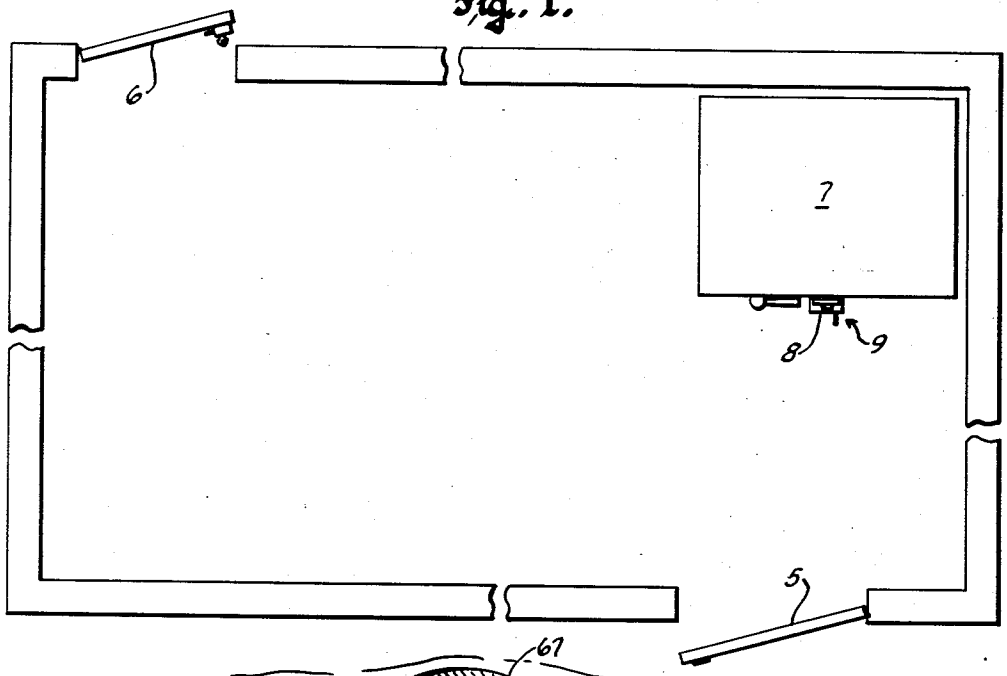
Nov. 28, 1961 E. F. TOEPFER 3,010,306

LOCK MECHANISM

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Fig. 1.



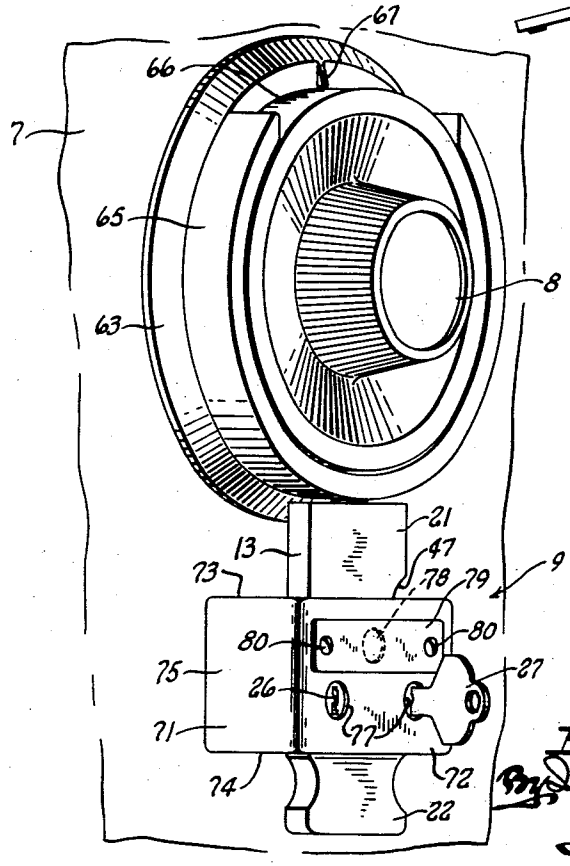


Fig. 2.

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Nov. 28, 1961 E. F. TOEPFER 3,010,306

LOCK MECHANISM

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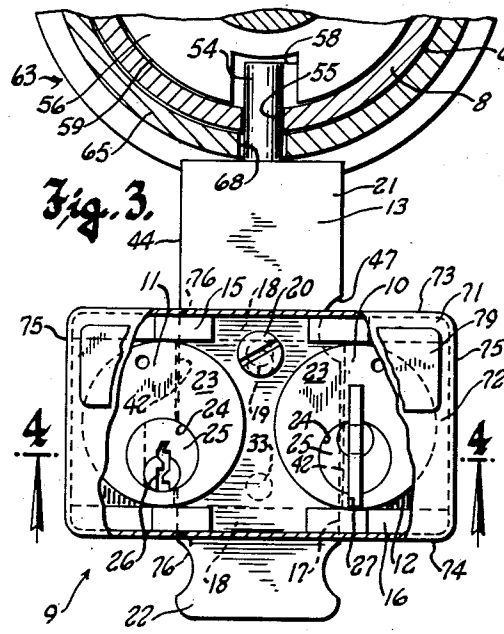


Fig. 3.

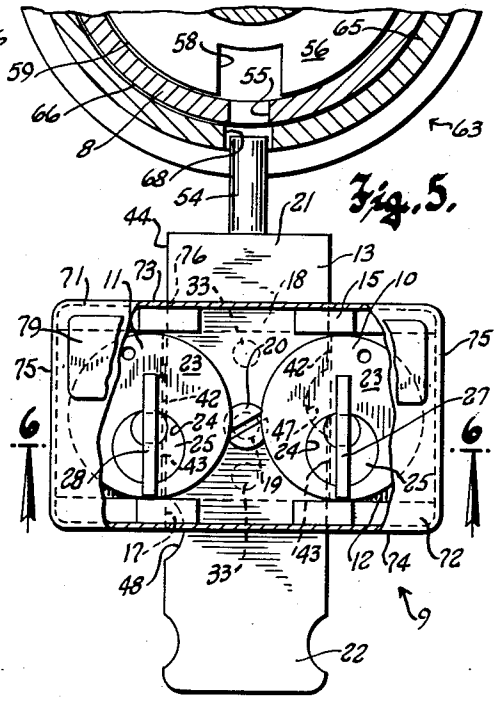


Fig. 5.

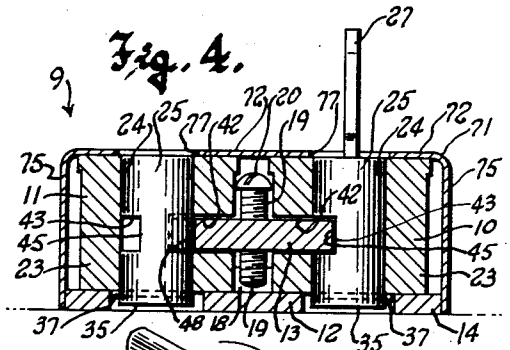


Fig. 4.

