June 14, 1966 T. HERMANN 3,255,618

DOOR LOCK

Filed April 22, 1964 4 Sheets-Sheet 1

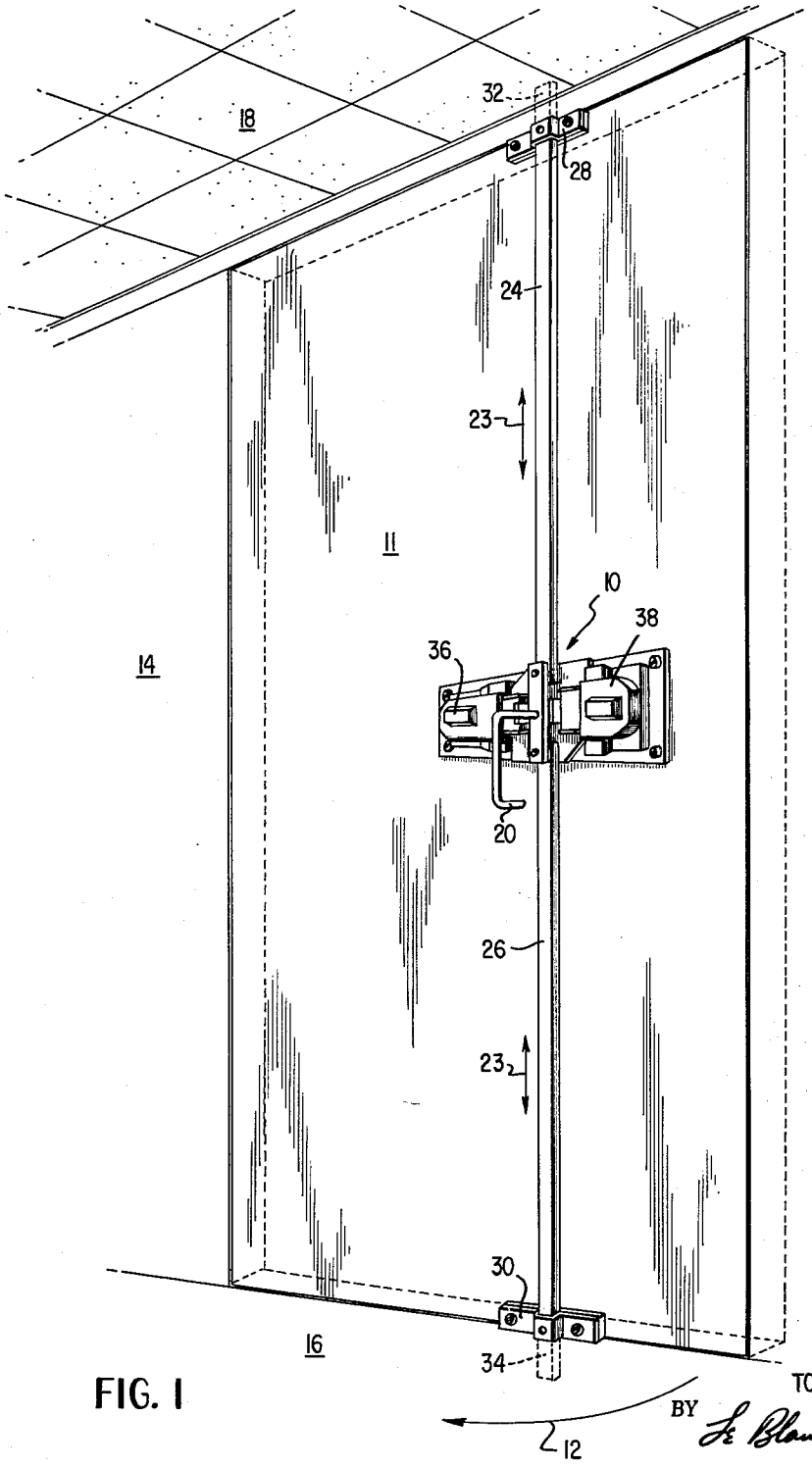


FIG. 1

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DOOR LOCK

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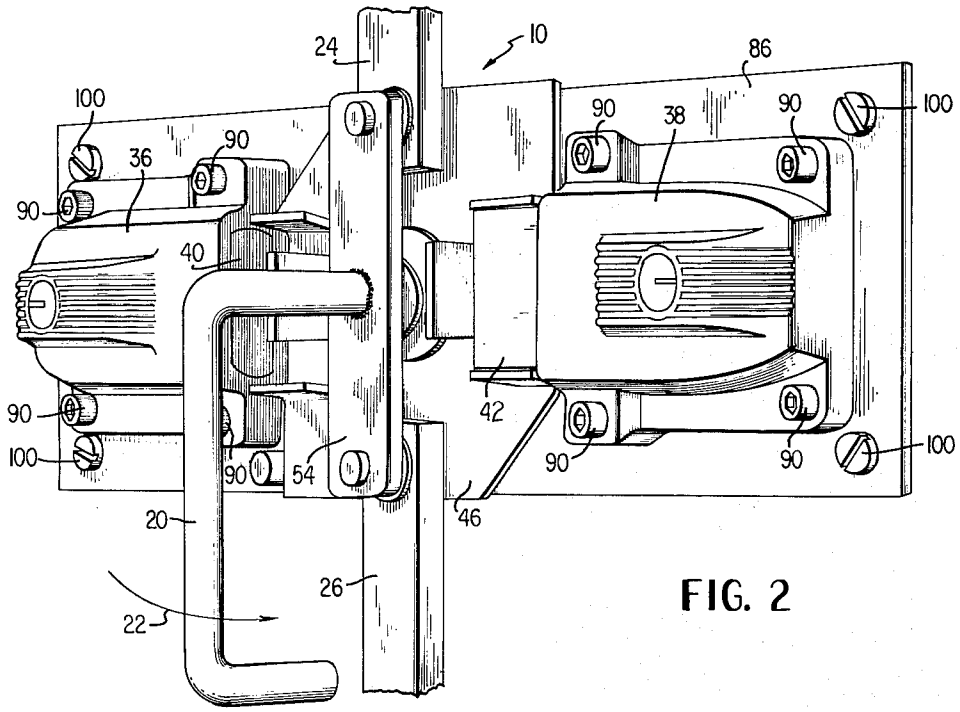


