(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 091 314**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **23.07.86**

(51) Int. Cl.[4]: **E 05 B 43/00,** E 05 G 1/04

(21) Application number: **83301909.4**

(22) Date of filing: **05.04.83**

(54) **Locking apparatus.**

(30) Priority: **06.04.82 GB 8210197**

(43) Date of publication of application:
12.10.83 Bulletin 83/41

(45) Publication of the grant of the patent:
23.07.86 Bulletin 86/30

(84) Designated Contracting States:
BE DE FR IT SE

(56) References cited:
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EP 0 091 314 B1

Courier Press, Leamington Spa, England.

Description

This invention relates to locking apparatus and more especially although not exclusively it relates to locking apparatus suitable for safes and strong rooms.

Safes and strong rooms although normally locked are nevertheless vulnerable if a key can be procurred. To prevent a keyholder being attacked or abducted for the purpose of obtaining a key, safes and strong rooms are often fitted with a time lock which prevents the safe or strong room from being opened even with a key, except during a limited time period which is usually during business hours.

During business hours however, safes and strong rooms can be vulnerable to armed raiders prepared to demand a key with threats of violence. Under the circumstances, the time lock if one is provided, will not be in operation and a keyholder will normally quite sensibly part with the key whereby the safe or strong room can be opened immediately by a raider. Similarly, if the safe or the strong room is operable by a combination operated lock, instead of a key operated lock, then the combination holder will again normally quite sensibly part with the information as to the combination needed.

It is known from DE—A—2211361 to provide locking apparatus for strong rooms. The locking apparatus of DE—A—2211361 comprises a bolt effective to provide security, and a time delay device for permitting operation of the bolt to an unlocked condition only after a predetermined time period has lapsed. The time period set by the time delay device starts to lapse when a first electrically-operated door-opening button inside the strong room is opened (for permitting a cashier inside the strong room to get out) or when a second electrically-operated door-opening button outside the strong room is operated (for permitting the cashier outside the strong room to get in). When the time period has lapsed, the bolt may be moved to its unlocked condition, but only for a short predetermined period of time, and this short period of time is arranged to start when the time period set by the time delay device lapses.

The locking apparatus of DE—A—2211361 has the disadvantage that it only has one time delay device controlling operation of the bolt and this time delay device is designed to be in continuous operation. Because the time delay device operates through the day, the actual time delay period must be relatively short and, as mentioned in DE—A—2211361, the delay period is typically of from 5 to 15 minutes. Any longer time delays can be very frustrating to a cashier wishing to leave or enter the strong room. Such relatively short time delays are effective to deter raiders during day time business hours because raiders are generally not prepared to wait around for even short periods of time in case an alarm is raised and police arrive. However, after business hours, for example at nights and weekends, the relatively short time delays afforded by DE—A—2211361 are ineffective because raiders have the peace of the night or the entire weekend to wait undisturbed for the relatively short time period to lapse. Thus, the locking apparatus of DE—A—2211361 suffers from the very substantial disadvantage that it does not provide effective security after business hours.

The locking apparatus of the present invention is able to overcome the disadvantage presented by DE—A—2211361 by having time lock means that can provide long time delays to deter raiders that operate after business hours when things are quiet, and by having a separately operating delay device which operates during the day to provide the short time delays which are sufficient to allow reasonably prompt access to strong rooms and safes but which are also sufficient to deter raiders that arrive during business hours. Thus, it can be arranged that the longer operating time lock means only functions after business hours and the shorter operating delay device only functions during business hours.

Accordingly, this invention provides locking apparatus comprising a bolt effective to provide security, the locking apparatus being characterised by time lock means for permitting operation of the bolt to an unlocked condition only after time set on the time lock means has lapsed, a delay device, electrically operated locking means for preventing operation of the bolt to its unlocked condition until a time delay determined by the delay device has lapsed, and a sensor, the sensor being responsive to an unlocking operation of the locking apparatus after the time set on the time lock means has lapsed to cause the delay device to operate and generate a further time delay before the electrically operated locking means will permit operation of the bolt to its unlocked condition and opening of the locking apparatus.

