having a back plate and side wall, a tumbler guide mounted for rotation in said casing, locking means operatively connected to said tumbler guide, said tumbler guide having a central opening to receive a suitable key, a cover for said casing having a central post for receiving the key, a plurality of radially reciprocable tumbler posts mounted in said tumbler guide, a depending fence on each tumbler, said tumbler guide having radial slots therein receiving said fences, said casing back plate having a plurality of slots generally aligned with said tumblers to allow radial and arcuate movement thereof, and resilient means biasing said tumblers inwardly to inactive position.

2. A lock assembly as set forth in claim 1, in which said slots in the back plate each have a radial leg and a connecting arcuate leg to receive said fence therein.

3. A lock assembly as set forth in claim 2, in which said slots in the back plate are generally T-shaped with the crossbar of the T-shaped slot having a radially extending leg and the main stem of the T is the arcuate slot portion.

4. A lock assembly as set forth in claim 1, in which said tumbler guide has a plurality of radial circumferentially equally spaced channels in one face thereof corresponding to and receiving the tumblers therein for sliding movement, said tumbler guide also having a central opening to receive said key with inwardly extending stop projections corresponding to the number of tumblers, and each of said tumblers having a rounded camming nose at one end thereof normally partially overlapping the central opening.

5. A lock assembly as set forth in claim 4, in which said key has a plurality of radially extending arms corresponding to the number of tumblers, said arms being received in the central opening in the tumbler guide and having reduced shoulders adjacent the ends of the arms adapted to engage the camming noses of said tumblers to actuate said tumblers upon rotation of said key.

6. A lock assembly as set forth in claim 5, in which said arms on said key engage said stop projections upon limited rotation of said key and, if said fences on the tumblers are aligned with the arcuate portions of said T-shaped slots, said key rotates said tumbler guide which carries said tumblers.

7. A lock assembly as set forth in claim 6, including means connecting said locking means and said tumbler guide through said back plate, said back plate having an opening to allow movement of said connecting means upon rotation of said tumbler guide.

8. A lock assembly as set forth in claim 1, in which said locking means includes a pivotally and reciprocably mounted fence bolt on the opposite side of the back plate having an arcuate slot adjacent one end, a pivot pin extending through said slot in the fence bolt, a pin on said fence bolt adjacent the opposite end thereof extending through said back plate and into the tumbler guide, a fence on said fence bolt, a shackle bolt adjacent the fence bolt, and means causing said shackle bolt and fence bolt to pivot simultaneously in one position of the fence bolt, and in a second position of the fence bolt, to allow pivotal movement of the shackle bolt relative to the fence bolt with pivotal movement of the shackle bolt releasing a shackle.

9. A lock assembly as set forth in claim 8, in which said last mentioned means includes an L-shaped slot having a radial portion and an integral right angular portion in the back plate and a radial slot in said tumbler guide receiving said fence bolt pin, said radial slot in the tumbler guide and said radial portion of said L-shaped slot allowing pivotal movement of the fence bolt, and said integral right angular portion of the L-shaped slot allowing reciprocal movement of the fence bolt upon rotation of the tumbler guide.

10. A lock assembly as set forth in claim 8, including a curved inner edge on said shackle bolt having a two-step recess therein with a shallow recess portion and a deep recess portion, said shallow recess portion normally receiving said fence on said fence bolt to provide simultaneous pivotal movement of said fence bolt and shackle bolt, and said deep recess portion is aligned with and receives said fence when the fence bolt is in its second position to allow pivotal movement of the shackle bolt relative to said fence bolt.

11. In a combination shackle lock having a casing, a shackle, and a post in said casing carrying a plurality of combination disks, each disk having a gate notch in the periphery thereof adapted to be aligned to form a gate, a shackle bolt pivotally mounted in said casing and cooperating with the shackle, a pivot pin for said shackle
b bolt, a fence bolt mounted on said pivot pin for pivotal and reciprocable movement relative thereto, a fence integral with said fence bolt, and means adapted to actuate said fence bolt between first and second positions, said shackle bolt including a curved inner edge having a two step recess therein with a shallow recess portion and a deep recess portion, said shallow recess portion normally receiving said fence when said fence bolt is in its first position to provide for simultaneous pivotal movement of said fence bolt and shackle bolt to move the fence into the gate, and said deep recess portion receiving said fence when the fence bolt is in its second position to allow pivotal movement of said shackle bolt relative to said fence bolt with pivotal movement of said shackle bolt acting to release said shackle.

12. A combination shackle lock as set forth in claim 11 in which said combination disks form a gate to receive said fence when said fence bolt and shackle bolt are simultaneously pivoted.

13. In a combination shackle lock having a casing, a shackle and a post in said casing carrying a plurality of combination disks, each disk having a gate notch in the periphery thereof adapted to be aligned to form a gate, a shackle bolt pivotally mounted in said casing and cooperating with the shackle, a pivot pin for said shackle bolt, a fence bolt mounted on said pivot pin for pivotal and reciprocable movement relative thereto, a fence integral with said fence bolt, and means adapted to actuate said fence bolt between first and second positions including a key-actuated lock, a connecting pin extending through said casing to connect said fence bolt with said key-actuated lock, said casing having a back plate separating said combination shackle lock from said key-actuated lock and having an L-shaped slot receiving said connecting pin, said fence bolt and shackle bolt pivoting simultaneously when the fence bolt is in its first position, and when the fence bolt is in its second position, said shackle bolt pivoting relative to said fence bolt with pivotal movement of said shackle bolt acting to release said shackle.

14. A combination shackle lock as set forth in claim 13, in which said L-shaped slot has a radial portion allowing pivotal movement of said fence bolt and an arcuate portion allowing movement of the fence bolt between its first and second positions, said fence bolt having an arcuate slot adjacent one end to receive said pivot pin, said arcuate slot allowing movement of said fence bolt relative to said pivot pin between its first and second positions.

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