

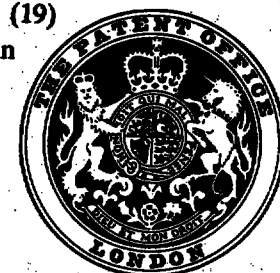
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(54) A LOCK FOR OPERATION BY A PROPERLY BITTED KEY

(71) We, EMHART INDUSTRIES INC., (formerly Emhart Corporation), a corporation organized and existing under the laws of the State of Connecticut, United States of America, of 426 Colt Highway, Farmington, Connecticut, 06032, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates in general to locks for operation by a properly bitted key and deals more particularly with improvements in locks of a type wherein pin tumblers reciprocally positioned by bits cut on one edge of a key release a plug for rotation relative to a supporting cylinder shell.

Heretofore, locks have been provided wherein pin tumblers carried by a key plug are positioned by a properly bitted key reciprocally to clear a shear line between the key plug and its supporting shell and also positioned rotationally to release another locking member so that it also clears the shear line. Typical lock cylinders of the afore described general type are illustrated and described in US Patents 3,499,302 and 3,722,240 to Spain et al; 3,449,303 to Spain; and 3,837,197 to Lopez. Each of the key operated lock cylinders disclosed in the aforesaid prior art references includes pin tumblers reciprocally positioned to clear a shear line and rotationally or angularly positioned to clear a shear line and rotationally or angularly positioned to release another locking member which comprises a side bar or fence. While such locks provide a high degree of security and facilitate a large number of possible key changes, utilization of multiple locking elements, e.g. both pin tumblers and a side bar or fence, substantially increase the number of parts and operations required to make a lock, as compared

to a lock of known pin tumbler type, which utilizes only one form of locking element.

Accordingly, it is the general aim of the present invention to provide improved pin tumbler locks having locking members consisting solely of pin tumbler assemblies, difficult if not impossible to pick, and which provide a significantly greater number of key change possibilities than pin tumbler locks heretofore available. A further aim of the invention is to provide improved pin tumbler locks which may be readily adapted for use in master keyed systems.

According to the invention there is provided a lock for operation by a properly bitted key comprising a shell, a plug supported for rotation in said shell between locked and unlocked positions, said plug and said shell having a shear line there between and holes therein coaxially aligned in said locked position to define a bore, means defining a keyway in said lock in communication with said bore, an axially elongate pin tumbler assembly coaxially supported in said bore for axial translation and axial rotation therein, said tumbler assembly including a plurality of pin tumbler elements and means releasably coupling said elements, said coupling means defining at least one split line along which one of said elements may separate from another of said elements when said one element is in a predetermined axial and angular releasing position relative to said plug and said shell wherein said split line is aligned with said shear line, means biasing said pin tumbler assembly to a blocking position relative to said plug and said shell wherein said split line is out of alignment with said shear line to prevent rotation of said plug from its locked position, bit engaging means on said one element for moving said pin tumbler assembly from said blocking position to said releasing position against the action of said biasing means, in response to insertion of a proper key into said keyway to

permit rotation of said plug from its locked position to an unlocked position, and a groove in said plug receiving an associated portion of said coupling means when said plug is rotated from its locked position to an unlocked position.

In the drawings:-

Figure 1 is a side elevational view of a lock cylinder and key embodying the invention, portions of the cylinder shell and plug shown broken away and in longitudinal section.

Figure 2 is a sectional view taken along the line 2-2 of Figure 1.

Figure 3 is similar to Figure 2, but shows the key plug rotated to an unlocked position;

Figure 4 is similar to Figure 1, but shows the lock cylinder with the key removed therefrom;

Figure 5 is a somewhat enlarged fragmentary sectional view taken along the line 5-5 of Figure 3;

Figure 6 is a fragmentary sectional view taken along the line 6-6 of Figure 5;

Figure 7 is similar to Figure 6, but shows the position of the key plug and key relative to a driver after rotation 180 degrees from the locked position of Figure 2;

Figure 8 is a somewhat enlarged exploded perspective view of a portion of a key and an associated pin tumbler assembly and also shows a master pin which may comprise a part of the tumbler assembly.

Figure 9 is a somewhat enlarged fragmentary longitudinal sectional view of the lock cylinder of Figure 1.