FIG. 2

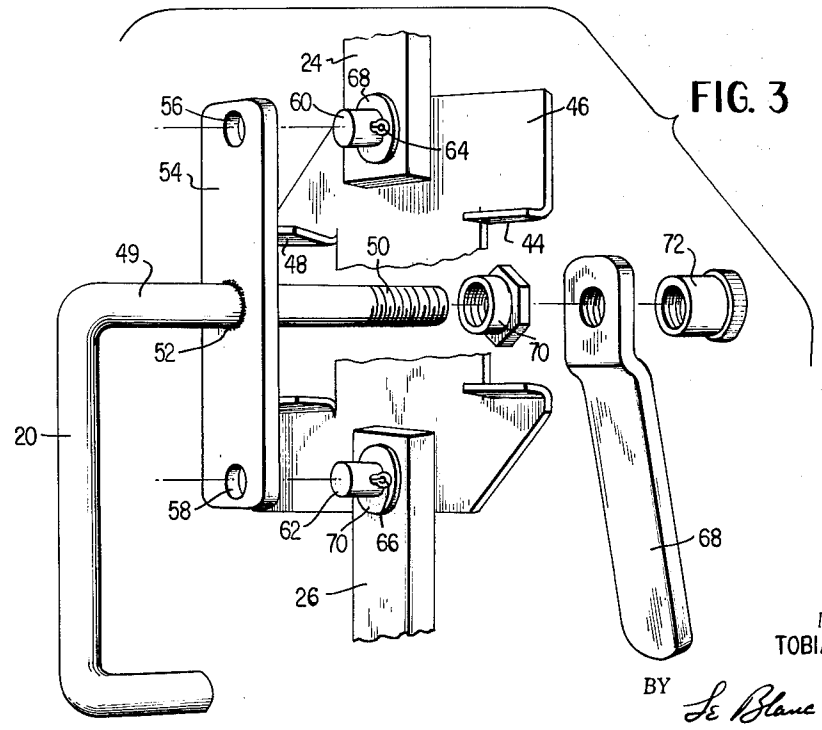


FIG. 3

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DOOR LOCK

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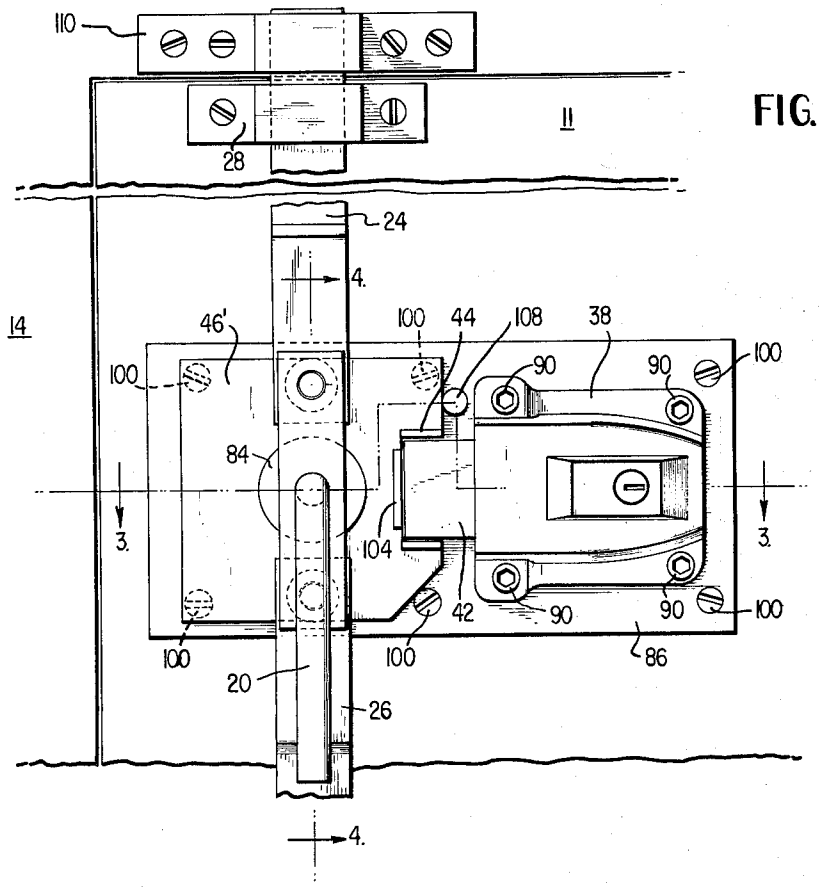


