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(54) **Locking apparatus.**

(57) Locking apparatus comprising a bolt (4) effective to provide security, an electrically operated locking device (14) effective normally to prevent withdrawal of the bolt (4), a sensor (25), and a delay device (24), the sensor (25) being responsive to operation of the locking apparatus from a locked condition to an unlocked condition such that the sensor (25) causes the locking device (14) to operate after a period of time determined by the delay device (24) so that withdrawal of the bolt (4) is then permitted.

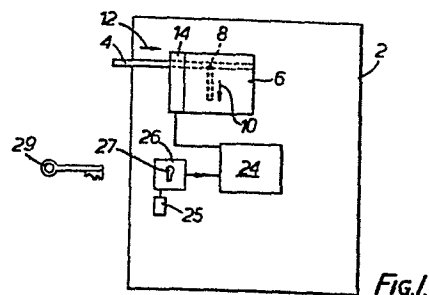


Fig. 1.

LOCKING APPARATUS

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 procured. To prevent a keyholder from 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 room can be vulnerable to armed raiders prepared to demand a key with threats of violence. Under these circumstances, the time lock if one is provided, will not be in operation and a key holder will normally quite sensibly part with the key whereby the safe or strong room can be opened immediately by the 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 an object of the present invention to provide a locking system which will buy time without risk to the key or combination holder.

According to the present invention locking apparatus

comprises a bolt effective to provide security, an electrically operated locking device effective normally to prevent withdrawal of the bolt, a sensor, and a delay device, the sensor being responsive to operation of the locking apparatus from a locked condition to an unlocked condition such that the sensor causes the locking device to operate after a period of time determined by the delay device so that withdrawal of the bolt is then permitted.

The sensor may be responsive to a key which is used to operate the locking apparatus from its locked 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 sensor may comprise a microswitch.

The electrically operated locking device 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 withdrawal 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 audible indicator may be arranged to operate for a brief period only whilst it is possible to withdraw the bolt.

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 comprise 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 device to lapse. The over-ride means can be any convenient apparatus such for example as a printed circuit board
5 appropriately connected to and forming part of the locking apparatus.

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

10 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

15 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 a clockwork time lock 6. The time lock 6 includes
20 a locking bar 8 which serves to prevent withdrawal of the bolt 4 during specified time periods set on the time lock. When the time lock 6 operates to enable the bolt 4 to be released, the locking bar 8 is moved in the direction of the arrow 10
25 but the bolt 4 can still not be moved in the direction of the arrow 12 to be withdrawn, because an electrically operated

locking device 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 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 microswitch 25 which is contained in a lock 26. The lock 26 has a keyhole 27 and the microswitch 25 is operated when a key 29 is inserted into the keyhole 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 or 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
5 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 re-introduced into the keyhole 27 to restart the entire sequence of operations. The solenoid 20 is advantageously arranged to restart its period of operation each time the key
10 29 is inserted into the keyhole 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
15 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 bought
20 between insertion of a key in the keyhole 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
25 normal bolt operating mechanism (not shown) and to operate the electrical timer 24. Although a lock as just before described

is eminently suitable for safes and strong rooms it is envisaged that locks 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 locking device remains in the desired locking position even if the safe, till or the like 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 effective to provide security, an electrically operated locking device effective normally to prevent withdrawal of the bolt, a sensor, and a delay device, the sensor being responsive to operation of the locking apparatus from a locked condition to an unlocked condition such that the sensor causes the locking device to operate after a period of time determined by the delay device so that withdrawal of the bolt is then permitted.
2. Locking apparatus according to claim 1 in which the sensor is responsive to a key which is used to operate the locking apparatus from its locked condition to its unlocked condition.
3. Locking apparatus according to claim 1 in which the sensor 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 in which the sensor is a microswitch.
5. Locking apparatus according to any one of the preceding claims in which the electrically operated locking device comprises 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.

6. Locking apparatus according to claim 5 in which the locking member comprises 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
5 lifted so as to permit withdrawal of the bolt.