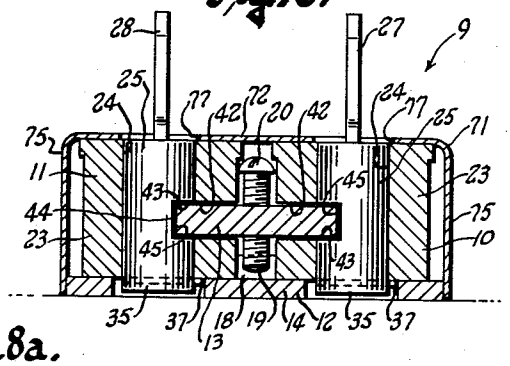


Fig. 6.

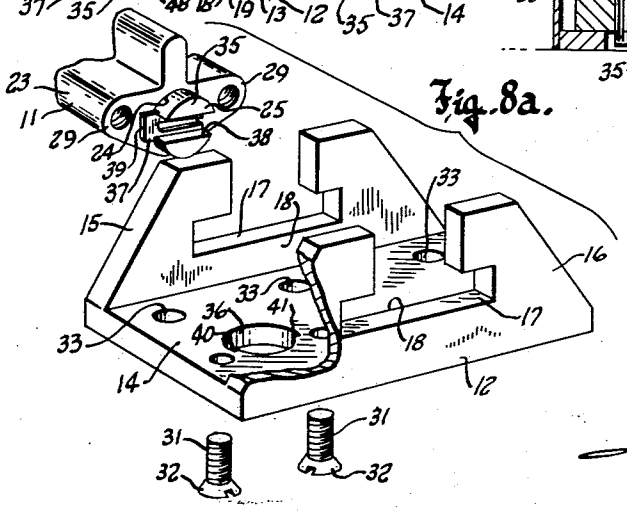


Fig. 8a.

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LOCK MECHANISM

Filed Oct. 28, 1959 4 Sheets-Sheet 3

Fig. 7.

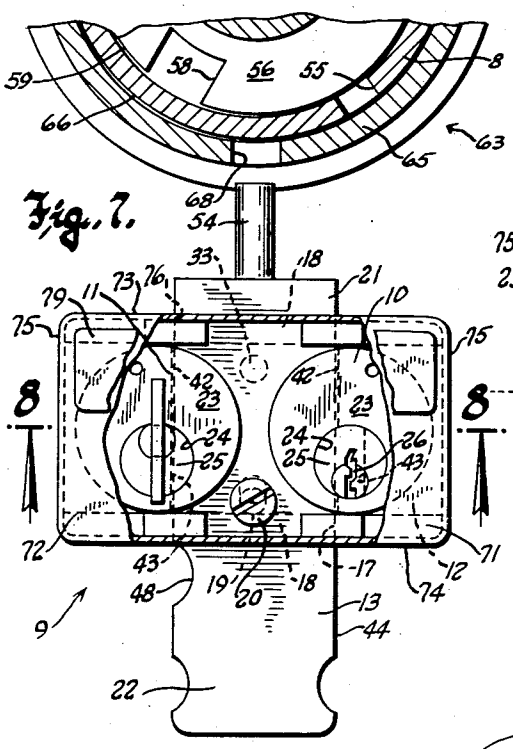


Fig. 8.

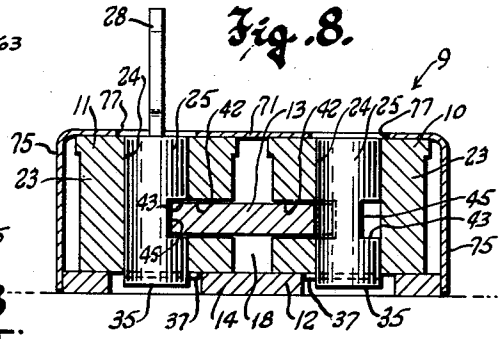
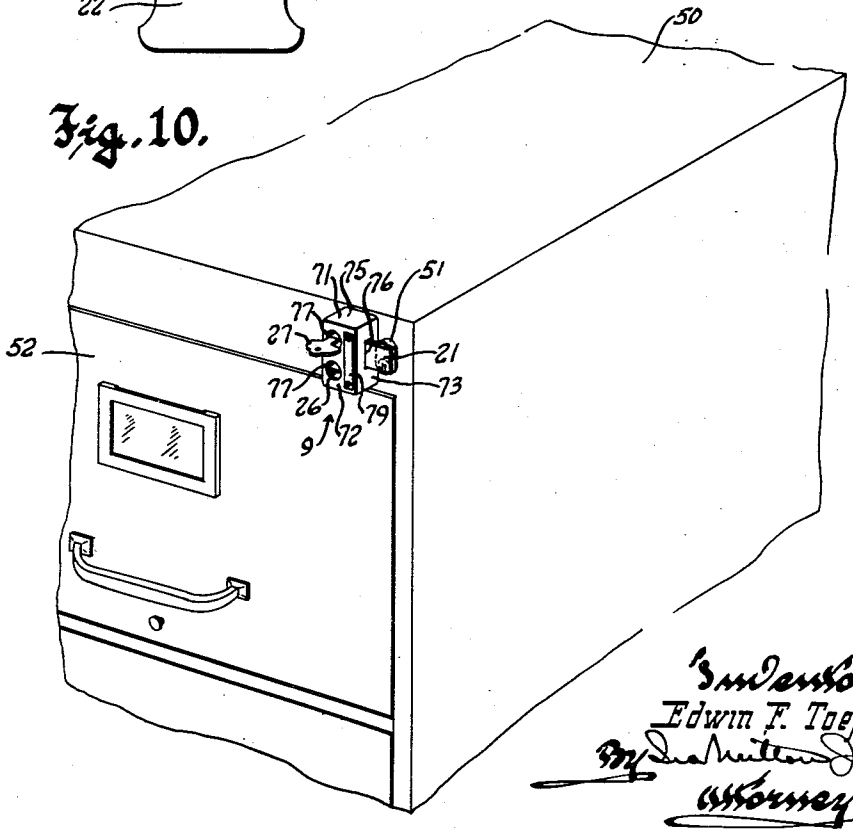


Fig. 10.