FIG. 4

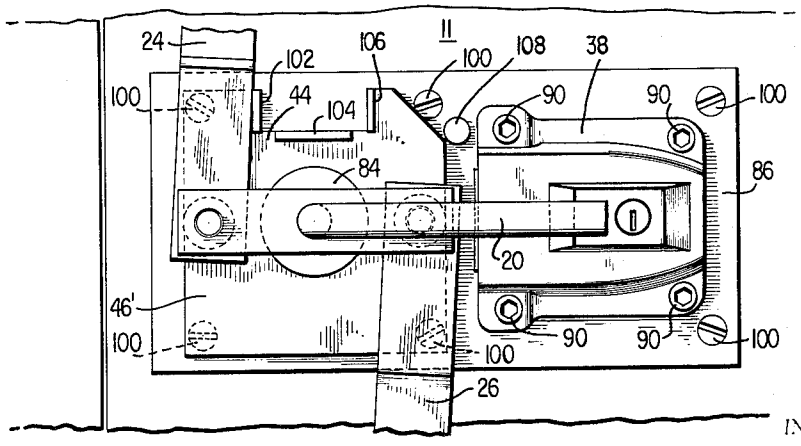


FIG. 5

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DOOR LOCK

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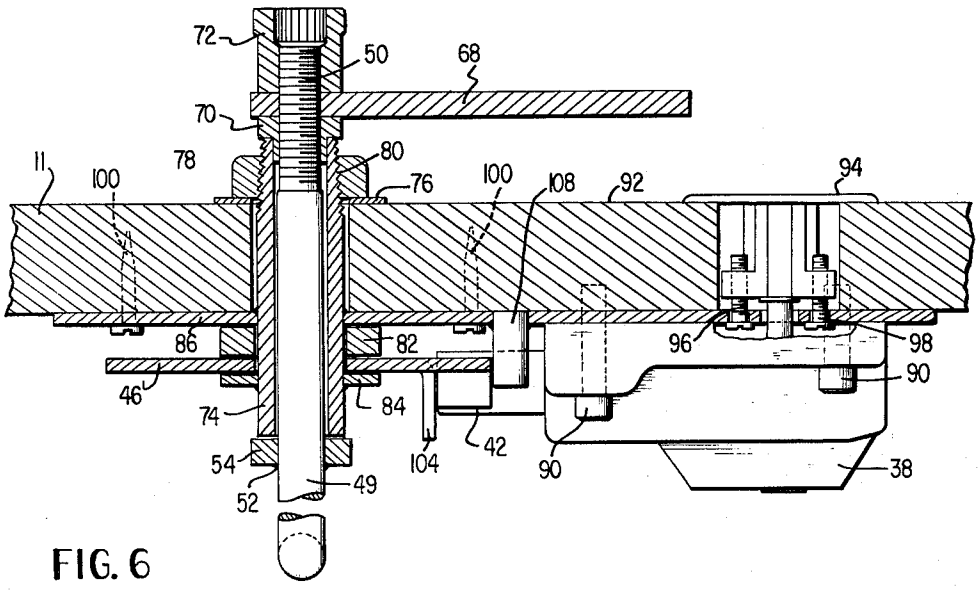


