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PIN TUMBLER LOCK

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This invention relates to a pin-tumbler lock having a cylinder, which is rotatably mounted in the lock housing, and tumblers that are displaceable transversely of the cylinder and are so adjustable by means of a control key that the cylinder is unlocked, that is, released for being rotated.

It is known to use an arrangement including pin-tumblers which are loaded by compression springs, alternatively, in combination with balls, and which, in cooperating with a system of teeth or recesses arranged on the key shank, are displaced or adjusted as required against said spring influence for unlocking the rotatable cylinder. The functioning of these pin-tumblers can be checked or frustrated altogether, for example, by dust having accumulated in the lock, particularly if the dust forms a hard crust by intermixing with oil or moisture, or if by action of frost ice is formed. In such events it may happen that resistances arising in such manner can be overcome by the springs associated with the pin-tumblers only with difficulty or not at all. The pin-tumblers must then be caused to function properly again by injecting into the lock a liquid having dissolving properties, as for example benzine, or the lock must be heated which procedure is however tedious and expensive.

With a view to eliminating these drawbacks the safety lock according to the present invention is provided with a slide which is correlated to a system or row of sectional pin-tumblers and is shaped in accordance with a certain distribution of said tumblers, in such manner, that by inserting the key into the said plug the slide is positively displaced by cooperation of the key with one of the pin-tumblers and that by action of the slide the other pin-tumblers are adjusted into their unlocked positions, while in retracting the key, by cooperation of the latter with the system of pin-tumblers, the slide is positively restored and by slide action the pin-tumbler which displaced the slide is also restored so as to be moved into locking position.

By this means the proper functioning of the pin-tumblers is ensured.

In the accompanying drawing an embodiment of the invention is illustrated by way of example, in which

Fig. 1 depicts an axial section of the lock, according to the invention, the pin-tumblers being shown in locking position;

Fig. 2 is a cross section on the line II—II in Fig. 1, and

Fig. 3 shows an axial section of the lock with pin-tumblers moved out of locking position.

The numeral 1 designates the cylindrical lock casing having a cylinder 2 and a plug 3 which is rotatably mounted in a stepped off bore. In five radial bores of the plug 3 distributed axially over the latter pin-tumblers 4 are displaceably guided and have correlated thereto, in known manner, studs 5 for the reception of which the cylinder 2 is provided with corresponding bores. The two sections 4, 5 of the pin-tumblers are formed with points at their opposite ends in a known manner. The keyhole for the insertion of the flat control key 7 is denoted by 8. Depending on the number of pin-tumblers 4, on one of the flat sides of said key five depressed rests or engaging portions 8 of relatively varied shape are provided. These engaging portions are distributed in accordance with the permutation chosen, four of said engaging portions are formed by recesses, whereas the fifth is formed by a front oblique face on the key shank. To these engaging portions 8 of the key shank the sections 4 of the pin-tumblers 4, 5 are fitted, the sections 8 thereof being coordinated with depressed engaging portions 8 of the slide 10 which latter portions are distributed in accordance with the permutation chosen. The slide 10 is guided in a recess of the cylinder 2 so as to be displaceable in the axial direction of the lock casing, three of the said engaging portions of the slide 10 being formed by recesses and the other two by a front and a rear oblique face of the slide respectively, that is, oblique engaging faces provided on the slide for cooperation with mating oblique faces on the sections 8 of the pin-tumblers 4, 5.

As the control key 7 is inserted in the plug 3 in the required manner, the pin-tumblers 4, 5 are successively forced out of the range of the keyhole 8. By cooperation of the front oblique engaging portion of the key shank with the section 4 of the rearmost pin-tumbler 4, 5 the slide 10 is positively shifted to the right from its position shown in Fig. 1 by cooperation of the section 8 of said pin with the rearmost engaging portion 8 of the slide 10. By this means the remaining engaging portions 9 of the slide 10 are caused to cooperate with the section 5 of the other four pin-tumblers 4, 5 so that these are positively adjusted.