Figure 10 is a fragmentary sectional view taken along the line 10-10 of Figure 9, a portion of the key plug shown broken away to reveal the key therein;

Figure 11 is a diagrammatic view of the pin tumblers and key of the lock cylinder of Figure 1;

Figure 12 is a fragmentary side elevational view of another pin tumbler assembly;

Figure 13 is similar to Figure 12, but shows a further pin tumbler assembly;

Figure 14 is also similar to Figure 12, but shows still another pin tumbler assembly;

Figure 15 is a fragmentary longitudinal sectional view of the lock cylinder of Figure 1 modified for master key operation;

Figure 16 is a sectional view taken along the line 16-16 of Figure 15.

Figure 17 is similar to Figure 15, but shows the key plug with a master key therein;

Figure 18 is a fragmentary sectional view taken along the line 18-18 of Figure 17.

Turning now to the drawings and referring first particularly to Figures 1-4, a lock cylinder embodying the present invention and indicated generally by the reference numeral 10 comprises a cylindrical shell 12

provided with an annular flange at its outer end and externally threaded for connection to a suitable supporting structure in which the lock cylinder is to be used. A plurality of cylindrical driver holes 14, 14 formed in the upper portion of the shell 12 communicate with a bore 16 which extends longitudinally through the lower portion of the shell 12.

A generally cylindrical key plug 18 is supported for rotation in the bore 16 along a

shear line 20 between locked and unlocked positions, as hereinafter further discussed.

The key plug 18 has a keyway or key slot 22 formed in its lower portion which extends longitudinally therethrough and opens

through its lower peripheral surface, as shown in Figures 1 and 2. A plurality of

cylindrical tumbler holes 24, 24 equal in number to the driver holes 14, 14 and

formed in the upper portion of the key plug 18 open in to the key slot 22. When the key

plug 18 is in its locked position, as it appears in Figures 1 and 2, each pin tumbler hole 24

is coaxially aligned with an associated driver hole 14 and cooperates therewith to define a

generally vertically disposed bore 26 for receiving an associated pin tumbler assembly.

The illustrated lock 10 has six pin tumbler bores 26, 26 five of which are shown in

Figure 1, and may be set up with as many as six pin tumbler assemblies. An axially

spaced series of annular grooves 28, 28 open radially outwardly through the peripheral

surface of the key plug. Preferably and as shown, each groove 28 has a generally

rectangular cross section. In the illustrated lock cylinder 10 each pin tumbler hole 24

opens into an associated groove 28 and it should be noted that the width of each

groove 28 is substantially less than the diameter of the associated pin tumbler hole

24 which intersects it. At its inner end the key plug 18 carries a known cam 30 for

operating an associated lock mechanism (not shown) for example, the bolt mechanism

of an associated door lock. In accordance with the present invention, a lock

cylinder has at least one axially elongate tumbler assembly which comprises a plural-

ity of elements and means for coupling the elements for rotation in unison within an

associated bore defined by the shell and the key plug in its locked position. The coupling

means at least partially defines a split line along which the elements may separate when

the tumbler assembly is moved axially and rotated about its axis with the shear line

between the plug and shell to release the plug for rotation relative to the shell and to

an unlocked position. A lock cylinder in accordance with the invention may also have

one or more split tumbler assemblies which include known pin tumblers and drivers

separable along split lines, but not coupled for rotation in the manner afore described.

However, the illustrated lock cylinder 10 has six pin tumbler assemblies of coupled type, five of which are shown in Figure 1, and respectively generally indicated at 32a-32e. Each pin tumbler assembly is received in an associated bore 26 and biased in the direction of the key plug 18 by an associated driver spring 34. A slide 35 received in a dove-tailed slot in the shell 12 retains the various tumbler assemblies 32a-32e and springs 34, 34 within respective bores 26, 26 as best shown in Figures 1-3.