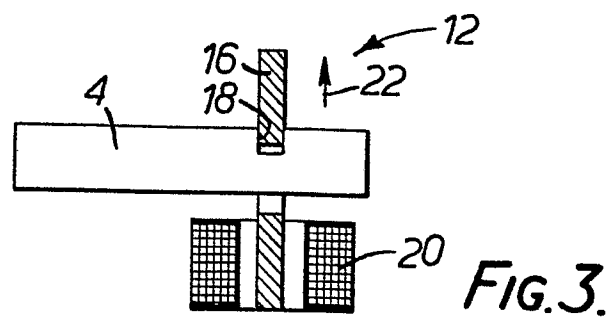
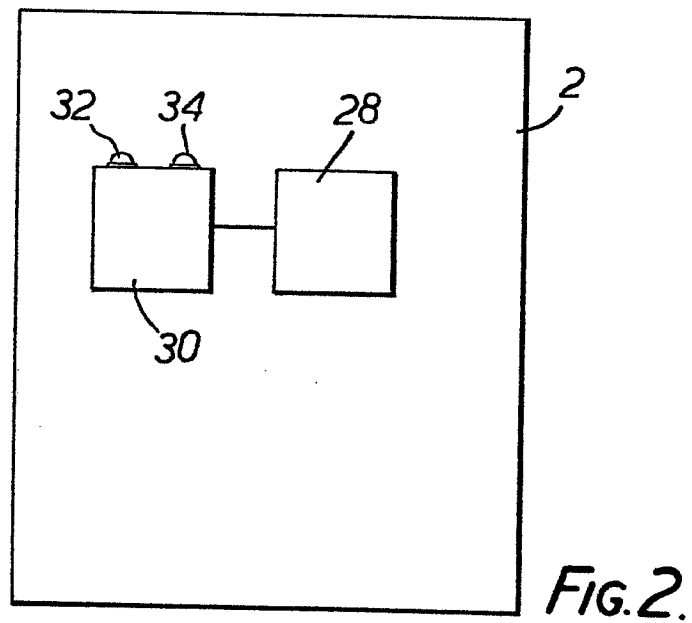
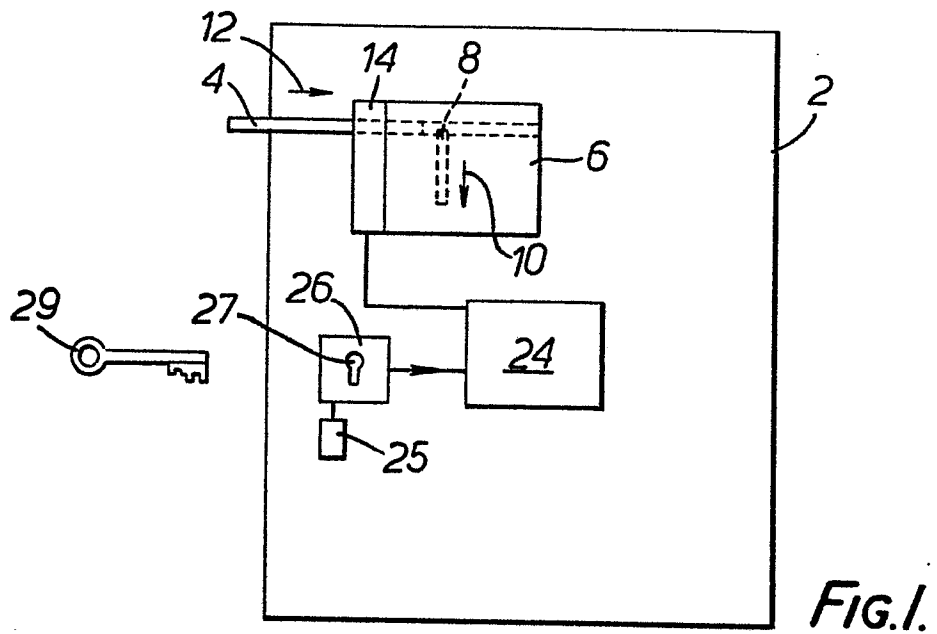
7. Locking apparatus according to claim 5 or claim 6 in which the solenoid is coupled to indicator means which serves to indicate whether or not the solenoid is energised so that the bolt can be withdrawn, the indicator means comprising an
10 indicator light and/or an audible indicator.

8. Locking apparatus according to any one of claims 5 to 7 in which the solenoid is fed with power from batteries contained in a battery box.

9. Locking apparatus according to any one of the preceding
15 claims in which the delay device is an electrical timer.

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

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
X	DE-A-2 211 361 (HAUNI-WERK KÖRBER & CO. KG) * Figure 2; claims 1, 2; page 6, paragraphs 2, 3; page 7; paragraph 3; page 8 *	1,5,7-9	E 05 B 43/00 E 05 G 1/04
X	DE-A-2 252 985 (HAUNI-WERKE KÖRBER & CO. KG) * Figures 2, 3; pages 6-8 *	1,5,7-9	
A	DE-A-2 808 391 (K.-H. ERPELDING) * Claim 1; page 12, paragraph 2 *	2	
A	DE-U-7 814 258 (LIPS VAGO S.P.A.) * Claims 1, 2 *	3,7	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 7)
			E 05 B 43/00 E 05 B 47/00 E 05 B 51/00 E 05 G 1/00 H 03 K 17/00
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 16-06-1983	Examiner KRABEL A.W.G.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			