April 23, 1935. J. LOMBARDO 1,998,900

LOCK

Filed Oct. 31, 1934

Fig. 1

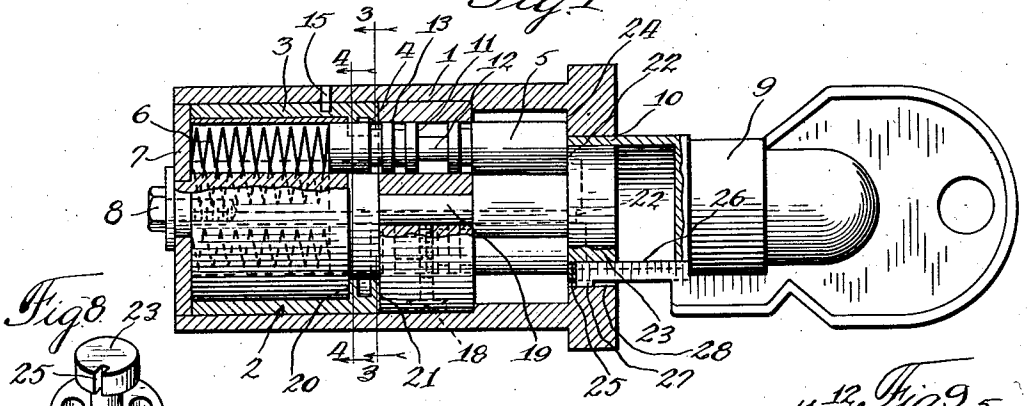


Fig. 8

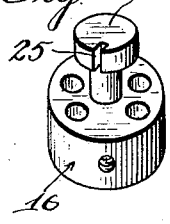


Fig. 2.

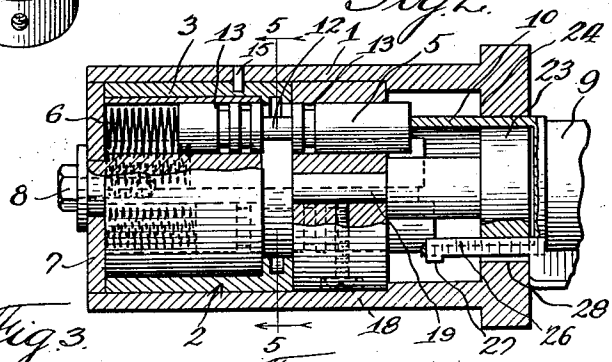


Fig. 9.

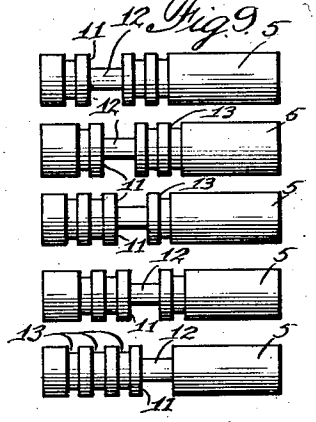


Fig. 3.

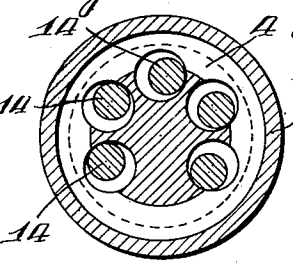


Fig. 4

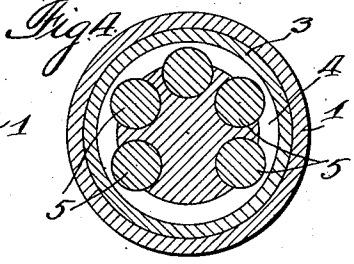


Fig. 7.

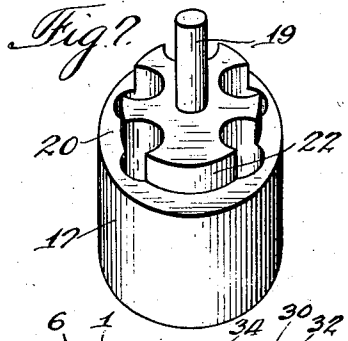


Fig. 5.