FIG. 6

FIG. 7

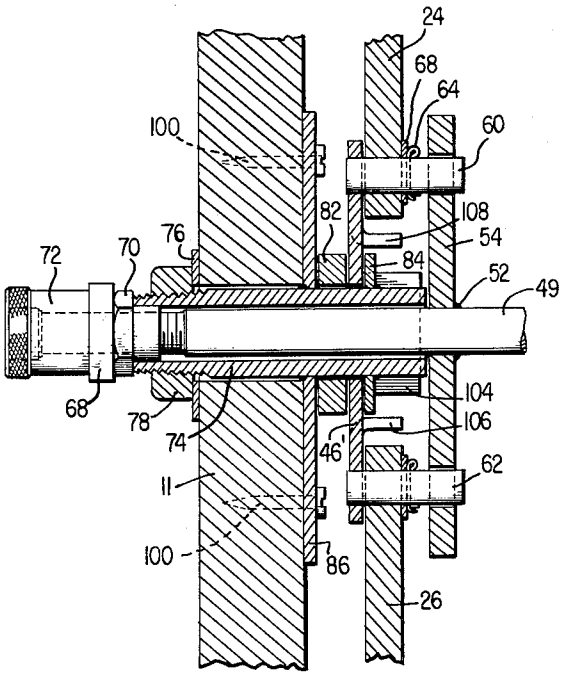
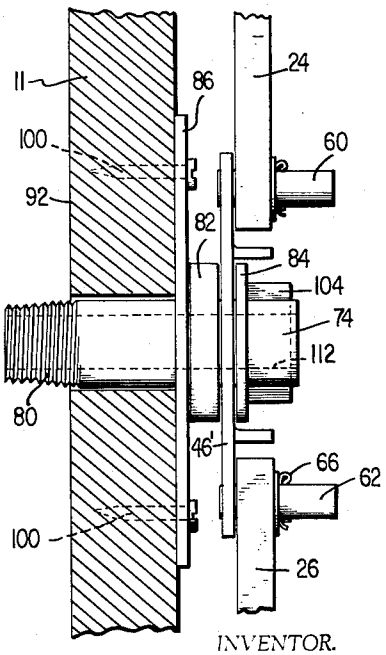


FIG. 8



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3,255,618

DOOR LOCK

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Filed Apr. 22, 1964, Ser. No. 361,848
14 Claims. (Cl. 70—114)

This invention relates to a lock particularly suited for doors and other closure members and other closure members and more particularly to a so-called security lock for reducing the possibility of unauthorized entry and which is less susceptible to tampering, especially from the outside of the door.

While no door lock is completely burglar proof, certain types of locks are more resistant to tampering and make unauthorized entry more difficult. Locks especially designed for this purpose are often referred to as security locks in that they provide maximum security from unauthorized entry to a room or container which they protect.

A wide variety of security locks have been proposed in the past offering various degrees of protection from different types of burglarization, depending upon the particular use and application of the closure device to which they are affixed. However, many of these locks are difficult to operate in that they have a tendency to bind, in some instances are subject to excessive wear, and very often do not provide the tamper resistance to unauthorized entry or burglarization intended.

The present invention provides a novel security type door lock overcoming many of the above disadvantages. It is intended to provide maximum security from outside entry and limited security from inside attack. At the same time the lock is readily adaptable to a wide variety of door types and constructions and is useable with double doors, wood or metal, inswing or outswing, single doors of this nature and even overhead or lift doors with the lock and bolts mounted in a horizontal direction. Likewise, a wide variety of locking arrangements may be used in conjunction with the lock of this invention including single and double custody arrangements, used in conjunction with various key and handle combinations.

Most locks using vertical locking bars of the type under consideration can be fairly easily burglarized by breaking off the outside handle and driving the conventional handle shaft through the door. Such action will vary often release the locking bars, or if not, will expose an actuating tube having a central aperture of rectangular cross-section to which an iron bar or other strong instrument may be applied to force the lock. Tampering of this type will not open or seriously damage the lock of the present invention since provision is made for the support of a bolt cam plate by a central circular tube with the plate held in position by a spacer welded to the tube. The bolt bars are held in position on cam plate studs by cotter keys so they can not be jarred off. Actuation of the bolt bars is by way of an apertured lever slidable over a pair of pins rotatably received by the locking bars. Thus, breaking off the handle and driving out the handle shaft through the door removes all direct coupling to the locking bars without at the same time releasing the bolts so that nothing is accessible from the exterior of the door by means of which the locking bars or bolts may be forced.

Locks and cam plate are mounted on a single piece of metal in the form of a lock mounting plate so that one may not be moved out of alignment with the other. The lock mounting plate is fastened to the inside of the door by a plurality of screws several of which are located behind the cam plate so they cannot be easily removed when the cam plate is in the locked position. One or more

cylinder locks are fastened to the lock mounting plate by socket head screws which cannot be removed with a screwdriver.