The sensor may be responsive to a key which is used to operate the locking apparatus from its locked condition to its unlocked condition. Alternatively, the sensor may be responsive to a combination locking mechanism which is used to operate the locking apparatus from its locked condition to its unlocked condition.

The electrically operated locking means may form a part of the time lock means. Alternatively, the electrically operated locking means may be separate from the time lock means. When the electrically operated locking means is separate from the time lock means, the time lock means is advantageously a mechanical clockwork time lock.

Preferably, the locking apparatus is only openable for a limited period after the further time delay caused by the delay device has lapsed.

The sensor may comprise a micro-switch.

The electrically operated locking means may comprise a solenoid operated locking member arranged normally to engage for locking purposes with the bolt, but which responsively to energisation of the solenoid is moved so as to permit withdrawal of the bolt.

The locking member may comprise a latch member, which normally engages for locking purposes with a complementary slot in the bolt but which responsively to energisation of the solenoid is lifted so as to permit withdrawl of the bolt.

The solenoid may be coupled to indicator means which serves to indicate whether or not the solenoid is energised so that the bolt can be withdrawn. The indicator means may comprise an indicator light and/or an audible indicator.

The solenoid may be fed with power from batteries contained in a battery box. Advantageously, the batteries are rechargeable batteries.

The delay device may comprise an electrical timer. The electrical timer may be a solid state electrical timer.

It will be appreciated that locking apparatus according to the present invention serves to buy time due to the delay between operation of the locking apparatus from a locked condition to an unlocked condition and withdrawal of the bolt to open a safe or the like with which the bolt is operatively associated. This delay is likely to unnerve a raider who will not know the delay period and will therefore most likely make off empty handed. Even if the raider knows the delay period, it is unlikely that he will have the time or the nerve to wait until the delay period has expired.

Advantageously, the locking apparatus is provided with over-ride means for preventing operation of the locking apparatus during predeterminable set times. The over-ride means can thus be used to prevent the locking apparatus operating at night and at weekends so that a raider cannot kidnap a bank manager, for example, obtain the required key or combination and then have plenty of time during the night or the weekend to wait for the time delay afforded by the locking apparatus to lapse. The over-ride means can be any convenient apparatus such for example as a printed circuit board appropriately connected to and forming part of the locking apparatus.

An embodiment on the invention will now be described solely by way of example and with reference to the accompanying drawings in which:

Figure 1 is a generally schematic diagram of the back of a safe door showing a lock and bolt arrangement;

Figure 2 is a front view of the door shown in Figure 1 showing a battery box and indicator light arrangement; and

Figure 3 is an enlarged view of a part of the bolt and lock arrangement shown in Figure 1.

Referring now to Figure 1, a safe door 2 is fitted with a locking bolt 4 which enters into a complementary recess (not shown) of a door frame for security purposes. The bolt 4 is operatively associated with a bolt withdrawal mechanism (not shown) and time lock means in the form of a clockwork time lock 6. The time lock 6 includes a locking bar 8 which serves to prevent withdrawal of the bolt 4 during specified time periods set on the time lock 6. When the time lock 6 operates to enable the bolt 4 to be released, the locking bar 8 is removed in the direction of the arrow 10 but the bolt 4 can still not be moved in the direction of the arrow 12 to be withdrawn, because electrically operated locking means in the form of a solenoid lock 14 is arranged to retain the bolt 4 in position.

As shown in Figure 3, the solenoid lock 14 comprises a latch plate 16 which normally engages a complementary slot 18 in the bolt 4. However, when a solenoid 20 is energised the latch plate 16 is constrained to move in the direction indicated by arrow 22 so as to release the bolt 4. Relocking of the door 2 causes resetting of the locking apparatus.