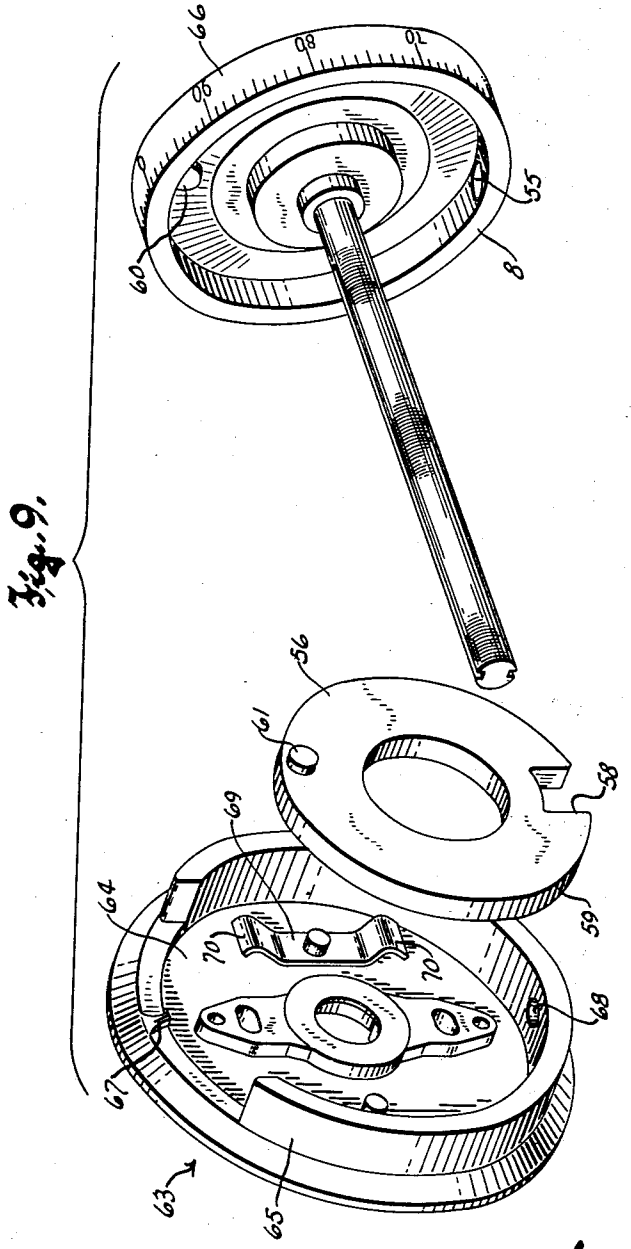
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LOCK MECHANISM

Filed Oct. 28, 1959 4 Sheets-Sheet 4

Fig. 9.



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United States Patent Office 3,010,306 Patented Nov. 28, 1961

3,010,306

LOCK MECHANISM

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Filed Oct. 28, 1959, Ser. No. 849,236
18 Claims. (Cl. 70—337)

This invention relates to sequential locking devices and refers more particularly to an interlock device adapted to cooperate with a pair of keys usable on locks apart from the device to require said locks to be locked and unlocked in a predetermined sequence, and which device may be associated with a third lock mechanism to require actuation of said third lock mechanism as one of the steps in the sequence determined by the device.

In a store, shop or office having two entrances, both of which are normally unlocked during the daytime, it is desirable that there be some means of providing positive assurance that both of the doors will be locked every night. One means of accomplishing this is to require that the doors be locked in a rigidly prescribed sequence. For example, where both a rear and a front door must be locked, and the employee charged with locking up customarily leaves by way of the front door, it is possible for him to forget to lock the rear door unless he is for some reason unable to lock the front door until the rear door has been attended to.

The present invention has as one of its general objects the provision of a device which mechanically compels adherence to an invariable sequence for the locking and unlocking of two locks by securely holding either of two keys until the other is brought to the device and used to effect release of the key being held by the device.

Thus in the case of a shop having front and rear doors locked by different keys, the device of this invention securely holds the front door key until the key for the rear door is brought to it and used to release the key to the front door, so that locking of the rear door cannot be forgotten. In the morning the operation is reversed, that is, the front door key is used to release the rear door key from the interlock device, thus assuring that the front door key will always be secured in the interlock device when the rear door is unlocked.

It is contemplated that the device of this invention will be used in a situation where the rear door is furnished with a lock of the type which admits and releases its key only when the rear door is locked, so that presentation of the rear door key to the device of this invention is ipso facto assurance that the door is locked. The front door is fitted with a lock having both locked and unlocked key receiving positions.

It will be apparent that it is another object of this invention to provide an interlock device which always affords secure safekeeping for one of two keys fitting different locks, and which thus permits a person charged with locking and unlocking a shop, office or plant having two doors to carry only one key by which locking of both doors is effectively controlled, despite the fact that the doors have locks fitted by two different keys.

It is another important object of this invention to provide an interlock device of the character described which is adapted to cooperate with two different keys that fit locks apart from the device and with a movable member by which a third lock mechanism may be actuated, and which device securely holds one of said keys until the other key is engaged in the device and said movable member is moved to a position in which its associated lock mechanism is locked.

Thus, for example, where a safe is situated in a location where it is accessible through either of two doors, each lockable with a different key, a device embodying the principles of this invention may be installed on the safe to require that the rear door key be inserted into

the device before the safe is locked and to require that the safe be locked before the key to the front door is released from the device.

It follows that it is another object of this invention to provide an interlock device adapted to be installed on a safe situated in a room or building having a front door that is locked by one key and a rear door that is locked by another key, which interlock device insures that both locking up and unlocking are performed in an invariable sequence that affords security for the safe as well as for both doors.

It is also an object of this invention to provide a sequential locking device which mechanically prescribes an invariable sequence of use for two different keys that fit locks apart from the device, and which interlock device is in itself capable of performing a locking function such as the securement of a door, drawer, safe dial or the like.

It is a further and more specific object of this invention to provide an interlock device comprising a lock bolt slidable in opposite directions to and from rotation preventing engagement with a dial of a safe or the like, and a pair of cylinder lock mechanisms cooperable with the lock bolt to hold it either in or out of engagement with the dial, and wherein the lock bolt cooperates with the cylinder lock mechanisms to prevent the keys for the two cylinder lock mechanisms from being simultaneously disengaged from the device, but instead requires that one of the keys always be engaged in the device to effect release of the other, the position of the lock bolt determining which of the two keys can be released when both are engaged in the device.

Another specific object of this invention is related to the necessity for establishing to the satisfaction of insurance companies that the looting of a safe was an actual burglary, upon which an insurance indemnity is payable, rather than an embezzlement. Some burglars are so skilled in the opening of safes by experimental manipulation of the dial that it is not necessary for them to drill or otherwise damage a safe in order to open it, and the victim of such a burglar often has great difficulty in proving to his insurer that the person who took valuables out of his safe did not have a legitimately acquired knowlege of the combination.

It is therefore another object of this invention to provide an interlock device of the character described which is cooperable with a lock mechanism actuating dial on a safe or the like to insure that the dial is rotated to a position in which its associated lock mechanism is locked before the last unlocked door giving access to the safe is secured, and which device is adapted to block rotation of the dial in such a manner that some degree of obvious destruction of the device must be accomplished by an unauthorized person before he can attempt to open the safe by manipulation of its dial.

It is also an object of this invention to provide an interlock device having a pair of cylinder lock mechanisms and a lock bolt shiftable back and forth to defined limits, at each of which it can be locked by one of the lock mechanisms, wherein the cylinder lock mechanisms are secured in place in the interlock device by securement means located beneath the lock bolt and so disposed that an authorized person, having the keys to both lock mechanisms, can readily remove the lock bolt and lock mechanisms, but an unauthorized person is compelled to destroy or very substantially damage the device in order to withdraw one of the keys from the device or to actuate a third lock mechanism with which the device is operatively associated.