The entire assembly is constructed of heavy gauge metal to resist wear and abuse, all joints are welded, and the supporting tube for the cam plate extends through the door so that pulling on the inside handle when closing the door does not crush the door material which is possible when the lock is used on wood or hollow core metal doors. Heavy locking bars are provided and are in vertical alignment when the device is in the locked position to provide a complete deadlock and ready visual indication of the locked condition. Bolt brackets are provided preferably having a shield holding the bars away from the door and thus limiting wear on the door by movement of the locking bars.

If the outside handle is broken off or dismantled in a burglary attempt the cam plate and bars are held in locked position. The outside rim of each cylinder lock is screwed directly to the mounting plate eliminating the possibility of turning the cylinder in the door to unlock it. In the preferred embodiment the bar bolts are provided with approximately 1½ inches of throw to completely eliminate prying.

It is therefore one object of the present invention to provide a novel door lock.

Another object of the present invention is to provide a security type door lock.

Another object of the present invention is to provide a lock giving maximum security from outside entry and limited security from inside attack.

Another object of the present invention is to provide a door lock for a wide variety of doors of relatively simple construction, easy to operate, and one which is not seriously affected by excessive wear.

Another object of the present invention is to provide a novel security lock embodying a complete deadlock, with the position of the lock bars giving an instantaneous visual indication of whether the bolts are in the locked position, that is they are straight when locked, and staggered when unlocked.

Another object of the present invention is to provide a door lock wherein the handle mechanism is so constructed as to be completely removable from the cam plate without affecting locking operation of the device. If enough turning pressure is applied to the outside handle, or the inside handle, while the device is in locked position, the handle will break free from the cam control bar or lever (which bar is welded to the handle and engages the cam bolt stud pins) or twist off before the cam plate can be forced into unlocked position. In other words, the device is designed to withstand the twisting off and complete removal of the handle without causing a successful entry by force. In addition, the outside rim cylinder is held in position by retaining screws which pass completely through the mounting plate. The lock cylinder is therefore fastened directly to the lock mounting plate thus minimizing the danger of twisting the cylinder in the door to unlock the inside bolt.

These and further objects and advantages of the invention will be more apparent upon reference to the following specification, claims and appended drawings, wherein:

FIGURE 1 is an inside perspective view showing a door incorporating a double custody lock constructed in accordance with this invention;

FIGURE 2 is an enlarged perspective view of the lock of FIGURE 1;

FIGURE 3 is an exploded view showing the handle assembly of the lock of this invention;

FIGURE 4 is an inside elevational view of a single custody lock similar to that of FIGURE 1;

FIGURE 5 is a view similar to that of FIGURE 4 showing the device in the unlocked position;

FIGURE 6 is a horizontal section through the lock and door of FIGURES 4 and 5;

FIGURE 7 is a vertical section through the lock; and

FIGURE 8 is a partial vertical section similar to that of FIGURE 7 showing the device in the locked position with the handle assembly removed.

As previously pointed out, most locks using sliding locking bars can be easily burglarized by breaking off the outside handle and driving the handle shaft through the door. This results either in release of the bars or makes accessible the operating mechanism of the lock so that it may be forced with an appropriate tool. This forced entry is avoided by the novel lock of this invention by the provision of a circular support tube upon which the bolt actuating cam plate is rotatably mounted. A circular handle shaft is rotatably received through the support tube and carries at its inner end a lever slidably receiving a pair of pins mounted on the cam plate. Hence, inward movement of the handle shaft during a forced entry attempt simply causes the ends of the lever to slide off the pins thus completely breaking the coupling or mechanical linkage from the exterior of the door to the cam plate.

Referring to the drawings, there is illustrated in FIGURE 1 the novel lock device of the present invention generally indicated at **10**. The lock **10** is mounted on a single door **11** swingable inwardly in the direction of the arrow **12** and supported from a wall **14** between a floor **16** and a ceiling **18**. Lock **10** is provided with a handle **20** rotatable from the locked vertical position illustrated in the direction of the arrow **22** in FIGURE 2. Movement of the handle **20** reciprocates a pair of lock bars **24** and **26** in the vertical direction as indicated by the arrows **23** in FIGURE 1. The outer ends of the lock bars are slidably received through locking bar guides **28** and **30** mounted on the door and the extreme outer ends of the locking bars **24** and **26** are received in suitable cavities provided in the ceiling and floor as indicated by the dashed lines at **32** and **34**.

FIGURE 2 is an enlarged view of the lock of FIGURE 1 and similarly shows what hereinafter will be referred to as the inside of the lock mechanism. That is the lock and door are viewed in FIGURES 1 and 2 from that side of the door or from the room to which access is to be prevented. In FIGURES 1 and 2, the lock is of the double custody type and is shown provided with a pair of more or less conventional cylinder locks **36** and **38** which by way of example only may be Yale locks. Each of the locks is provided with a conventional locking tongue or bolt **40** and **42** respectively, the bolt **40** in FIGURE 2 being illustrated as retracted while bolt **42** is shown as extended into locking position in a cooperating notch **44** formed on one side of a flat cam plate **46**. Bolt **40** of cylinder lock **36** is adapted to be received in a similar notch **48** formed on the other side of the cam plate **46**. In FIGURE 2, the locks **36** and **38** are indicated as operable by keys from the inside as well as the outside, normally each lock being actuated by a different key in the custody of a different person, hence the lock is referred to as a double custody lock.