The solenoid 20 of the solenoid lock 14 is arranged to be fed with electrical energy via a delay device in the form of a timer 24 as shown in Figure 1. The timer 24 is arranged to be started into operation consequent upon activation of a sensor in the form of a micro-switch 25 which is contained in a lock 26. The lock 26 has a key hole 27 and the micro-switch 25 is operated when a key 29 is inserted into the key hole 27 and turned to move the lock 26 from its locked to its unlocked condition.

The solenoid 20 is fed with power from rechargeable batteries in a battery box 28, and the operative state of the solenoid 20 is indicated by an indicator light arrangement 30 comprising a red light 32 and a green light 34. The green light 34 is lit when the solenoid 20 is operated so that the bolt 4 can be withdrawn and the red light 32 is operated when the bolt 4 is retained by the latch plate 16 which normally falls under gravity into the slot 18. As an alternative to the lights 32, 34 or in addition to them, a buzzer may be arranged to provide an audible signal when the solenoid 20 is operated and the bolt can be withdrawn. The solenoid 20 only operates for a short period of time, for example 15 to 30 seconds, and the safe door must be opened in this time. If the safe door is not opened in this time, then the solenoid 20 will cease to operate and the latch plate 16 will fall back into the slot 18 and it will not be possible to open the safe door. The key 29 must be reintroduced into the key hole 27 to restart the entire sequence of operations. The timer 24 is advantageously arranged to restart its period of operation each time the key 29 is inserted into the key hole 27.

Although the timer 24 may provide any predetermined time delay period, for example of from 1 to 15 minutes or more, it is envisaged that the timer 24 might normally provide a delay of approximately 5 minutes. The timer 24 may comprise a solid state timer device. By providing an electrical solid state timer, it is possible precisely to set the delay period and the precise delay can easily be altered as may be desired.

Locking apparatus according to the present invention has the advantage that a predetermined period of time is brought between insertion of a key in the key hole 26 and the opening of a safe

with which the lock is associated, whereby raiders are thwarted. The locking apparatus is clearly of great use in banks and post offices and it is particularly advantageous in that one key only is required which serves to release the normal bolt operating mechanism (not shown) and to operate the electrical timer 24. Although a lock as just before described is emminently suitable for safes and strong rooms, it is envisaged that locking apparatus in accordance with the present invention may be fitted to tills and other secure containers for valuables. The tills and other secure containers may then be fitted with a locking bar. During normal use, they can be left open and they can be closed at the slightest hint of a possible robbery. Reopening of the tills or other secure containers can then easily be effected but it will necessitate waiting for the pre-set time period, which pre-set time period will usually be longer than a raider can safely wait.

It will be appreciated that the solenoid lock 14 can form part of or can be separate from the time lock 6. Also advantageously, the locking apparatus is provided with a protector mechanism (not shown) for ensuring that the electrically operated locking means remains in the desired locking position even if a safe, till or the like that is fitted with the locking apparatus is inverted. If desired, the lock 26 can be a combination operated lock instead of a key operated lock. Advantageously, the locking apparatus is provided with over-ride means (not shown) for preventing operation of the locking apparatus during predeterminable set times that may be set by an operator. Thus, for example, an operator might set the over-ride means so that the locking apparatus cannot be opened during the night and say until 10.00 a.m. the next morning so that a raider cannot kidnap the operator during the night, obtain the key or combination and have the peace of the night to wait for the time delay afforded by the locking device to lapse.

Claims

1. Locking apparatus comprising a bolt (4) effective to provide security, the locking apparatus being characterised by time lock means (6) for permitting operation of the bolt (4) to an unlocked condition only after time set on the time lock means (6) has lapsed, a delay device (24), electrically operated locking means (14, 16) for preventing operation of the bolt (4) to its unlocked condition until a time delay determined by the delay device (24) has lapsed, and a sensor (25), the sensor (25) being responsive to an unlocking operation of the locking apparatus after the time set on the time lock means (6) has lapsed to cause the delay device (24) to operate and generate a further time delay before the electrically operated locking means (14, 16) will permit operation of the bolt (4) to its unlocked condition and opening of the locking apparatus.