Said cooperation of the key 7 with the sections 4 and that of the sections 5 with the slide 10 have the result that the joint between the two pin sections 4, 5 is positively moved into alignment with the periphery of the plug 3 as shown in Fig.
3. The locking action of the pin-tumblers 4, 5 is then terminated in consequence whereof the plug 3 is released so that it can be turned by means of the key. This rotational movement of the plug 3 is then transmitted to the looking bar of the lock (not shown) connected with this plug.

If in the condition of the lock as shown in Fig. 3 the key is pulled out of the plug 3, the sections 4 are forced outwardly, that is, out of the engaging portions of the key with the exception of the rearmost section, whereby the slide 10 is positively displaced to the left in regard to Fig. 3 into its position shown in Fig. 1. By this means the slide 10 positively pushes the rearmost portion 4 by means of the section 5 correlated to the latter inwardly into locking position. The other pin-tumblers had thus entered into a locking position also due to having been moved in the outward direction and if, as illustrated in the drawing, provision is made for the pin-tumblers 4, 5 to move in a vertical path, in consequence whereof, they have the tendency to drop by influence of their own weight into their lowermost position shown in Fig. 1 as the key is retracted, these tumblers freely move into a different position of locking by locking engagement of their sections 5.

If a key not being configured in accordance with the permutation chosen is inserted in the keyhole 6 there is absolutely no possibility of displacing the slide 10 for releasing the plug 3. From the foregoing explanations it will be clear without any further comment that only a key of a form according to the permutation chosen can be inserted in the lock to the depth required for rotating the plug 3 (after unlocking of the same).

According to one well known arrangement of the row of pin-tumblers as illustrated in the drawing the keyhole is arranged as in the usual actual practice in the rotatable cylinder as a rule at right angles to the position shown, in which case the configuration for the key in accordance with the permutation chosen is applied to one of the narrow sides of the key. Obviously the position of the row of pin-tumblers in the lock casing may be horizontal instead of vertical when the cylinder is locked. Further the lock may be provided with several rows of pin-tumblers instead of with a single row, to which rows with the tumblers distributed thereto in accordance with the permutation chosen the key must naturally be fitted. Again the shank of the key need not be flat. The configuration of the key in accordance with the permutation chosen may be effected by means of milled teeth instead of bored recesses; which former arrangement may include one or more rows to conform to the number of rows of pin-tumblers provided.

I claim:

In a pin-tumbler lock, a casing, a cylinder having a cylindrical bore and a longitudinal slide way formed therein, a plug in the bore, a slide in said slide way, a keyway in said plug, a plurality of transverse bores in the plug and cylinder extending from the keyway to the slide way, two-part pin-tumblers in said bores having their lines of junction flush with the surface of the plug when the plug is to be turned in the cylinder, the slide being formed with a plurality of inclined surfaces each adapted to contact one of the tumblers, and a key formed with a plurality of spaced conical recesses in positions corresponding to the tumblers, the inner end of said key having an inclined surface and adapted to engage the innermost tumbler, each of said tumblers having conical outer ends, said slide being formed with an inclined surface adjacent the innermost tumbler adapted to be engaged by the adjacent conical end of the innermost tumbler and to be moved longitudinally thereby, the inclination of the last mentioned inclined surface being opposite to that of the other inclined surfaces, said slide having a series of recesses registering with the adjacent ends of the respective tumblers except said innermost tumbler, said recesses being adapted to accommodate the ends of the respective tumblers when the slide is in locked position and also when the slide is in unlocked position and the respective tumblers are seated in the corresponding recesses of a properly formed key, said tumblers, when an improper key is inserted, being either positioned too high so as to prematurely contact the corresponding inclined surface of the slide and prevent longitudinal movement of the slide, thus preventing the innermost tumbler from having the junction of its parts brought flush with the surface of the plug, or remaining itself too low with its function of parts out of flush with said surface and preventing turning of the plug.

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