FIGURE 4 illustrates a single custody embodiment incorporating the single cylinder lock **38**. In this embodiment the cam plate **46'** is provided with only the single notch **44** receiving the single bolt **42**. In all other respects the embodiment of FIGURE 4 is similar to that of FIGURE 2.

FIGURE 3 is an exploded view showing the lock handle structure which is the same for both single and double custody embodiments. As illustrated in the drawings and as seen in FIGURES 3–5, U-shaped inner handle **20** is provided with a longer leg or handle shaft **49**

threaded at its outer end **50**. Welded to this leg as at **52** is a cam control bar or lever **54**. This lever is provided with apertures **56** and **58** at each end slidingly receiving pins **60** and **62** rigidly connected to the opposite sides of the cam plate **46** or **46'** as the case may be. Each of the pins **60** and **62** is provided with a transverse aperture receiving a cotter pin **64** and **66**. The cotter pins hold washers **68** and **70** on the pins which washers retain the ends of the pressure bars **24** and **26** rotatably mounted on the pins.

Threadedly received over the end **50** of handle shaft **49** is an outer handle **68** retained in position between a threaded inner spacer nut **70** and an outer threaded bushing nut **72**.

As best seen in FIGURES 6 and 7, shaft **49** of the handle is rotatably received through a hollow circular tube **74** which is secured to the door on the outside by a retaining plate **76** and a lock nut **78**. The lock nut is threadedly received over the end of the tube as illustrated at **80** in FIGURE 6. Rotatably mounted on the tube **74** is a spacer bearing **82** and welded to the tube **74** is a retainer **84** and a mounting plate **86**. Bearing **82** and cam plate **46'** are thus rotatably retained on the tube by the spaced plates **84** and **86**, both rigidly welded to the tube.

As best seen in FIGURE 2, each of the cylinder locks **36** and **38** is connected to the mounting plate and to the door by four socket head screws **90** so that they cannot be operated from the inside with a screwdriver. The penetration of these screws through the plate **86** and into the door **11** is illustrated in dashed lines in FIGURE 6. The cylinder lock **38** is mounted approximately flush with the outer surface **92** of the door, as indicated generally at **94**, and is preferably bolted to the mounting plate **86** by means of a pair of bolts **96** and **98** illustrated in FIGURE 6. The mounting plate itself is secured to the door **11** by means of six screws **100** and as best seen in FIGURES 4 and 5 three of these screws are positioned beneath or behind the cam plate **46** or **46'** when the device is in the locked position so as to make access to them quite difficult.

Referring to FIGURES 4 and 5, the former shows the unit from the inside in the locked position with the bolt **42** received in the notch **44**. The edges of the notch are turned over to form flanges **102**, **104** and **106** so as to provide a larger surface against which the bolt **42** may act. Also a stop pin **108** is provided on mounting plate **86** to be engaged by the cam plate **46'** so as to limit the rotation of this plate. When the bolt **42** is moved to the retracted position by the insertion of a key into the cylinder lock **38** and rotation of the key therein, the cam plate **46'** is free to rotate so as to withdraw the locking bars **24** and **26** from locking brackets such as bracket **110** illustrated in FIGURE 4. These locking bars preferably move longitudinally a distance about an inch and a half so as to completely clear the locking brackets and permit the door to open. Rotation of the cam plate **46'** from the locked position illustrated in FIGURE 4 to the open or unlocked position illustrated in FIGURE 5 may be effected by rotation of either the handles **20** or **68**. In either case, the shaft **49** is rotated by the handle, thus rotating the lever **54**. Rotation of the lever is transmitted through pins **60** and **62** to the locking bars **24** and **26** and to the cam plate **46'**. Rotation of either of the handles in the opposite direction will return the elements from the open position of FIGURE 5 to the closed position of FIGURE 4. The device may then again be locked by actuation of the conventional cylinder lock **38**.

FIGURES 7 and 8 illustrate the increased tamper resistance of the lock of this invention particularly to forced entry by the method of driving the handle actuator rod or shaft **49** through the door. FIGURE 7 is a cross-section showing the entire assembly while FIGURE 8 illustrates what is left after the handle has been removed and the shaft **49** driven inwardly through the tube **74**. Inward

movement of the shaft **49** through the tube simply causes the lever **54** to slide off the ends of pins **60** and **62** and to fall to the floor. Thus, all that remains for access at the outer surface **92** of the door is the threaded end **80** of the hollow tube **74**. Since the central aperture of the tube indicated by the dashed lines at **112** in FIGURE 8 is circular no tool may be inserted and rotated so as to force the lock. Likewise, the nails **100** cannot be driven backwardly from the outside of the door since at least three of them lie underneath the cam plate **46'** and can only be backed off until their heads engage this cam plate.