2. Locking apparatus according to claim 1 characterised in that the sensor (25) is responsive to a key (29) which is used to operate the locking apparatus from its locked condition to its unlocked condition.

3. Locking apparatus according to claim 1 characterised in that the sensor (25) is responsive to a combination locking mechanism which is used to operate the locking apparatus from its locked condition to its unlocked condition.

4. Locking apparatus according to any one of the preceding claims characterised in that the electrically operated locking means (14, 16) forms a part of the time lock means (6).

5. Locking apparatus according to any one of claims 1 to 3 characterised in that the electrically operated locking means (14, 16) is separate from the time lock means (6).

6. Locking apparatus according to claim 5 characterised in that the time lock means (6) is a mechanical clockwork time lock, and characterised in that the locking apparatus is only openable for a limited period after the further time delay caused by the delay device (24) has lapsed.

7. Locking apparatus according to any one of the preceding claims characterised in that the electrically operated locking means (14, 16) comprises a solenoid (20) operated locking member (16) arranged normally to engage for locking purposes with the bolt (4), but which responsively to energisation of the solenoid (20) is moved so as to permit withdrawal of the bolt (4).

8. Locking apparatus according to claim 7 characterised in that the solenoid (20) is coupled to indicator means (30) which serves to indicate whether or not the solenoid (20) is energised so that the bolt (4) can be withdrawn.

9. Locking apparatus according to any one of the preceding claims and including a protector mechanism for ensuring that the electrically operated locking means (14, 16) remains in the locking position even if the locking apparatus as installed is inverted.

10. Locking apparatus according to any one of the preceding claims and characterised in that it includes over-ride means for preventing operation of the locking apparatus during predeterminable set times.

Patentansprüche

1. Verschlußvorrichtung mit einem der Sicherung dienenden Riegel (4), gekennzeichnet durch eine Zeitverriegelungseinrichtung (6), die ein Öffnen des Riegels (4) nur nach Verstreichen einer an der Zeitverriegelungseinrichtung (6) eingestellten Zeit gestattet, durch eine Verzögerungseinrichtung (24) durch elektrisch betätigt Verriegelungsmittel (14, 16), die ein Öffnen des Riegels so lange verhindern, bis eine von der Verzögerungseinrichtung (24) bestimmte Zeit verstrichen ist, und durch einen Sensor (25), der auf einen das Öffnen der Verschlußvorrichtung bewirkenden Vorgang anspricht, nachdem die an der Zeitverriegelungseinrichtung (6) eingestellte Zeit verstrichen ist, und die Verzögerungseinrichtung (24) zur Er-

zeugung einer weiteren Zeitverzögerung veranlaßt, bevor die elektrisch betätigten Verriegelungsmittel (14, 16) ein Öffnen des Riegels (4) und damit der Verschlußvorrichtung zulassen.

2. Verschlußvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Sensor (25) auf einen Schlüssel (29) anspricht, der dazu dient, die Verschlußvorrichtung vom verschlossenen in den offenen Zustand zu bringen.

3. Verschlußvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Sensor auf einen Kombinationsschloß-Mechanismus anspricht, der dazu dient, die Verschlußvorrichtung vom verschlossenen in den offenen Zustand zu bringen.

4. Verschlußvorrichtung nach einem beliebigen der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die elektrisch betätigten Verriegelungsmittel (14, 16) einen Teil der Zeitverriegelungseinrichtung (6) bilden.

5. Verschlußvorrichtung nach einem beliebigen der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die elektrisch betätigten Verriegelungsmittel (14, 16) von der Zeitverriegelungseinrichtung (6) getrennt sind.

6. Verschlußvorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß die Zeitverriegelungseinrichtung (6) ein mechanisches Uhrwerk aufweist, und dadurch gekennzeichnet, daß die Zeitverriegelungseinrichtung nur während einer bestimmten Zeitspanne geöffnet werden kann, nachdem die von der Verzögerungseinrichtung (24) verursachte weitere Verzögerungszeit verstrichen ist.