Another specific object of this invention resides in the provision of means for locking the dial actuator for a combination lock mechanism in a position of rotation at which the mechanism is locked, and for requiring

rotation of the dial through at least one complete revolution before the dial is locked in said position, to thus provide assurance that the lock mechanism controlled by the dial is fully locked and cannot be reopened by mere rotation of the dial through a partial revolution to its unlocking position.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiments of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

FIGURE 1 is a diagrammatic plan view of a typical shop or office arrangement in which the device of this invention finds utility when the device is installed on a safe;

FIGURE 2 is a fragmentary perspective view of a safe having the device of this invention installed thereon in operative association with the actuating dial for the lock mechanism of the safe, shown in the position in which the safe is locked;

FIGURE 3 is a plan view on a larger scale of the sequential lock device of this invention, with portions of the cover broken away, the mechanism being shown in its night time condition when both doors and the safe are locked;

FIGURE 4 is a vertical sectional view taken on the plane of the line 4—4 in FIGURE 3;

FIGURE 5 is a view similar to FIGURE 3 but showing the device with both door keys engaged therein and with the lock bolt in a position intermediate its retracted and projected positions;

FIGURE 6 is a vertical sectional view taken on the plane of the line 6—6 in FIGURE 5;

FIGURE 7 is a view similar to FIGURE 3 but showing the device in its daytime condition when both doors and the safe are unlocked;

FIGURE 8 is a vertical sectional view taken on the plane of the line 8—8 in FIGURE 7;

FIGURE 8*a* is a fragmentary group perspective view of the base, per se, and one of the lock mechanisms showing how the latter is secured to the base;

FIGURE 9 is a separated perspective view of a dial actuator adapted for use with the device of this invention; and

FIGURE 10 is a fragmentary perspective view of a filing cabinet having the device of this invention installed thereon.

Referring now to the accompanying drawings, in which like reference numerals designate like parts throughout the several views, FIGURE 1 depicts a typical arrangement of a store, office or the like wherein the device of this invention finds utility, and wherein a front door **5** and a rear door **6** both give access to a safe **7** having a lock mechanism (not shown) actuatable by a dial **8**. The interlock or sequential locking device of this invention, designated generally by **9**, is secured to the safe adjacent to the dial, and cooperates with the dial as well as the keys to the front and rear doors to compel the accomplishment of a predetermined sequence of operations for both locking and unlocking of the doors and safe. In this arrangement the front and rear doors are furnished with cylinder locks (which may be substantially similar to those described hereinafter), each of which is fitted by a different key. The lock on the rear door **6** is of the type which allows the key to be inserted into and withdrawn from the lock mechanism only when the lock mechanism is locked, the key being retained in the lock so long as it is in its unlocked position. Thus assurance is had that when the rear door key is brought to the interlock device of this invention, the rear door is locked.

As brought out hereinafter, the rear door key must be used to release the key to the front door from the interlock device, and such release of the front door key cannot be effected until the dial **8** of the safe is rotated to a position in which the safe is locked. The person who is locking up then leaves by the front door, locking it from the outside. The front door lock mechanism is of the type having both locked and unlocked key receiving and withdrawing positions.

In the morning the locking up sequence is reversed, that is, the key that has been used to unlock the front door is engaged in the interlock device to first release the safe dial **8** for rotation and to then release the key to the rear door so that the rear door can be unlocked.

The interlock or sequential locking device **9** of this invention comprises, in general, a pair of cylinder lock mechanisms **10** and **11** mounted on a base **12** in spaced apart side-by-side relation, and an elongated substantially rectangular lock bolt **13**, common to the two cylinder lock mechanisms, mounted between them on the base for endwise back and forth sliding motion between a projected position in which a part on the lock bolt can engage a safe dial **8** to prevent rotation of the latter and a retracted position in which the lock bolt is clear of the dial.

The base **12** is an elongated channel shaped member having a substantially flat web portion **14** and a pair of flanges **15** and **16** projecting forwardly at right angles to the web portion and extending lengthwise along the upper and lower edges thereof. Each flange has a lengthwise extending slot **17** intermediate its ends, and the slots in the two flanges are laterally aligned and cooperate to carry the lock bolt **13** and guide it for endwise sliding motion transversely to the flanges. The slots **17** are spaced forwardly from the web portion of the base member, and the portions **18** of the flanges which lie between the slots and the base provide abutments cooperable with an abutment member **19** on the lock bolt to define the limits of sliding motion of the lock bolt. Preferably the abutment member **19** comprises the rearwardly projecting end portion of a screw **20** that extends through a threaded hole in the lock bolt and has its head accessible at the front of the lock bolt so that the screw can be readily removed to permit the lock bolt to be slid endwise out of the base.

The screw **20** is so located along the length of the lock bolt that its engagement with the upper flange **15** defines the projected position of the lock bolt, at which the upper end portion **21** of the lock bolt projects a substantial distance beyond said flange for cooperation with another lock mechanism, as described hereinafter. When the lock bolt is slid to its retracted position, at which the screw **20** engages the lower flange **16**, the upper end of the lock bolt is substantially even with the upper flange **15**. In either position of the lock bolt its lower end portion **22** projects a substantial distance beyond the lower flange **16** to provide a handle by which the lock bolt may be manually slid up and down.

The two cylinder lock mechanisms **10** and **11** are both of the conventional type comprising a housing **23** having a bore **24** therethrough and a cylinder **25** confined in the bore and rotatable by means of a proper key engageable in a key receiving slot **26** opening to the front of the cylinder.

The lock mechanisms **10** and **11** may be of either the plate tumbler or the pin tumbler type, but in either event they have only one rotational position of the cylinder at which a key may be inserted into and withdrawn from the key receiving slot, and when the cylinder is rotated

out of that position by means of a proper key, the key is securely held against withdrawal from the cylinder. The details of such lock mechanisms are sufficiently familiar to those skilled in the art to need neither description nor illustration here.

The lock mechanisms **10** and **11** are fitted by keys **27** and **28**, respectively, that fit locks apart from the device, and in the case of the system herein described for illustrative purposes, the lock mechanism **10** is fitted by a key **27** that fits the rear door **6** and the lock mechanism **11** is fitted by the key **28** for the front door **5**.

The housing **23** of each lock mechanism has at its rear a pair of mounting lugs **29** which project laterally in opposite directions from the body of the housing, and mounting screws **31** extending forwardly through holes in the web portion of the base are engaged in tapped holes in these lugs to secure each lock mechanism to the base, between the flanges. The two lock mechanisms are held with their cylinder axes in a plane parallel to the planes of the flange portions of the base, and with their adjacent sides spaced apart lengthwise of the base by a distance substantially less than the width of the lock bolt. The mounting screws **31** by which the lock mechanisms are fastened to the base have their heads **32** countersunk into the rear face of the base so that the base can flatwise overlie a wall of a safe or the like on which the device is installed. Obviously, so long as the base is thus secured to a flat surface, the screws **31** can not be removed, to detach the lock mechanisms from the base. The base has mounting screw holes **33** therethrough, to facilitate such installation, and it will be observed that certain of these holes are axially in line wtih the medial portion of the lock bolt so that mounting screws engaged in them are normally blocked by the lock bolt, necessitating removal of the latter from the base before such screws can be removed.