The pin tumbler assemblies will now be described in further detail with particular reference to a typical pin tumbler assembly 32e, best shown in Figures 8-10. The tumbler assembly 32e includes a pin tumbler 36e carried by the key plug 18 and a driver 38e disposed within the shell 12 and releasably coupled to the pin tumbler. The pin tumbler 36e comprises an axially elongate cylindrical pin which has a key engaging lower end portion shaped to cause axial translation and axial rotation of the tumbler assembly to predetermined axial and angular positions relative to the key plug 18 and the shell 12 in response to engagement with an associated bit on a properly bitted key. More specifically, the pin tumbler 36e has a generally V-shaped chisel tip at its lower end defined by two planes which intersect generally at an apex 40e. The line of intersection formed by the planes and which defines the apex 40e intersects and is generally normal to the axis of the pin tumbler 36e. Preferably and as shown the chisel tip is slightly rounded at its apex 40e to smoothly engage key bits. At its upper end the pin tumbler 36e has an axially transverse T-slot 42e which preferably extends diametrically there across and which is or may be angularly offset relative to the chisel tip of the pin tumbler. In accordance with the presently preferred lock cylinder construction pin tumblers of three general types are employed which provide three basic T-slot arrangements. One type, referred to as a neutral tumbler, has its T-slot in parallel alignment with the apex of its chisel tip. A pin tumbler may also be provided which has the longitudinal axis of its slot angularly offset 20 degrees in either direction about its axis and relative to its chisel tip. The length of the pin tumblers vary in accordance with a selected code, as well known to those skilled in the art. The illustrated pin tumbler 36e has a 20 degree negative offset, that is the longitudinal axis of its slot 42e, as viewed from above and as shown in Figure 10, the offset angle being indicated by the numeral 44. However, other pin tumblers which comprise the lock 10 have positive angular offsets, the slots thereof being angularly offset in a clockwise direction, as will be hereinafter

discussed.

The driver 38e comprises a generally cylindrical spool-shaped member and has a coupling projection 46e on its lower end which has a generally T-shaped cross-section. The width of the projection 46e is substantially equal to the width of the annular groove 28 with which it is associated. The projection is adapted to be received in and generally complement the T-slot 42e and cooperates with the slot to couple the driver 38e to the tumbler 36e for axial rotation therewith. The projection and the slot also cooperate to prevent the driver and the tumbler from separating in generally axially opposite directions. The projection 46e and its associated slot 42e define a generally T-shaped split line 20' (Figure 9) normal to the longitudinal axis of the slot and along which the pin tumbler 36e and driver 38e may separate, when the pin tumbler is moved relative to the driver and in a transverse direction relative to its axis such as will occur upon rotation of the key plug 18 relative to the shell 12. However, before such separation can occur the split line 20' must be aligned with the shear line 20, as will be hereinafter further discussed.

The key for operating the lock cylinder 10, hereinbefore described, is indicated generally at 48 and includes an elongate blade 50 which has a plurality of generally V-shaped bits 52a-52f cut to various depths along its upper edge in accordance with a selected code which matches the code of the tumblers which it is to operate. The bits 52a-52f are cut across the longitudinal axis of the key blade 50, each bit being generally defined by two planes which form an included angle of 90° and intersect along a line of intersection of the various bits being indicated at 54a-54f. Preferably, at least one of the bits is cut skew across the longitudinal axis of the key blade 50, but, if desired, all of the bits may be skew cut.

Referring now to Figure 11, a proper key 48 for unlocking the lock cylinder 10 is diagrammatically illustrated with reference to the pin tumblers 36a-36f which it operates. The tumbler 36d comprises a neutral tumbler, the axis of its slot 42d being parallel to the apex of its chisel tip. Accordingly, the corresponding key bit 52d which operates the tumbler 36d, comprises a neutral bit cut perpendicular to the longitudinal axis of the blade 50. The pin tumblers 36a and 36f each have a 20 degree positive angular offset, therefore, the corresponding bits 52a and 52f which operate the latter pin tumblers are cut with a 20 degree negative offset. Thus, for example, the line of intersection 54a of the V-shaped bit 52a, is angularly offset 20 degrees in a counterclockwise direction from a neutral axis normal to the longitudinal axis of the blade 50, as viewed from



above in Figure 11. The remaining pin tumblers 36b, 36c, and 36e each have a 20 degree negative offset, hence the corresponding key bits 52b, 52c, and 56e which operate these pin tumblers have 20 degree positive offsets. The key 48 also has a plurality of notches 58, 58 formed in its lower edge and cut generally perpendicular to the axis of the blade 50. Preferably and as shown, each notch 58 has a generally rectangular cross section and is adapted to complement and at least partially define a portion of an associated one of the grooves 28, 28 when the key 48 is fully inserted into the key slot 22, as best shown in Figure 1.