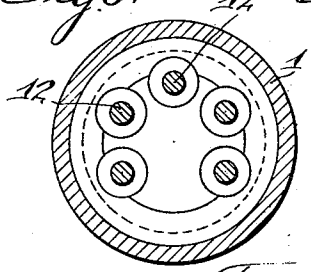


Fig. 6.

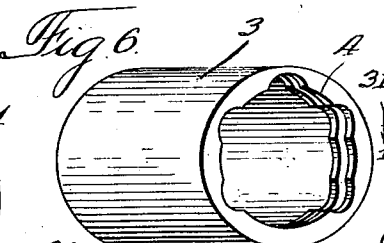


Fig. 10.

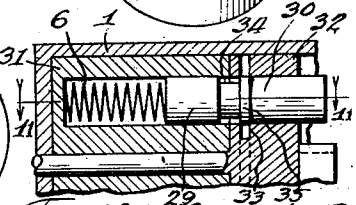
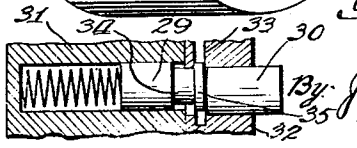


Fig. 11



Inventor:
Joseph Lombardo.
By: Jones, Addington, Ames & Seibold Attys

Patented Apr. 23, 1935 1,998,900

UNITED STATES PATENT OFFICE

1,998,900

LOCK

Joseph Lombardo, Chicago, Ill.

Application October 31, 1934, Serial No. 750,786

9 Claims. (Cl. 70—47)

My invention relates to locks.

One of the objects of my invention is to provide an improved lock of the sliding tumbler type which cannot be picked by known methods, such as those involving the determining of the "breaking" position of the tumblers or by "vibrator" picking apparatus.

A further object of my invention is to provide an improved lock of the type indicated which will have security against forcing, shearing, drilling, etc.

A further object of my invention is to provide a lock of the type indicated which, in addition to providing security is also of compact construction so that it can be made with dimensions small enough to meet the practical requirements of the trade.

A further object of my invention is to provide a lock of the type indicated which is so designed that it can be produced economically.

Further objects and advantages of the invention will be apparent from the description and claims.

In known types of sliding tumbler locks, it is possible to determine the breaking position of the tumblers by exerting a turning pressure on the driving barrel of the lock, at the same time moving the tumblers slidably, the breaking position of the tumbler being determined by a slight click and a slight rotational movement of the driving barrel when the tumbler is moved to breaking position. By thus determining the breaking position of all of the tumblers, the entire set of tumblers may be moved to breaking position and the lock then unlocked.

My improved lock is so designed that if it is attempted to pick it by the method outlined above, each tumbler when slidably shifted in the barrel will give a plurality of clicks which are indistinguishable from each other so that any one attempting to pick the lock is left entirely in the dark as to which one of the clicks indicates the breaking position and so that it is entirely a matter of guess-work as to which one of a plurality of positions is the breaking position of each tumbler. When it is considered that there are a plurality of tumblers, with respect to each one of which any one picking the lock has to make a guess as to its true unlocking position, it will be seen that the picking of this lock cannot be accomplished methodically but would be purely a matter of chance with the chances decidedly against any one attempting to pick the lock.

Present locks of the sliding tumbler type are also easily picked by means of electrical or mechanical vibrators which apply vibratory action to the lock at the same time that a turning effort is applied to the tumbler carrier. By this method, each tumbler eventually is vibrated to its breaking position, in which it will be held by the rotational pressure exerted on the tumbler carrier. When all of the tumblers have thus been turned to their breaking position, the lock can be opened. With my improved lock, the tumblers are so designed that they might be caught in any one of a plurality of positions with the chances greatly in favor of each tumbler being caught in an unreleased position. As there are a plurality of such tumblers, the chances against all of them being caught and held in an unlocking position are extremely slight.