The cylinder of each lock mechanism projects rearwardly behind its housing a short distance, as at **35**, and is received in a larger diameter aperture **36** in the web portion of the base. A U-shaped spring clip **37**, having its legs engaged in an undercut slot **38** across the rear of the cylinder, has its bight portion **39** projecting laterally beyond the cylinder and engaged with the rear surface of the housing to prevent forward displacement of the cylinder out of the housing bore. The aperture **36** in the base is so shaped as to provide a pair of abutments **40** and **41**, one of which, designated **40**, is engageable by the bight portion of the clip to define the locked, key receiving position of rotation of the cylinder and the toher of which is engaged by the bight portion of the clip when the cylinder is rotated a half turn from its locked position, to define an unlocked key retaining position of the cylinder.

The housing of each lock mechanism has a slot **42** of substantial depth at one side thereof, opening toward the other lock mechanism and axially in line with the slots **17** in the flange portions of the base; and each cylinder has a laterally opening groove **43** which registers with the slot **42** in the housing when the cylinder is in its unlocked, key retaining position of rotation. The side edges of the lock bolt are straight along most of its length, as at **44**, and the slots **42** and grooves **43** in the lock mechanisms are sufficiently wide and deep to accommodate the marginal side edge portions of the lock bolt when the cylinders of both lock mechanisms are in their unlocked positions of rotation, so that the lock bolt is then freely slidable up and down across the base, being limited in its sliding motion only by the engagement of the abutment member **19** with the abutment portions **18** on the flanges.

Attention is directed to the fact that the bottoms **45** of the grooves **43** in the cylinders lie closely adjacent to the straight side edge portions **44** of the lock bolt, so that said edge portions of the lock bolt and the bottoms **45** of said grooves provide cooperating abutments which prevent rotation of the cylinders out of their unlocked, key retaining positions. However, the lock bolt has arcuate cutouts or recesses **47** and **48** in its opposite side edges, the centers of which are spaced apart lengthwise of the lock bolt by a distance equal to that through which the lock bolt moves between its retracted and projected positions. The recess **47**, which is at the side of the lock mechanism **10**, is adapted to be laterally aligned with the cylinder of said lock mechanism in the retracted position of the lock bolt, while the recess **48**, which is at the other side of the lock bolt and spaced below the recess **47**, aligns with the cylinder of lock mechanism **11** in the projected position of the lock bolt. Hence, when the lock bolt is at either its defined positions of sliding motion one of the arcuate recesses provides clearance for the ungrooved portion of the cylinder of its adjacent lock mechanism and permits said cylinder to be rotated to its locked, key withdrawing position, whereupon the curved surface of the cylinder and the curved surface of the recess in the lock bolt in which the cylinder is received provide cooperating abutments which lock and lock bolt against sliding motion to its other position.

To illustrate specifically the cooperation of the lock bolt with the cylinders of the lock mechanisms, let it be assumed that the key **28** for the front door is engaged in the sequential locking device, where it is held in the cylinder of the lock mechanism **11**, while the rear door **6** is unlocked and its key **27** is retained in the rear door lock. The cylinder of lock mechanism **11** is in its unlocked position of rotation, and it cannot be rotated out of that position because of the engagement of the abutments provided by the straight edge portion **44** on the lock bolt and the bottom **45** of the groove in said cylinder. But the cylinder of the other lock mechanism **10** is in its locked, key receiving position, engaged in the recess **47** in the lock bolt and thus holding the lock bolt in its retracted position.

When the rear door is locked, its key is inserted into the cylinder of the lock mechanism **10** and said cylinder is rotated to its unlocked position at which the rear door key is held in the cylinder and the groove **43** is in line with the lock bolt so that the lock bolt is free to be manually moved to its projected position. When the lock bolt is in its projected position, the recess **48** aligns with the cylinder of the lock mechanism **11**, permitting said cylinder to be rotated to its locked position in which it prevents movement of the lock bolt but releases the front door key **28**. With the bolt in its projected position the cylinder of lock mechanism **10** is held against rotation to its key withdrawing position by the engagement of abutments **44** and **45**.

The sequence of operations just described is followed in locking up at night and is, of course, reversed in the morning, when the front door key **28** is inserted into the cylinder of lock mechanism **11** and said cylinder is rotated to its unlocked key retaining position, the lock bolt is slid to its retracted position, and the cylinder of lock mechanism **10** is rotated to its key releasing position at which it locks the lock bolt against sliding movement.

In addition to compelling use of the front and rear door keys in a predetermined sequence of operations, as just described, the interlock device of this invention is adapted to cooperate with a third lock mechanism to insure locking and unlocking thereof as an intermediate step in the sequence. For example, as illustrated in FIGURE 10, the device may be mounted on a filing cabinet **50** furnished with a well known type of lock mechanism having an axially movable cylinder lock **51** which projects forwardly from a wall of the cabinet when unlocked and which is movable inwardly to a locked position in which the drawers **52** are held shut. The interlock device **9** is mounted on the cabinet to have the end portion **21** of its lock bolt lie across the axis of the filing cabinet lock **51** when the lock bolt is in its projected position, so that when the filing cabinet is un-

locked its forwardly projecting lock **51** blocks movement of the lock bolt to its projected position, but access to the filing cabinet lock is blocked by the lock bolt when the latter is in its projected position.

Another example of the use of the sequential lock device of this invention with a third lock mechanism is illustrated in FIGURE 2, wherein the lock bolt **13** cooperates with a dial actuator **8** for a combination lock mechanism on a safe **7** or the like. In this case the lock bolt and the dial have cooperating abutments **54** and **55** which are engaged to prevent rotation of the dial when the dial is out of its unlocked position and the lock bolt is in its projected position. The abutment **54** on the lock bolt may comprise an endwise projecting pin secured on the end portion **21** of the lock bolt, while the cooperating abutment means **55** on the dial may comprise the edges of an aperture or slot in the side of the dial, in which the pin is receivable. When the dial is in its position at which the safe is unlocked, its circumferential surface **66** blocks movement of the lock bolt to its projected position.

On many combination locks it is possible to partially lock the mechanism by rotating the dial through a fraction of a turn from its unlocking position, and the mechanism can then be unlocked again by merely rotating the dial directly back to its unlocking position. To fully lock the mechanism (i.e., "scatter" the tumblers) so that the dial must be manipulated through the entire combination in order to effect unlocking, the dial must be rotated through at least one full turn.

To insure that the dial is rotated through a full turn before the lock bolt is engaged therewith, a disc member **56** is coaxially mounted beneath the dial for free rotation relative to the dial. The disc member has a notch or aperture **58** opening to its circumferential surface **59**, adapted to register with the aperture **55** in the dial in one position of rotation of the disc member relative to the dial, and the pin **54** on the lock bolt projects into the aperture **58** in the disc member, through the aperture **55** in the dial, when the lock bolt is in its projected position. If the pin **54** enters the aperture **55** in the dial when the disc member occupies a rotational position relative to the dial at which said apertures are not in register, the pin encounters the circumferential surface **59** of the disc member and the lock bolt is thereby prevented from moving all the way to its projected position.