Considering now the operation of the lock cylinder 10, when the lock cylinder in its locked condition with the key removed therefrom, as it appears in Figure 4, the key plug 18 is in its locked position and the tumbler assemblies 32a-32f extend across the shear line 20 to prevent rotation of the key plug 18 relative to the shell 12. The tumbler assemblies are or may be disposed in random angular positions within the bores 26, 26. When the proper key 48 is fully inserted into the key slot 22 the various tumbler assemblies are raised and lowered or axially translated and rotated to predetermined release positions wherein the split lines 20' 20' (see Figure 9) between the pin tumblers and drivers are generally aligned with the shear line 20 and the longitudinal axes of the slots 42a-42f are generally disposed in radial planes relative to the plug 18. The lock cylinder 10 is then in an unlocked condition, as it appears in Figures 1 and 2, from which position the key 48 may be rotated in either direction to rotate the key plug 18 and thereby separate each of the pin tumblers from its respective driver. As the key plug 18 is rotated to an unlocked position, such as its position of Figure 3 each of the T-shaped coupling projections (such as 46a) on the drivers (such as 38a) enters its associated annular groove 28. The side walls of each groove cooperate with an associated coupling projection to prevent the driver associated herewith from rotating about its axis within its driver hole 14 while the key plug 18 is in an unlocked position, as illustrated in Figures 5-7, where a typical driver 38b is shown. When the key 48 is fully inserted into the key plug 18 the notches 58, 58 substantially complement and at least partially define the grooves 28, 28. More specifically, they define the side walls of an associated groove, as shown in Figure 7 wherein the position of a typical coupling projection 46b is shown relative to the key plug 18 and key 48, which have been rotated 180 degrees from the locked position of Figure 2. Thus the key 48 may travel smoothly past the projections 46a-46e when the plug 18 is rotated more than one half

revolution from its locked position relative to the shell 12. The pin tumblers 36a-36f are restrained against rotation within the tumbler holes 24, 24 by the cooperation of the key 48 and the bore 16 while the key plug 18 is in an unlocked position. Thus, the coupling projections on the drivers and the coupling slots in the pin tumblers cannot become misaligned when the lock cylinder 10 is in an unlocked condition.

Rotation of the key and key plug from an unlocked position to the locked position (figure 2) moves the pin tumblers into coupled engagement with the drivers. The key may be withdrawn from the lock cylinder 10 when the key plug is in its locked position. Withdrawal of the key tends to cause random rotation of the various tumbler assemblies which scrambles the tumbler assemblies leaving them in random angular positions relative to the key plug and shell. Sufficient clearance must be provided between the coupling projection on each driver and its associated tumbler slot to assure smooth coupling engagement and disengagement of the pin tumblers and drivers when the key plug is rotated between locked and unlocked positions. Clearance or tolerance requirements will, of course, be determined at least to some degree by the shape of the coupling employed. However, it is essential that each pin tumbler be connected with its associated driver in coupled condition so that the pin tumbler will accurately rotate the driver to its release position when a proper key is inserted in the lock cylinder. Referring now particularly to Figure 12 another embodiment of the invention is illustrated with reference to a tumbler assembly indicated generally at 32h which includes a tumbler 36h and a driver 38h constructed and arranged to assure substantially play-free angular drive connection therebetween. The pin tumbler 36h has a T-shaped slot in its upper end for receiving a T-shaped coupling projection 46h which depends from the driver 38h. The coupling projection 46h is loosely received in the slot, sufficient clearance being provided to assure smooth coupling engagement and disengagement. However, the projection 46h is provided with a protrusion 60 which has a V-shaped cross section and which is received in and closely complements an upwardly opening V-shaped recess or groove 62 in the upper end of the tumbler 36h. The protrusion 60, urged into the complementary groove 62 by an associated driver spring, provides positive drive connection between the tumbler 36h and its associated driver 38h is accurately rotated to its releasing position by the tumbler 36h in response to the action of a proper key.