7. Verschlußvorrichtung nach einem beliebigen der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die elektrisch betätigten Verriegelungsmittel (14, 16) ein von einer Magnetspule (20) betätigtes Verriegelungsglied (16) umfassen, das senkrecht zum Riegel (4) angeordnet ist und mit dem Riegel zu dessen Sperrung in Eingriff steht, jedoch bei Erregung der Magnetspule (20) bewegt wird, um ein Zurückziehen des Riegels zuzulassen.

8. Verschlußvorrichtung nach Anspruch 7, dadurch gekennzeichnet, daß die Magnetspule (20) mit Anzeigemitteln (30) gekoppelt ist, die anzeigen, ob die Magnetspule (20) erregt ist und der Riegel (4) zurückgezogen werden kann oder nicht.

9. Verschlußvorrichtung nach einem beliebigen der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sie eine Schutzeinrichtung enthält, die gewährleistet, daß die elektrisch betätigten Verriegelungsmittel (14, 20) auch dann in der Verriegelungsstellung bleiben, wenn die installierte Verschlußvorrichtung umgedreht wird.

10. Verschlußvorrichtung nach einem beliebigen der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sie eine Übersteuerungsvorrichtung umfaßt, welche die Betätigung der Verschlußvorrichtung während voreingestellten Zeiten verhindert.

Revendications

1. Appareil de verrouillage comprenant un verrou de sûreté (4), cet appareil de verrouillage étant caractérisé par des moyens de limitation de temps (6) pour amener le verrou (4) en position déverrouillée après que le temps réglé sur les moyens de limitation de temps (6) se soit écoulé, un dispositif de retardement (24), des moyens de blocage commandés électriquement (14, 16) pour empêcher le verrou (4) d'atteindre sa position déverrouillée jusqu'à ce qu'un délai de temps déterminé par le dispositif de retardement (24) se soit écoulé, et un détecteur (25), ce détecteur (25) étant sensible au déverrouillage de l'appareil de verrouillage après que le temps réglé sur les moyens de limitation de temps (6) se soit écoulé, de manière à commander le dispositif de retardement (24) et à produire un nouveau délai de temps avant que les moyens de verrouillage commandés électriquement (14, 16) ne permettent d'amener le verrou (4) en position déverrouillée et l'ouverture de l'appareil de verrouillage.

2. Appareil de verrouillage suivant la revendication 1, caractérisé en ce que le détecteur (25) est sensible à une clé (29) que l'on utilise pour amener l'appareil de verrouillage de sa position verrouillée à sa position déverrouillée.

3. Appareil de verrouillage suivant la revendication 1, caractérisé en ce que le détecteur (25) est sensible à un mécanisme de verrouillage à combinaison, que l'on utilise pour amener l'appareil de verrouillage de sa position verrouillée à sa position déverrouillée.

4. Appareil de verrouillage suivant l'une quelconque des revendications précédentes, caractérisé en ce que les moyens de verrouillage commandés électriquement (14, 16) font partie des moyens de limitation de temps (6).

5. Appareil de verrouillage suivant l'une quelconque des revendications 1 à 3, caractérisé en ce que les moyens de verrouillage commandés électriquement (14, 16) sont séparés des moyens de limitation de temps (6).

6. Appareil de verrouillage suivant la revendication 5, caractérisé en ce que les moyens de limitation de temps (6) sont constitués par un dispositif de limitation de temps à minuterie mécanique et caractérisé en ce que l'appareil de verrouillage ne peut être ouvert que pendant une période limitée, après que le nouveau délai de temps occasionné par le dispositif de retardement (24) se soit écoulé.

7. Appareil de verrouillage suivant l'une quelconque des revendications précédentes, caractérisé en ce que les moyens de verrouillage commandés électriquement (14, 16) comprennent un organe de verrouillage (16) commandé par un solénoïde (20), agencé perpendiculairement pour engager, à des fins de verrouillage, le verrou (4) mais qui est amené à se déplacer, suite à une activation du solénoïde (20), de manière à permettre l'enlèvement du verrou (4).