The dial and the disc member have a lost motion connection whereby the disc member is carried around with its aperture **58** out of register with the aperture **55** in the dial when the dial is rotated in one direction, but is rotated with its aperture in register with that in the dial when the dial is turned in the opposite direction. The lost motion connection may comprise an inwardly projecting screw or pin **60** on the inner face of the dial, spaced from the dial axis, and an outwardly projecting screw or pin **61** on the outer face of the disc, radially spaced the same distance from the dial axis. On a modern combination lock the dial can be rotated away from its unlocking position in only one direction, i.e., the direction opposite to that in which it is turned when approaching the unlocking position. Hence, the abutments comprising the screws **60** and **61** are so located circumferentially that when they engage upon rotation of the dial away from its unlocking position they dispose the disc member in a rotational position relative to the dial at which aperture **58** is out of register with the aperture **55** in the dial, and the screws hold the disc member in that position relative to the dial during further rotation of the dial in that direction. When the dial has been turned through a full revolution away from its unlocking position, it can be rotated in the opposite direction, and upon engagement of the opposite sides of the abutment screws **60** and **61** the apertures **55** and **58** in the dial and disc member are in register, and thereafter the disc member is constrained to turn in unison with the dial as the dial is further rotated in the same direction to bring its aperture into alignment with the pin **54** on the lock bolt.

The dial may be provided with a fixed guard member **63** having a rear wall **64** that underlies the dial and projects radially beyond it, and having a forwardly projecting curved flange **65** that surrounds most of the numbered peripheral surface **66** of the dial, leaving said surface exposed only near the top of the guard member, where an index marker **67** on the guard member cooperates with the numbers on the dial to define its rotational position. The flange **65** of the guard member has an aperture **68** at its bottom through which the pin **54** on the lock bolt can enter the aperture **55** in the dial.

To retard the disc member against free rotation with the dial and thus insure proper engagement of the screws **60** and **61** comprising the lost motion connection, a substantially U-shaped braking member **69** of spring material may be secured to the flat face of the guard member, with its legs **70** projecting forwardly to engage the rear face of the disc member under yielding bias and thus produce a slight drag on the disc member. If a guard member is not used, the braking member can, of course, be secured directly to the wall or door of the safe, behind the disc member.

Cooperating with the web portion **14** of the base to substantially enclose the mechanism of the interlock device is a cover **71**, preferably formed as a unitary stamping having a front wall **72** that overlies the fronts of the housings **23** of the lock mechanisms, top and bottom walls **73** and **74** which overlie the flanges **15** and **16** of the base, and end walls **75**. The top and bottom walls of the cover have slots **76** that register with the slots **17** in the flange portions of the base to clear the projecting end portions of the lock bolt, and the front wall of the cover has circular apertures **77** through which the keys can be admitted to the cylinders. Another hole **78** in the front of the housing affords access to the abutment screw **20** on the lock bolt, since the lock bolt can neither be inserted into nor removed from the cover through the slots **76** when the screw is engaged therein. The screw access hole **78** in the cover is normally covered by a name plate **79**, which is secured in place by means of a pair of screws **80** that extend through the front wall of the cover and into threaded holes in the lock mechanism housings therebehind, to thus also fasten the cover to the lock mechanisms.

Because the lock bolt projects through the slots **76** in the cover **71**, the cover cannot be removed without first removing the lock bolt from the device, and this, as has been pointed out hereinabove, requires the key propelled rotation of both lock mechanism cylinders to their unlocked key retaining positions. Hence an unauthorized person, not having both keys, is virtually compelled to destroy some part of the interlock device in order to free it from the safe dial to permit rotation of the latter, and such a person would most probably begin his destructive operation on the cover, where the evidence of his efforts will be most apparent.

From the foregoing description taken together with the accompanying drawings it will be apparent to those skilled in the art that this invention provides a simple, inexpensive and dependable interlock device which mechanically prescribes a sequence of locking and unlocking operations that insures that both of a pair of doors will be locked every night, and which also cooperates with a third lock mechanism to insure that such third lock mechanism will be attended to at one stage of the locking and unlocking sequences.

What is claimed as my invention is:

1. An interlock device adapted to securely hold either one of a pair of keys that fit locks apart from the device and from which device each key is releasable only upon engagement of the other key in the device so that the device compels sequential use of the keys on the locks which they fit, said device comprising: a pair of cylinder

locks of the type comprising a rotatable cylinder having a key slot into which a proper key may be inserted, and from which the key may be withdrawn, in one rotational position of the cylinder, and in which the key is held against withdrawal when the cylinder is rotated out of said position, the cylinder of each of said cylinder locks being adapted to receive a key that fits a lock apart from the device; a base supporting said cylinder locks in fixed spaced apart relationship; a bolt carried by said base for movement in opposite directions along a defined path adjacent to the lock cylinders to either of a pair of defined limits; cooperating abutment means on the cylinder of one of the cylinder locks and on the bolt, engageable when the bolt is at one of its defined limits of motion to preclude rotation of said cylinder to its said rotational position to thus prevent withdrawal of a key engaged in the cylinder, the abutment means on the bolt being disengaged from said cylinder in consequence of movement of the bolt to its other defined limit; cooperating abutment means on the bolt and on the cylinder of the other cylinder lock engaged when the bolt is at its other limit of motion to preclude rotation of the cylinder of said other lock to its said rotational position; and second cooperating abutment means on the cylinder of each cylinder lock and on the bolt, engageable upon rotation of each cylinder to its said rotational position to preclude movement of the bolt along its defined path, so that when the bolt is at either of its defined limits of motion it is locked at that limit of motion by rotation of one cylinder to its said rotational position at which its key can be inserted and withdrawn and the bolt holds the other cylinder against rotation to its said rotational position to prevent withdrawal of the key therefrom.

2. In an interlock device of the type comprising an elongated lock bolt slidable endwise back and forth between a pair of defined limits and a pair of cylinder lock mechanisms cooperable with the lock bolt and each having a cylinder rotatable to a first position at which a key can be inserted into and withdrawn from the cylinder and the cylinder holds the lock bolt at one of its defined limits, and to a second position at which the bolt is released for sliding movement to its other defined limit and the key is held in the cylinder: an elongated channel shaped base having spaced apart flanges extending forwardly from a web portion and each of which has a slot intermediate its ends, the lock bolt having its medial portion slidably confined in said slots in the flanges for motion transverse to the flanges and parallel to the web portion, and the cylinder lock mechanisms being secured to the web portion of the base, between the flanges, with one of the cylinder lock mechanisms on each side of the lock bolt and with the lock mechanisms projecting forwardly between the flanges with their axes substantially parallel and normal to the web portion.