Various other coupling arrangements may be provided for releasably securing each

tumbler in coupled relation with an associated driver. In Figure 13 a further embodiment of the invention is illustrated with reference to a tumbler assembly 32g wherein a driver 38g is provided with a dove-tailed coupling projection 46g which cooperates with an associated dove-tailed slot formed in a tumbler 36g. Known techniques for picking pin tumbler lock cylinders rely upon separation occurring between drivers and tumblers. Since the coupled tumbler assemblies of the aforescribed embodiments are positively mechanically coupled to resist separation in axially opposite directions it will be apparent that the aforescribed lock cylinders cannot be picked by such known methods.

Referring now to Figure 14, a still further embodiment of the invention is illustrated with reference to a tumbler assembly 32k which includes a pin tumbler 36k and a driver 38k. The driver has a coupling projection 46k which has a rectangular cross section and is received in an associated generally complementary upwardly opening slot in the upper end of the tumbler 36k. The projection 46k and its associated slot provide a positive drive connection to assure rotation of the driver 38k. An associated driver spring (not shown) continually urges the driver 38k toward coupled relation with the tumbler 36k. However, if desired, additional means may be provided for coupling the driver and tumbler to resist separation in axially opposite directions. The illustrated tumbler assembly 32k has magnetic means for coupling the driver 38k and the pin tumbler 36k. The tumbler and driver may comprise magnets arranged with opposite poles in coupled engagement, substantially as shown, or alternatively one of the elements may comprise a magnet and the other be made from a magnetic material.

A lock cylinder in accordance for use in a master keyed locking system. A modified form of the lock cylinder 10 adapted for master key operation is illustrated in Figures 15-18 and indicated at 10a. The lock cylinder 10a includes a pin tumbler 36e and a driver 38e substantially identical to the correspondingly numbered parts previously described, however, it will be noted that a master pin 64 interposed between the pin tumbler and driver provides the coupling therebetween. The master pin 64 comprises a generally cylindrical pin which has a T-shaped coupling projection 66 on its lower end received in a complementary coupling slot in the pin tumbler 36e. At its upper end the master pin has a T-shaped coupling slot 68 which receives the coupling projection on the driver 38e. The coupling slot 68 is or may be angularly offset from the coupling projection 66. In accordance with the presently preferred master key coding

system, three general types of master pins are provided. The illustrated master pin 64 is of a type which has a 40 degree positive angular offset, the longitudinal axis of its slot 68 being offset 40 degrees in a clockwise direction relative to the axis of its coupling projection 66, as best shown in Figure 16. In accordance with the presently preferred master keyed system, other master pins may be provided which have 40 degree negative offsets and still other master pins may be utilized which are of a neutral type. In Figure 8 a typical neutral master pin is illustrated and indicated at 64', and it will be noted that the longitudinal axis of the slot 68' is substantially parallel to the longitudinal axis of the coupling projection 66'.

Considering now the operation of the master-keyed lock cylinder 10a, and further referring to Figures 15-18, in Figure 15 the pin tumbler 36e is shown in its releasing position in engagement with the bit 52e of the key 48, which may comprise a change key in the aforesaid master keying system. The pin tumbler 36e has been rotated by the bit 52e to the position shown in Figure 10, previously described. The latter bit has a 20 degree positive offset angle 44, as shown in Figure 10. When the tumbler 32e is in its releasing position (Figure 15), it is free to separate from the master pin 64 and the driver 38e which remain within the cylinder shell 12 when the plug 18 is rotated to an unlocked position. A master key for operating the lock cylinder 10a is shown in Figure 17 and indicated generally at 48'. The master key 48' has a bit 52e' which is cut to a depth greater than the depth of the bit 52e by an amount equal to the effective axial length of the master pin 64. The angle of the bit 52e' is determined by the relative angular relationship between the chisel tip apex 40e and the slot 68 when the master pin 64 is coupled to the pin tumbler 36e. In the illustrated case, Figures 17 and 18, the slot 68 has a 20 degree positive offset relative to the apex 40e. Accordingly, the master key 48' for operating this coupled pin tumbler master pin must have a 20 degree negative offset. Thus, when the key 48' is inserted into the lock cylinder 10a the bit 52e' causes axial translation and rotation of the master pin to its releasing position as shown in Figures 17 and 18. In the latter position the split line 20" defined by the coupling between the master pin 64 and the driver 38e is aligned with the shear line 20. The master pin 64 which is disposed within the key plug 18 and coupled to the pin tumbler 36e is then free to separate from the driver 38e along the split line 20" in response to rotation of the plug to an unlocked position.