In the drawing, in which two forms of my invention are shown,

Figure 1 is an axial section of a lock and key showing the tumblers in locked position;

Fig. 2 is a view similar to Fig. 1 but with the key fully inserted and the tumblers all pressed to unlocking position;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a section on the line 4—4 of Fig. 1;

Fig. 5 is a section on the line 5—5 of Fig. 2;

Fig. 6 is a perspective view of the flanged lock and sleeve;

Fig. 7 is a perspective view of the inner portion of the tumbler carrier;

Fig. 8 is a perspective view of the outer portion of the tumbler carrier;

Fig. 9 is a view of a set of tumblers;

Fig. 10 is a detail sectional view showing another form of locking tumbler; and

Fig. 11 is a section on the line 11—11 of Fig. 10.

Referring to the drawing in detail, and first to Figs. 1 to 9, incl., the construction shown therein comprises a cylindrical housing or casing member 1, a two-part tumbler carrying barrel 2 rotatably mounted in said housing member 1, a sleeve 3 having a notched plural locking flange portion 4 non-rotatably mounted in said housing, a plurality of locking tumblers 5 slidably mounted in said rotatable barrel, a plurality of springs 6 in said barrel for pressing the tumblers outwardly, and a washer or cap 7 secured to said barrel by means of a screw 8 for holding the springs in place in the barrel. A key 9 having a tubular tumbler engaging portion 10 is provided for pressing the tumblers 5 inwardly to unlocking position. The true breaking or unlocking position of each slidable tumbler is when the wide deep groove 11 in the tumbler straddles both notched portions of the grooved locking flange 4,

in which position the small neck portion 12 of the tumbler is lined up with the locking flange portion of the sleeve, as shown in Figs. 2 and 5, in which position the barrel can be turned to unlock the lock without any interference between the locking flange 4 and the tumblers as the reduced neck portions 12 of the tumblers will then clear the innermost portions of the notched locking flange.

In addition to the wide deep "breaking" groove 11 in the tumbler, a number of additional "dummy" grooves 13 are provided which are shallower and narrower than the true breaking grooves 11, the effect of which is to make it impossible for any one attempting to pick the lock to determine what is the true breaking position of the tumbler. These dummy grooves 13 co-operate with the narrow flange portions of the locking flange in such a manner as to give a click when the dummy groove lines up with the narrow flange portion which is indistinguishable from the click given by the true breaking groove when it lines up in the breaking position so that any one attempting to pick the lock is absolutely in the dark as to which one of the several clicking positions is the true breaking position of the tumbler. The width of the flanged portions of the tumbler lying between the grooves is slightly less than the distance between the two locking flange portions of the locking flange so that when turning pressure is exerted on the barrel and the tumbler is forced inwardly in attempting to find the breaking position, this narrow flange portion on the tumbler will snap into the space between the two locking flange portions when in alignment therewith to permit a slight rotational movement of the tumbler barrel, causing a click to be made which cannot be distinguished from the click made when the true breaking position of the tumbler is reached. The dummy notches do not permit the barrel to rotate sufficiently to effect any unlocking operation, as the neck portion 14 formed by the comparatively shallow groove 13 is too thick to permit it to clear the innermost portion of the locking flanges, as shown in Fig. 3.

Any desired number of these dummy grooves may be provided and any desired arrangement of the dummy grooves with respect to the true breaking groove may be adopted, as shown in Fig. 9, which shows a complete set of five tumblers with different arrangements of breaking grooves and dummy grooves. It will be noted here that in some of the tumblers at least dummy grooves are provided on both sides of the true breaking groove so that any one attempting to pick the lock will have no idea as to which click corresponds to the true breaking groove in the tumbler.