3. The interlock device of claim 2, further characterized by a cover member secured to the base and having front, side and end walls cooperating with the web portion of the base to provide an enclosure for the cylinder lock mechanisms, opposite side walls of the cover member being slotted to permit end portions of the lock bolt to project therethrough and the front wall of the cover member being apertured to permit access to the cylinders of the lock mechanisms.

4. In combination with a lock mechanism having a member which must be moved out of a predetermined position to effect locking of the lock mechanism: a lock bolt; means mounting the lock bolt for motion in opposite directions between a projected position and a retracted position, said means disposing the lock bolt adjacent to said member; cooperating abutment means on said member and on the lock bolt whereby motion of the lock bolt out of its retracted position is blocked by the member when the member is in its said predetermined position and movement of the member to its said predetermined position is precluded by the lock bolt when the latter is in its projected position; a cylinder lock mechanism mounted adjacent to the lock bolt, of the type comprising a cylinder rotatable to and from a position in which a key may be inserted into and withdrawn from the cylinder, and in which the key is held against withdrawal when the cylinder is out of its said rotational position; and cooperating abutment means on the cylinder and on the lock bolt, engageable when the cylinder is in its said rotational position to hold the lock bolt in its projected position, said abutment means being disengageable when the cylinder is rotated out of its said position to permit movement of the lock bolt to its retracted position.

5. The combination defined by claim 4, further characterized by: other cooperating abutment means on the lock bolt and the cylinder, engageable when the lock bolt is in its retracted position for precluding rotation of the cylinder to its said position.

6. An interlock device adapted to securely hold either one of a pair of keys that fit locks apart from the device and from which device each key is releasable only in consequence of engagement of the other key in the device so that the device compels sequential use of the keys on the locks which they fit, said device comprising: a pair of lock mechanisms of the type comprising a housing and a cylinder rotatable in the housing between one position in which a key may be inserted into and withdrawn from the front of the cylinder and a second rotational position in which the key is held in the cylinder against withdrawal, each of said lock mechanisms having a slot through its housing, at one side thereof, and a groove in its cylinder which registers with said slot in the housing when the cylinder is in its said second rotational position; a base; means mounting the lock mechanisms on the base with their cylinder axes parallel and spaced apart and with the slots in their housings opposite and opening toward one another; a lock bolt mounted on the base, between the lock mechanisms, for sliding motion in opposite directions between a retracted position and a projected position and having opposite straight marginal edge portions engageable in said slots in the lock mechanism housings and the grooves in the cylinders when the cylinders are in their said second positions of rotation and by which rotation of the cylinders out of said second position is prevented, said lock bolt having a notch in one of its side edge portions which registers with the cylinder of one of the lock mechanisms when the lock bolt is in its retracted position and permits said cylinder to be rotated to its first position of rotation, and said lock bolt having a notch in its other side edge portion which registers with the cylinder of the other lock mechanism when the lock bolt is in its projected position and permits the cylinder of said other lock mechanism to be rotated to its first position of rotation, each of the cylinders, when in its said first position of rotation, cooperating with its adjacent notched side edge portion of the lock bolt to block sliding movement of the lock bolt.

7. The interlock device of claim 6, further characterized by the fact that said base is a channel shaped member having forwardly projecting flange portions and slots in its flange portions in which the lock bolt is slidable in directions normal to the flanges and parallel to the web portion of the base; further characterized by abutment means on the lock bolt engageable with the inner faces of the flange portions of the base to define the retracted and projected positions of the lock bolt; and further characterized by the fact that said lock mechanisms are mounted on the base between the flange portions thereof and with their cylinder axes normal to the web portion of the base.

8. The interlock device of claim 7, further characterized by the fact that said abutment means on the lock bolt comprises a screw threaded through the lock bolt and engageable with the flange portions of the base, said screw being accessible at the front side of the lock bolt so

that the lock bolt is readily removable from the base upon removal of said screw and rotation of the cylinders of both lock mechanisms to their said second positions of rotation.

9. The interlock device of claim 6, further characterized by: a lock mechanism of the type having a member which must be moved out of a predetermined position to effect locking thereof, said lock mechanism being mounted with its said member adjacent to the lock bolt; cooperating abutments on said member and on the lock bolt, engageable when said member is in its said predetermined position to preclude movement of the lock bolt out of its retracted position; and other cooperating abutments on said member and on the lock bolt, engageable when the lock bolt is in its projected position to preclude movement of said member to its said predetermined position.

10. A lock device comprising: a base; a pair of cylinder lock mechanisms mounted on the base, each having a lock cylinder rotatable to one position in which a key may be inserted into and withdrawn from the cylinder, and to another position in which withdrawal of the key from the cylinder is precluded; a lock bolt common to both lock mechanisms; means supporting the lock bolt on the base for back and forth motion along a predetermined path between projected and retracted positions; cooperating means on the lock bolt and on the cylinder of one of the lock mechanisms, interengageable when the lock bolt is in its projected position and the said cylinder is in its said one rotational position for locking the bolt against movement out of its projected position, said means being disengageable upon rotation of the cylinder by its key to said other position of rotation to free the lock bolt for movement to its retracted position; cooperating means on the lock bolt and on the cylinder of the other lock mechanism, interengageable when the lock bolt is in its retracted position and the cylinder of said other lock mechanism is in its said one rotational position for locking the lock bolt against movement out of its retracted position, said means being disengageable upon rotation of the cylinder by its key to its said other position to free the bolt for movement to its projected position; and other cooperating means on the lock bolt and on the cylinders of each of the lock mechanisms engageable to prevent rotation of each lock cylinder to its said one position of rotation whenever the other lock cylinder is locking the lock bolt against motion.

11. The interlock device of claim 9, further characterized by the fact that each of said lock mechanisms has laterally projecting lugs on its housing which overlie the front face of the web portion of the base; further characterized by the fact that the lock mechanisms are secured to the base by means of screws extending forwardly through the web portion of the base with their heads accessible at the rear thereof; and further characterized by the fact that the web portion of the base is provided with holes for mounting screws which are located directly behind the lock bolt so that access to mounting screws engaged in said holes is normally obstructed by the lock bolt.

12. In a device of the type comprising a dial by which a combination lock mechanism is actuatable and which is rotatable to and from a predetermined position at which the lock mechanism is unlocked: a lock bolt movable to and from a projected position in which a part of the lock bolt projects into an aperture in the dial to prevent rotation of the latter; key actuated means for releasably locking the lock bolt in its said position; a circular member mounted coaxially with the dial for rotation relative to the dial and having a circumferential surface adapted to be engaged by said part on the lock bolt to block movement of the latter to its projected position, said circular member having an aperture opening to its said surface which is adapted to register with the aperture in the dial in one rotational position of the circular member relative to the dial and to permit movement of the lock bolt to its projected position; and cooperating eccentric abutment means on the dial and on the circular member providing lost motion connections between the dial and the circular member, said abutment means being engageable upon rotation of the dial in one direction to constrain the circular member to rotate in said direction in unison with the dial and to hold the circular member in a rotational position relative to the dial at which the aperture in the circular member is out of register with the aperture in the dial, and said abutment means being engageable upon rotation of the dial in the other direction to constrain the circular member to rotate in said other direction in unison with the dial and to hold the circular member in a rotational position relative to the dial at which the apertures in the dial and circular member are in register so that the dial must be rotated through a full turn in said one direction from its unlocked position before the lock bolt can be moved to its projected position.