In addition to the fact that the door provides maximum security from the outside and limited security from the inside, it is also quite easy to operate and will not tend to bind, become misaligned or fail to operate with excessive wear. Rotation of either of the handles provides for direct actuation of the retainer bars **24** and **26** by way of the pins **60** and **62**. The bars are retained rotatably on the pins by means of the cooperating washers and cotter keys **64** and **66**. Positive locking is provided and the device is locked with the locking bars in vertical alignment to provide a positive deadlocked arrangement. The cylinder lock **38** is retained by screws **96** and **98** thus fastening the lock cylinder directly to the lock mounting plate **86** so as to minimize the danger of twisting the cylinder in the door to unlock the inside bolt.

The lock may be used with a wide variety of doors and with a wide variety of locking arrangements. These locking arrangements include:

(a) Key control from inside and outside with handle control from the inside only.

(b) Key control from the outside with a turn knob (on the lock bolt) and handle inside.

(c) Key and handle control from inside only.

The above locking arrangements can be accomplished with no additional accessories to the device but instead an elimination of components shown in the drawings. For example, the arrangement (b) given above, is accomplished by using a Yale lock of the same size and operation as shown but instead of using a key on the inside to activate the bolt a turn knob replaces the inside key. This arrangement finds use for example in store rooms where a single door is the only way in.

Lock arrangement (c) above involves the same basic construction as that shown but the outside cylinder is eliminated as is the outside handle. The tubular cam plate support **74** is cut off flush with the back of the mounting plate **86**. Handle shaft or leg **49** is cut off just long enough to extend one-quarter inch beyond the end of the shortened cam plate support tube **74**. This end of the handle spindle may be threaded and a nut attached to hold the handle within the cam plate support tube. A relief hole is in this case drilled part way into the door to accommodate the extending end of the handle shaft and nut. Lock mount plate **86** is screwed directly to the door as in any other type installation. In this arrangement no handle is available for actuation from the outside and none of the door lock assembly is visible from the outside of the door. This arrangement is ideally suited for super markets where back service doors are desired to be locked at all times. Obviously, if there are no handles on the outside of the door bolts they cannot be thrown to the unlocked position from the outside. Thus, if the door is closed and the bolts thrown, this door is in effect locked to anyone outside even if the key is not turned on the inside lock. This also allows personnel to open and close the doors for deliveries without having access to keys. In addition, it is considerably less vulnerable to outside attack since persons outside have no knowledge where the lock is located and have much more difficulty in centering an attack on the pertinent areas of the door. The inside handle can still be driven or twisted off without gaining access to the inside.

FIGURE 1 shows an arrangement involving a double custody lock. This is accomplished by extending the mounting plate **86** beyond the cam plate **46** as illustrated in FIGURE 2 far enough to accommodate a second lock **36** like the lock **38**. Another slot **48** is cut in the cam plate to allow the bolt of the second lock to enter it at the opposing edge of the slot. The bolt operation, cam plate, tube and handle constructions are unchanged. This double custody arrangement of FIGURE 1 is a very special type arrangement having a limited demand where it is desirable to have two persons present when opening the lock and requiring two different keys.

By way of example only in one embodiment constructed in accordance with the present invention the locking bars **24** and **26** were formed of 1" x ⅜" flat steel and had a 1⅝" throw. The guides **28** and **30** were made of 1" x ⅛" x 4½" flat steel. The bars were held away from the door ¼" by a guide mounting strap welded to each of the guides. The cam plate was of flat steel and carried two ⅜" cold rolled steel pins **60** and **62**. The mounting plate was ⅛" x 4½" x 9" steel plate and the handle shaft and inside handle was a one-piece construction having a diameter of ½" formed of cold rolled steel and having an overall length of 4". In some instances where the door material is strong enough (not for light sheet metal or hollow core wooden doors) the support tube may be eliminated and the cam plate may be rotatably mounted directly on the handle shaft.

It is apparent from the above that the present invention provides a novel security lock that not only increases the security of the door upon which it is incorporated but one that is relatively simple and inexpensive, reliable in operation and one which will not bind or become inoperative with wear. All parts are positively connected, with the bolts and cam plates securely aligned by their mounting on a common mounting plate.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A door lock comprising a mounting plate for attachment to a door, a hollow cylindrical tube passing through said mounting plate and rigidly attached thereto, a handle shaft rotatable in said tube, a cam plate rotatably mounted on said tube, locking means coupled to and actuated by said cam plate, key actuated means for holding said cam plate against rotation, and means releasable upon longitudinal movement of said handle shaft in an inward direction away from said cam plate coupling said handle shaft to said cam plate.