It is desirable in locks of this type that the locking flange construction be of substantial proportions to resist crushing or shearing, either by a turning action on the barrel or by an axial crushing pressure exerted on the tumblers. It is also desirable that each of those tumblers which are provided with dummy grooves should have a plurality of dummy grooves for the sake of ample security. It has heretofore been proposed to provide a lock having sliding tumblers in which the tumblers are provided with a comparatively deep breaking groove and with a plurality of comparatively shallow dummy grooves. In these, however, the width of the dummy grooves was the same as the width of the locking groove, thus making it necessary to have a comparatively thin locking flange in order to keep down the depth of the lock, since any increase in the thickness of the locking flange would necessitate a corresponding increase in the width of each one of the grooves, including all of the dummy grooves thus multiplying the length of the grooved portion of the tumbler. Furthermore, this increase in the length of the grooved portion of the tumbler necessitated an increase in the key movement necessary to actuate the tumblers and also necessitated an increase in the length of the tumbler barrel in order to provide for the necessary movement of the tumbler. Thus, an increase in the thickness of the locking flange might necessitate an increase in the depth of the complete lock of twelve times the additional thickness provided on the locking flange if three dummy grooves were provided in addition to the breaking groove. With my construction, in which a plurality of notched flanged locking portions are provided, separated from each other by an undercut or groove, it is possible to provide substantial proportions for the locking flange for resisting, crushing, shearing, etc., without any great increase in the necessary depth of the lock, as the sides of the dummy grooves do not have to straddle the entire notched flange construction but only need to be wide enough to straddle a single one of the locking flange portions. In other words, in locks of the type indicated which have heretofore been proposed, the dummy grooves, being of the same width as the breaking groove, necessitated an extraordinary and commercially impracticable depth of lock in order to provide a locking flange of sufficient proportions to meet requirements.

Referring now more in detail to the structure, the sleeve 3 having the locking flange portion may be held in the casing in any suitable manner, as by means of a pin 15. The outer portion 16 of the tumbler barrel is secured to the inner portion 17 by means of a set screw 18 threaded in the outer barrel portion and engaging the central shank 19 extending outwardly from the inner barrel portion. The flanged portion 4 of the locking sleeve 3 lies in the space between the shoulder 20 on the inner barrel and the shoulder 21 on the outer barrel portion.

As shown in Figs. 1, 2 and 7, the inner portion 17 of the locking barrel is provided with a reduced portion 22 which fits within the notched and grooved locking flange 4 carried by the sleeve, the main body portion of the inner barrel member 17 being rotatable within the sleeve 3 on which the locking flange 4 is formed, the locking flange thus being held between the shoulder 20 of the inner barrel portion and the shoulder 21 of the outer barrel portion. The sleeve portion 3 itself fits snugly in the outer housing 1, thus insuring the correct positioning of the locking flange and holding it securely against any skewing action in the housing.

The entire lock is easily and quickly assembled by slipping the inner barrel portion 17 into the sleeve 3, slipping the outer barrel portion 16 on the shank 19 of the inner barrel portion and securing it in place by means of the screw 18, and then slipping this assembly into the outer casing 1 and securing it in place by means of the pin 15. The parts are all economically produced, most of them being screw machine parts.

The two barrel portions are drilled to provide aligning bores in which the spring-pressed tumbler slides. When the spring-pressed tumblers

are in locking position, the unreduced portions of the tumblers engage the notches in the locking flanges, as shown in Fig. 4, to prevent any rotation of the tumbler barrel in the casing. The tubular portion 10 of the key is provided with tumbler engaging projections of different lengths 22 so designed that when the key is pressed home, as shown in Fig. 2, the breaking grooves 11 of the tumblers will all be lined up so as to bring the reduced neck portions 12 of all of the tumblers into alignment with the locking flanges 4, as shown in Figs. 2 and 5 to enable the tumbler carrying barrel to be rotated freely in the casing to effect the unlocking operation. The head portion 23 of the outer barrel member 16 is in alignment with the inwardly extending flange portion 24 of the casing so that between this head portion 23 and the inwardly extending flange portion 24 there is formed an annular passage to permit the insertion of the key. The head portion 23 of the outer barrel portion is provided with a groove 25 which cooperates with a longitudinal rib 26 extending inwardly from the tubular portion of the key to enable the key to turn the barrel when the key is rotated. The key is provided with the usual outwardly extending projection 27 which cooperates with a notch 28 in the inwardly extending flange to position the key when it is being inserted and withdrawn. The head 23 serves as a stop to limit the outward spring pressed movement of the tumblers.