Since various master pins may be coupled to various pin tumblers, it will now be apparent that the angular bitting selected for

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use on a master key is independent of the angular biting on the change key. Thus, the angular biting required to make a master key for opening a series of locks embodying the invention cannot be predicted by examination of a proper change key which opens one or more locks in the series.

The invention has been illustrated and described with reference to lock cylinders, however, it should be understood that the present invention may be embodied in locks of other types, for example, padlocks, and such embodiments are contemplated within the scope of the claims appended hereto.

WHAT WE CLAIM IS:-

1. A lock for operation by a properly bitted key comprising a shell, a plug supported for rotation in said shell between locked and unlocked positions, said plug and said shell having a shear line therebetween and holes therein coaxially aligned in said locked position to define a bore, means defining a keyway in said lock in communication with said bore, an axially elongate pin tumbler assembly coaxially supported in said bore for axial translation and axial rotation therein, said tumbler assembly including a plurality of pin tumbler elements and means releasably coupling said elements, said coupling means defining at least one split line along which one of said elements may separate from another of said elements where said one element is in a predetermined axial and angular releasing position relative to said plug and said shell wherein said split line is aligned with said shear line, means biasing said pin tumbler assembly to a blocking position relative to said plug and said shell wherein said split line is out of alignment with said shear line to prevent rotation of said plug from its locked position, bit engaging means on said one element for moving said pin tumbler assembly from said blocking position to said releasing position, against the action of said biasing means, in response to insertion of a proper key into said keyway to permit rotation of said plug from its locked position to an unlocked position, and a groove in said plug receiving an associated portion of said coupling means when said plug is rotated from its locked position to an unlocked position.

2. A lock according to claim 1, wherein said one element comprises a pin tumbler and said other element comprises a driver.

3. A lock according to claim 1 or claim 2, wherein said coupling means comprises a slot in said one element and a projection on said other element, said projection being received within said slot when said elements are coupled, said slot being aligned with said groove in said releasing position.

4. A lock according to claim 3, wherein said slot is formed in an end of said one element and extends transversely of the axis

thereof and said projection generally complements an associated portion of said slot.

5. A lock according to claim 3 or claim 4, wherein said projection is loosely received in said slot and said coupling means includes means releasably connecting said one element and said other element for substantially playfree angular drive connection therebetween.

6. A lock according to any of claims 3 to 5, wherein said slot and said projection are shaped for interlocking engagement.

7. A lock according to claim 6, wherein said slot comprises a T-slot.

8. A lock according to claim 6, wherein said slot comprises a dove-tailed slot.

9. A lock according to claim 6, wherein said coupling means comprises magnetic means.

10. A lock according to claim 1 or claim 2, wherein said coupling means comprises a protrusion on one of said elements received in and generally complementing a recess in the other of said elements.

11. A lock according to any of claims 1 to 10, wherein said coupling means comprises part of said pin tumbler assembly and includes means for releasably coupling said one element to said other element to resist separation therebetween in axially opposite directions.

12. A lock according to any of claims 1 to 11, wherein said coupling means comprises a master pin.

13. A lock according to claim 12, wherein said master pin is releasably coupled to said one element to separate therefrom along one associated split line in one predetermined releasing position and releasably coupled to said other element to separate therefrom along another associated split line in another predetermined releasing position.

14. A lock according to claim 13, wherein said one associated split line is angularly offset from said other associated split line.

15. A lock according to any one of claims 1 to 14, wherein said coupling means is further characterised as means for coupling said elements for rotation in unison within said bore and said groove receives an associated portion of said coupling means therein to prevent angular movement of said other element about its axis when said one element is separated from said other element by rotation of said plug from its locked to an unlocked position.

16. A lock according to any of claims 1 to 15, wherein said groove comprises an annular groove.

17. The combination with a lock according to claim 1 of a key comprising an elongate blade having a bit thereon engageable with said bit engaging means for axially and

(13) (14)



use on a master key is independent of the angular biting on the change key. Thus, the angular biting required to make a master key for opening a series of locks embodying the invention cannot be predicted by examination of a proper change key which opens one or more locks in the series.

The invention has been illustrated and described with reference to lock cylinders, however, it should be understood that the present invention may be embodied in locks of other types, for example, padlocks, and such embodiments are contemplated within the scope of the claims appended hereto.