2. A door lock according to claim **1** wherein said releasable means comprises at least one pin mounted on said cam plate, and a lever rigidly mounted on said handle shaft, said lever having an aperture slidably received over said pin.

3. A door lock comprising a mounting plate, means for attaching said mounting plate to a door, a hollow tube having a circular central aperture passing through said mounting plate and rigidly attached thereto, a handle shaft rotatable in said tube, a handle attached to at least one end of said handle shaft, a cam plate rotatably mounted on said tube, said cam plate carrying at least one pin, locking means rotatably received over said pin, key actuated means for holding said cam plate against rotation and a lever rigidly mounted on said handle shaft, said lever having an aperture slidably received over the end of said pin.

4. A door lock according to claim **3** wherein said key actuated means includes a bolt movable into and out of engagement with a notch in the edge of said cam plate.

5. A door lock according to claim 4 wherein said bolt is part of a cylinder lock mounted on said mounting plate adjacent said cam plate.

6. A door lock comprising a mounting plate, means for attaching said mounting plate to a door, a hollow tube having a circular central aperture passing through said mounting plate and rigidly attached thereto, a handle shaft rotatable in said tube, a handle attached to at least one end of said handle shaft, a cam plate rotatably mounted on said tube, said cam plate carrying a pair of pins spaced upon diametrically opposite sides of said tube, a pair of locking bars each having an end rotatably received over one of said pins, key actuated means for holding said cam plate against rotation, and a lever rigidly mounted on said handle shaft, said lever having an aperture at each end slidably received over one of said pins.

7. A door lock according to claim 6 wherein said handle shaft is provided with a handle at each end.

8. A door lock according to claim 6 wherein said key actuated means comprises a pair of cylinder locks mounted on said mounting plate adjacent said cam plate, each of said cylinder locks having a sliding bolt movable into and out of engagement with a corresponding notch in the edge of said cam plate.

9. A door lock comprising a mounting plate, means for attaching said mounting plate to a door, a hollow tube having a circular central aperture passing through said mounting plate and rigidly attached thereto, a handle shaft rotatable in said tube, a handle attached to at least one end of said handle shaft, a cam plate rotatably mounted on said tube, said cam plate carrying a pair of pins spaced upon diametrically opposite sides of said tube, a pair of elongated slidable locking bars extending away from said cam plate on opposite sides thereof, the adjacent ends of said locking bars being rotatably mounted over said pins, means for retaining said adjacent ends of said bars on said pins, a cylinder lock bolted to said mounting plate adjacent said cam plate, said cylinder lock having a bolt movable into and out of engagement with a corresponding notch in the edge of said cam plate to hold said cam plate against rotation, and a lever rigidly mounted on said handle shaft, said lever having an aperture at each end slidably received over one of said pins.

10. A door lock according to claim 9 wherein said cam plate overlies at least three mounting screw apertures in said mounting plate when said cam plate is in the locked position with said bolt engaged in said notch.

11. A door lock according to claim 10 wherein said locking bar retaining means comprises a washer on each of said pins and a cotter key passing through each pin, said washers and cotter keys spacing said locking bars from said lever.

12. A door lock assembly comprising a door and surrounding door frame structure, a mounting plate secured to the inside surface of said door, a hollow tube having a circular central aperture passing through said door and said mounting plate and rigidly attached to said mounting plate, a handle shaft having a handle at each end rotatably received through said tube, a cam plate rotatably retained on said tube, said cam plate carrying a pair of pins spaced upon diametrically opposite sides of said tube, a pair of elongated slidable locking bars extending away from said cam plate on opposite sides thereof, the adjacent ends of said locking bars being rotatably mounted over said pins, means for retaining said adjacent ends of said bars on said pins, a receptacle in said door frame structure at each end of said door, the remote ends of said locking bars being slidable into and out of said receptacles with the rotation of said cam plate, a cylinder lock bolted to said mounting plate adjacent said cam plate, said cylinder lock having a bolt movable into and out of engagement with a corresponding notch in the edge of said cam plate to hold said cam plate against rotation, and a lever rigidly mounted on said handle shaft, said lever having an aperture at each end slidably received over one of said pins.

13. An assembly according to claim 12 including a second cylinder lock on said mounting plate adjacent said cam plate, said second cylinder lock also having a bolt movable into and out of engagement with a corresponding notch in the edge of said cam plate.

14. An assembly according to claim 12 wherein said cylinder lock is mounted on said mounting plate by socket head screws, and wherein said mounting plate is secured to said door by a plurality of mounting screws, said cam plate overlying the heads of at least three of said mounting screws when said cam plate is in the locked position.

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