Referring now to the construction of Figs. 10 to 11, incl., in this construction the tumblers are of the two-part type comprising inner and outer portions 29 and 30, and the tumbler-carrying barrel comprises two parts,—a non-rotatable locking barrel part 31 and a driving barrel part 32. The locking portion 31 of the barrel is non-rotatably held in the casing 1 while the driving barrel part 32 can be rotated in the casing to unlock the lock when all of the tumblers are in breaking position, that is to say, when all of the tumblers have been pushed into a position in which their breaking point is in alignment with the meeting faces of the locking portion of the barrel and the driving portion of the barrel. In order to make this lock more difficult to pick, I provide a deep annular groove 33 in the driving barrel part which extends inwardly beyond the circular bores in which the tumblers slide and I provide an annular groove 34 in the inner portion of one or more of the tumblers. This leaves a flange 35 on the outer end of the inner tumbler portion, the thickness of which flange is slightly less than the width of the annular groove in the driving barrel portion. With this construction, any one attempting to pick the lock by exerting turning pressure on the driving barrel as the plungers are pushed in will first experience a click when the flange 35 on the inner tumbler portion drops into the groove 33 in the driving barrel portion, permitting the driving barrel portion to rotate slightly to the position shown in Fig. 11, causing a click similar to the click experienced when the tumbler is moved to its true breaking position. There are thus two positions of this tumbler which give a click, thus adding to the difficulty of picking the lock.

Because of the fact that the lock is practically pick-proof, it cannot be serviced by an ordinary locksmith unless he knows the exact arrangement of breaking grooves and dummy grooves of the tumbler. By reason of this fact the lock manufacturer is enabled to maintain his own service system if desired, thereby enabling a high standard of service to be given.

I claim:

1. A locking construction comprising a rotatable tumbler carrier, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced portion, and means for preventing rotation of the tumbler carrier when an unreduced portion of a tumbler is aligned therewith but enabling rotation of the tumbler carrier when all the reduced portions of the tumblers are aligned therewith, at least one of said tumblers having at least one additional reduced portion which cooperates with said preventing means to enable a slight rotation of the carrier when an additional reduced portion is aligned therewith, but which additional reduced portion is not reduced sufficiently to enable the carrier to be turned to unlocking position, said preventing means comprising a plurality of axially spaced sets of circumferentially spaced projections between which the unreduced portions of the tumblers fit and slide, the axial distance between said sets being greater than the distance between the reduced portions of the tumblers.

2. A locking construction comprising a rotatable tumbler carrier, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced portion, and means for preventing rotation of the tumbler carrier when an unreduced portion of a tumbler is aligned therewith but enabling rotation of the tumbler carrier when all the reduced portions of the tumblers are aligned therewith, at least one of said tumblers having at least one additional reduced portion which cooperates with said preventing means to enable a slight rotation of the carrier when an additional reduced portion is aligned therewith, but which additional reduced portion is not reduced sufficiently to enable the carrier to be turned to unlocking position, said preventing means comprising a plurality of axially spaced sets of circumferentially spaced projections between which the unreduced portions of the tumblers fit and slide, the axial cross-section of a projection being small enough to enable it to enter between the enlarged portions of a tumbler.

3. A locking construction comprising a rotatable tumbler carrier, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced portion, and means for preventing rotation of the tumbler carrier when an unreduced portion of a tumbler is aligned therewith but enabling rotation of the tumbler carrier when all the reduced portions of the tumblers are aligned therewith, at least one of said tumblers having at least one additional reduced portion which cooperates with said preventing means to enable a slight rotation of the carrier when an additional reduced portion is aligned therewith but which additional reduced portion is not reduced sufficiently to enable the carrier to be turned to unlocking position, said preventing means comprising a plurality of axially spaced sets of circumferentially spaced projections between which the unreduced portions of the tumblers fit and slide, the axial distance between said sets being greater than the distance between the reduced portions of the tumblers, and the axial cross-section of a projection being small enough to enable it to enter between the enlarged portions of a tumbler.