WHAT WE CLAIM IS:-

1. A lock for operation by a properly bitted key comprising a shell, a plug supported for rotation in said shell between locked and unlocked positions, said plug and said shell having a shear line therebetween and holes therein coaxially aligned in said locked position to define a bore, means defining a keyway in said lock in communication with said bore, an axially elongate pin tumbler assembly coaxially supported in said bore for axial translation and axial rotation therein, said tumbler assembly including a plurality of pin tumbler elements and means releasably coupling said elements, said coupling means defining at least one split line along which one of said elements may separate from another of said elements where said one element is in a predetermined axial and angular releasing position relative to said plug and said shell wherein said split line is aligned with said shear line, means biasing said pin tumbler assembly to a blocking position relative to said plug and said shell wherein said split line is out of alignment with said shear line to prevent rotation of said plug from its locked position, bit engaging means on said one element for moving said pin tumbler assembly from said blocking position to said releasing position, against the action of said biasing means, in response to insertion of a proper key into said keyway to permit rotation of said plug from its locked position to an unlocked position, and a groove in said plug receiving an associated portion of said coupling means when said plug is rotated from its locked position to an unlocked position.

2. A lock according to claim 1, wherein said one element comprises a pin tumbler and said other element comprises a driver.

3. A lock according to claim 1 or claim 2, wherein said coupling means comprises a slot in said one element and a projection on said other element, said projection being received within said slot when said elements are coupled, said slot being aligned with said groove in said releasing position.

4. A lock according to claim 3, wherein said slot is formed in an end of said one element and extends transversely of the axis

thereof and said projection generally complements an associated portion of said slot.

5. A lock according to claim 3 or claim 4, wherein said projection is loosely received in said slot and said coupling means includes means releasably connecting said one element and said other element for substantially playfree angular drive connection therebetween.

6. A lock according to any of claims 3 to 5, wherein said slot and said projection are shaped for interlocking engagement.

7. A lock according to claim 6, wherein said slot comprises a T-slot.

8. A lock according to claim 6, wherein said slot comprises a dove-tailed slot.

9. A lock according to claim 6, wherein said coupling means comprises magnetic means.

10. A lock according to claim 1 or claim 2, wherein said coupling means comprises a protrusion on one of said elements received in and generally complementing a recess in the other of said elements.

11. A lock according to any of claims 1 to 10, wherein said coupling means comprises part of said pin tumbler assembly and includes means for releasably coupling said one element to said other element to resist separation therebetween in axially opposite directions.

12. A lock according to any of claims 1 to 11, wherein said coupling means comprises a master pin.

13. A lock according to claim 12, wherein said master pin is releasably coupled to said one element to separate therefrom along one associated split line in one predetermined releasing position and releasably coupled to said other element to separate therefrom along another associated split line in another predetermined releasing position.

14. A lock according to claim 13, wherein said one associated split line is angularly offset from said other associated split line.

15. A lock according to any one of claims 1 to 14, wherein said coupling means is further characterised as means for coupling said elements for rotation in unison within said bore and said groove receives an associated portion of said coupling means therein to prevent angular movement of said other element about its axis when said one element is separated from said other element by rotation of said plug from its locked to an unlocked position.

16. A lock according to any of claims 1 to 15, wherein said groove comprises an annular groove.

17. The combination with a lock according to claim 1 of a key comprising an elongate blade having a bit thereon engageable with said bit engaging means for axially and

(14) (15)

angularly positioning said pin tumbler assembly in its releasing position in response to insertion of said key into said keyway, said key having means for defining a portion of said groove when said key is in said keyway.

18. The combination according to claim 17, wherein said bit is cut skew relative to the longitudinal axis of said blade.

10 19. The combination according to claim 18, wherein said bit comprises V-shaped bit formed in said blade and defined by planes intersecting along a line of intersection which forms an acute angle with a side of said blade.

15 20. the combination according to any of

claims 17 to 19 wherein said means for defining a portion of said groove comprises a notch formed in an edge of said blade.

21. The combination according to claim 20, wherein said notch is generally rectangular. 20

22. A lock according to claim 1 and substantially as hereinbefore described with reference to the accompanying drawings. 25

23. The combination of a lock and a key according to claim 17 and substantially as hereinbefore described with reference to the accompanying drawings.

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