13. In combination with a safe or the like having a lock mechanism which is actuatable by means of a dial that must be rotated through a full turn in one direction from its unlocked position in order to effect secure locking of the lock mechanism, means for insuring locking of the safe and preventing rotation of the dial when the safe is locked, said means comprising: a lock bolt mounted on the safe adjacent to the dial for motion along a defined path between a projected and a retracted position, the dial having an aperture spaced from its axis through which a part on the lock bolt projects when the lock bolt is in its projected position and the dial is in a predetermined rotational position other than that at which the lock mechanism is unlocked; a circular member mounted coaxially with the dial for free rotation relative to the dial, said circular member having a surface which lies along the path of said part on the lock bolt and obstructs full movement of the lock bolt to its projected position through the aperture in the dial except in one rotational position of the circular member relative to the dial, and said circular member having an aperture which registers with said aperture in the dial in said one rotational position of the circular member relative to the dial; cooperating eccentrically disposed abutment means on the circular member and on the dial providing lost motion connections between the circular member and the dial, one of which is operative upon rotation of the dial in one direction, away from its unlocked position, to constrain the circular member to rotate in unison with the dial with the aperture in the circular member out of register with the aperture in the dial, and the other of which is operative upon rotation of the dial in the other direction to constrain the circular member to rotate in unison with the dial with the aperture in the circular member in register with the aperture in the dial, so that the circular member compels rotation of the dial through at least a full turn from its said predetermined position before the lock bolt can be moved all the way to its projected position; a cylinder lock mechanism mounted on the safe adjacent to the lock bolt and having a cylinder rotatable to and from a position in which a key may be inserted into or withdrawn from the cylinder; and cooperating means on the lock bolt and on the cylinder of the cylinder lock mechanism providing a connection between them whereby rotation of the cylinder to its said position locks the lock bolt in its projected position.

14. An interlock device adapted to compel sequential use of a pair of keys that fit locks apart from the device by always securely holding one or the other of the keys and releasing the held key only upon engagement of the other key in the device, said device comprising: a channel shaped base having an upright web portion and flange portions extending along the top and bottom edges of the web portion and projecting forwardly therefrom, each of said flange portions having a slot therein intermediate its ends; an elongated lock bolt slidably received in the slots in said flange portions of the base for endwise move-

ment transversely to the flange portions between a retracted position and a projected position in which an end portion of the lock bolt projects a substantial distance beyond one of the flange portions, said lock bolt having opposite straight side edge portions, each of which terminates at a laterally outwardly opening notch, the notches in the two sides of the lock bolt being lengthwise spaced apart; a pair of cylinder lock mechanisms, each of the type comprising a housing having a bore and a cylinder in the bore rotatable between a first position in which one of said keys can be inserted into and withdrawn from the cylinder and a second position in which the key is held against withdrawal from the cylinder, and each of said lock mechanisms having a lateral slot in its housing opening from the bore to one side of the housing and a laterally opening groove in its cylinder which registers with the slot in the housing when the cylinder is in its said second position of rotation; means securing the lock mechanisms to the front face of the web portion of the base at opposite sides of the lock bolt with the axes of the lock mechanisms disposed in a plane substantially parallel to and intermediate the flange portions and with the slots in the lock mechanism housings opening toward one another so that the marginal straight edge portions of the lock bolt can be engaged in the grooves in the cylinders to preclude rotation of each cylinder out of its second position of rotation, the cylinder of one lock mechanism being rotatable to its first position into one of said notches in the lock bolt when the lock bolt is in its retracted position to hold the lock bolt against sliding out of its retracted position, and the cylinder of the other lock mechanism being rotatable to its first position into the other notch in the lock bolt when the lock bolt is in its projected position to hold the lock bolt against sliding out of its projected position.

15. The interlock device of claim 14, further characterized by a screw extending through the lock bolt and engageable with one flange portion of the base to define the retracted position of the lock bolt and with the other flange portion of the base to define the projected position of the lock bolt.

16. The interlock device of claim 14, wherein said means for securing the lock mechanism to the web portion of the base comprises: laterally projecting lugs on the rear of the housing of each lock mechanism; and screws extending through the web portion of the base from the rear thereof and engaged in said lugs.

17. In a sequential lock device of the character described: a base; a pair of lock mechanisms of the type comprising a housing and a cylinder in the housing rotatable to and from a locked position by means of a key insertable into a forwardly opening key slot in the cylinder, each of said lock mechanisms having a laterally opening slot in its housing, and said lock mechanisms being secured to the base with the slots in their housings laterally opposite and opening toward one another; an elongated lock bolt having opposite marginal side edge portions guidingly engaged in the slots in the lock mechanism housings for endwise sliding motion of the lock bolt between defined projected and retracted positions, at each of which one of the cylinders is cooperable with the lock bolt, when the cylinder is rotated to its locked position, to lock the bolt against sliding motion; abutment means on the lock bolt cooperable with parts fixed on the base to define the projected and retracted positions of sliding motion of the lock bolt; a cover cooperable with the base to provide an enclosure for the lock mechanisms, opposite walls of which enclosure are provided with apertures through which the lock bolt projects outside the enclosure, so that the engagement of the lock bolt in said slots in the lock mechanism housings and said apertures in the enclosure walls prevents separation of the cover from the base, said cover also having other apertures through which the key slots in the lock mechanism cylinders are accessible and an aperture through which access may be had to said abutment means on the lock bolt in one position of sliding motion of the lock bolt to provide for disablement of the abutment means.

18. In a sequential lock mechanism of the character described: a base; a lock bolt; means fixed on the base constraining the lock bolt to sliding motion relative to the base in opposite directions and from which the lock bolt can be disengaged by motion in one of said directions beyond a predetermined limit; a pair of lock mechanisms mounted on the base in fixed relation to one another; cooperating means on one of the lock mechanisms and on the lock bolt for releasably locking the lock bolt in one position of sliding motion; cooperating means on the other of the lock mechanisms and on the lock bolt for releasably locking the lock bolt in another position of sliding motion; a cover cooperable with the base to define an enclosure for the lock mechanisms and for a portion of the lock bolt; and means on the cover engaging under the lock bolt to prevent the cover from being removed from the base except by moving the lock bolt beyond said predetermined limit upon unlocking of both lock mechanisms.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,010,306 November 28, 1961

Edwin F. Toepfer

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 32, for "wtih" read -- with --; column 5, line 50, for "tōher" read -- other --; column 6, line 7, after "lock" insert -- bolt adjacent to the lock --; line 21, for "and" read -- the --.

Signed and sealed this 17th day of April 1962.

(SEAL)
Attest:

ESTON G. JOHNSON
Attesting Officer

DAVID L. LADD
Commissioner of Pat ts