4. A locking construction comprising a rotatable tumbler carrier, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced portion, and means for preventing rotation of the tumbler carrier when an unreduced portion of a tumbler is aligned therewith but enabling rotation of the tumbler carrier when all the reduced portions of the tumblers are aligned therewith, at least one of said tumblers having at least one additional reduced portion which cooperates with said preventing means to enable a slight rotation of the carrier when an additional reduced portion is aligned therewith but which additional reduced portion is not reduced sufficiently to enable the carrier to be turned to unlocking position, said preventing means comprising a pair of axially spaced notched flanged portions in the notches of which the unreduced portions of the tumblers fit and slide, the space between said flanged portions being greater than the distance between the reduced portions of the tumblers.

5. A locking construction comprising a rotatable tumbler carrier, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced portion, and means for preventing rotation of the tumbler carrier when an unreduced portion of a tumbler is aligned therewith but enabling rotation of the tumbler carrier when all the reduced portions of the tumblers are aligned therewith, at least one of said tumblers having at least one additional reduced portion which cooperates with said preventing means to enable a slight rotation of the carrier when an additional reduced portion is aligned therewith but which additional reduced portion is not reduced sufficiently to enable the carirer to be turned to unlocking position, said preventing means comprising a pair of axially spaced notched flanged portions in the notches of which the unreduced portions of the tumblers fit and slide, the thickness of said flanges being less than the distance between the enlarged portions of the tumblers.

6. A locking construction comprising a rotatable tumbler carrier, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced portion, and means for preventing rotation of the tumbler carrier when an unreduced portion of a tumbler is aligned therewith but enabling rotation of the tumbler carrier when all the reduced portions of the tumblers are aligned therewith, at least one of said tumblers having at least one additional reduced portion which cooperates with said preventing means to enable a slight rotation of the carrier when an additional reduced portion is aligned therewith but which additional reduced portion is not reduced sufficiently to enable the carrier to be turned to unlocking position, said preventing means comprising a pair of axially spaced notched flanged portions in the notches of which the unreduced portions of the tumblers fit and slide, the space between said flanged portions being greater than the distance between the reduced portions of the tumblers, and the thickness of said flanges being less than the distance between the enlarged portions of the tumblers.

7. A locking construction comprising a rotatable tumbler carrier, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced portion, means for preventing rotation of the tumbler carrier when an unreduced portion of a tumbler is aligned therewith but enabling rotation of the tumbler carrier when all the reduced portions of the tumblers are aligned therewith, and a casing for said carrier having an internal cylindrical surface and preventing means, said preventing means comprising a cylindrical sleeve fitting snugly in said cylindrical surface in said casing and provided with a notched flange portion cooperating with said tumblers.

8. A locking construction comprising a rotatable tumbler carrier, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced portion, means for preventing rotation of the tumbler carrier when an unreduced portion of a tumbler is aligned therewith but enabling rotation of the tumbler carrier when all the reduced portions of the tumblers are aligned therewith, and a casing for said carrier having an internal cylindrical surface and preventing means, said preventing means comprising a cylindrical sleeve fitting snugly in said cylindrical surface in said casing and provided with a notched flange portion cooperating with said tumblers, and said tumbler carrier comprising an inner barrel portion and an outer barrel portion, one of said barrel portions being rabbeted to provide an annular recess between said barrel portions to receive said flange.

9. A locking construction comprising a rotatable tumbler carrier, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced portion, and means for preventing rotation of the tumbler carrier when an unreduced portion of a tumbler is aligned therewith but enabling rotation of the tumbler carrier when all the reduced portions of the tumblers are aligned therewith, said tumbler carrier comprising an inner barrel portion and an outer barrel portion, one of said barrel portions being rabbeted to provide an annular recess between said barrel portions to receive said flange.

JOSEPH LOMBARDO.