8. Appareil de verrouillage suivant la revendication 7, caractérisé en ce que le solénoïde (20) est couplé à des moyens indicateurs (30), qui servent à indiquer si le solénoïde (20) est activé ou pas, de telle sorte que le verrou (4) puisse être enlevé.

9. Appareil de verrouillage suivant l'une quelconque des revendications précédentes et comprenant un mécanisme protecteur permettant d'assurer que les moyens de verrouillage commandés électriquement (14, 16) restent en position verrouillée même si l'appareil de verrouillage tel qu'installé est inversé.

10. Appareil de verrouillage suivant l'une quelconque des revendications précédentes et caractérisé en ce qu'il comprend des moyens de commande permettant d'empêcher la commande de l'appareil de verrouillage pendant des périodes de temps réglées prédéterminables.

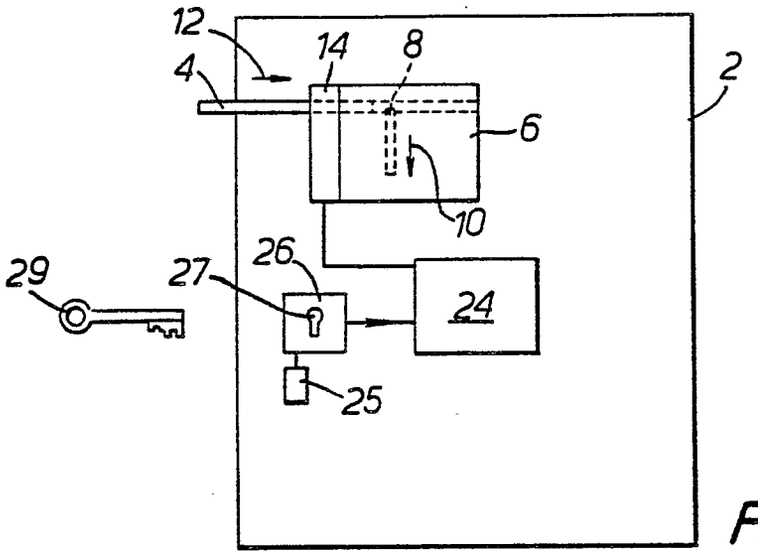

FIG.1.

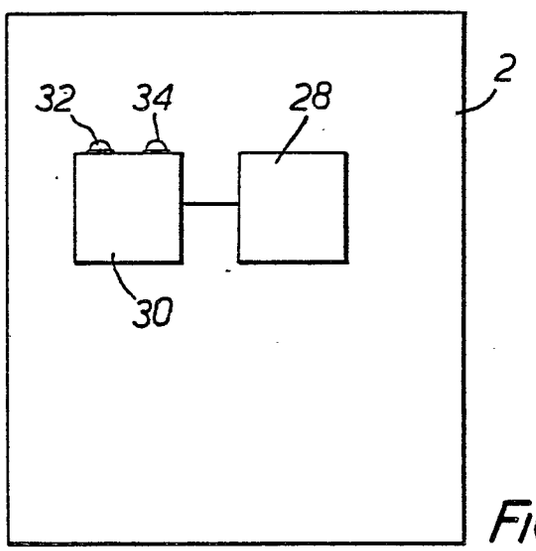

FIG.2.

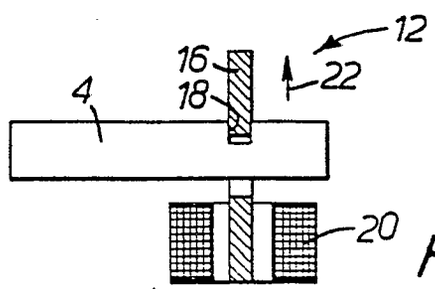

FIG.3.