

Description

This invention relates to apparatus for recording the opening or closing or a closure member.

More particularly, the invention relates to apparatus for recording the opening or closing of a closure member such as a door controlling access to an enclosed space. The invention is particularly, though not exclusively, concerned with goods vehicles such as closed lorries or vans.

When goods vehicles are loaded they are usually sealed at the point of despatch by means of a metal or wire seal which passes through the door or shutter catch. Each seal has stamped on it a unique number which is recorded on the driver's delivery documents. At the point of delivery the number on the seal is compared with that on the documents to check whether the vehicle has been opened. This system has a number of disadvantages. Some mechanical seals can be "locked" to appear sealed when in fact they are not. The seals can only be used once, and so add to the expense of vehicle operation. Moreover, to have numerous stocks of seals at all the locations a vehicle may visit is costly and reduces the security of the system as the allocation of the seals must be carefully controlled. United States Patent 4 118 047 describes a reusable seal consisting of a body and a wire loop, the ends of which pass through holes in the body and are clamped in position by plungers actuated by turning a drum rotatably mounted in the body. One side of the drum forms a tray containing a large number of balls of different colours, and rotating the drum to the clamping position moves five of the balls into a recess in the body, in which they are visible from outside the body. The five visible balls provide a colour code which is changed if the drum is rotated to release and unclamp the wire loop, so giving an indication that the seal has been tampered with. This provides a reusable seal, but requires a complex mechanism.

It is an object of this invention to provide apparatus which can be used instead of mechanical seals, and which can be manufactured simply and inexpensively.

In accordance with one aspect of this invention, there is provided apparatus for recording the opening or closing of a closure member such as a door controlling access to an enclosed space, the apparatus comprising a housing (10), a flexible element (12) attached at one end to the housing (10) or to the closure member and adapted to be linked to a catch of the closure member so that the flexible element (12) must be withdrawn from the catch before the closure member can be opened, attachment means (20) for releasably attaching the other end of the flexible element (12) to the hous-

ing (10), means in the housing for generating and displaying a random code on operation of the attachment means (20) and for storing the generated code, characterised in that the attachment means (20) comprises a recess (30) in the housing (10) adapted to receive an enlarged head (14) on the end of the flexible element (12) and a catch member (34, 36) movable on the housing between a clamping position in which the catch member (34, 36) prevents the head (14) from being moved from the recess (30) and a release position in which the head (14) can be moved into and from the recess (30), and in that the means for generating and displaying the random code comprises means (52) for providing an electrical signal in response to actuation of the catch member (34, 36) to attach the flexible element (12) to or detach it from the housing (10), an electronic circuit (80, 82) adapted to generate a random code on receipt of the electrical signal and to store the generated code, and electronic display means (70) adapted to display the generated code.

For example the code may be a random or quasi-random number.

The display means may, for example, be an LED or LCD display.

When the invention is applied to a goods vehicle or container, the housing may be fixed to the outer face of the door or shutter of the vehicle or container, so that the flexible element, which may be a steel cable, can be passed through the door or shutter catch, in a similar manner to a conventional seal, before being engaged with the housing. When the vehicle has been loaded and the door or shutter closed, the flexible cable is passed through the catch and secured in the housing by operation of the attachment means. This causes the electronic circuit to generate a random number which is stored by the electronic circuit. This number, as displayed by the display means, can be entered on the vehicle documents, so that, at the destination, the number entered on the documents can be checked against the number displayed, to ensure that the flexible cable has not been withdrawn to allow the door or shutter to be opened during the journey.

Since the next number to be generated on releasing the cable from the housing is unpredictable, the security of the system is high. Moreover, since the apparatus is mounted on the vehicle there is no need for stocks of seals to be kept at each collection and delivery point. The apparatus thus provides a cheaper and more secure system than the conventional system employing mechanical seals.

The housing may also contain a battery for energising the circuit. Preferably, the display means is actuated only when required, for example, on depression of a push button mounted on the housing.

The electronic circuit may include a free-running oscillator, a counter connected to the output of the oscillator, a means for storing the count of the counter at the instant the electrical signal is received, and a multi-digit display arranged to display the value of the stored count.

The apparatus of this invention could be used in other applications, for example in sealing bank vaults, security boxes, deed boxes or other containers where access is allowed only to authorised person. The apparatus could be used to seal buildings, eg. at night, the key holder who locks the building recording the number display by the apparatus. The number could be communicated to security patrols to enable them to check that the door has not been opened since the building was locked.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a reusable seal in accordance with the invention;

Figure 2 is a front elevation of the seal;

Figure 3 is a section on line III-III of Figure 2;

Figure 4 is a rear view of the seal, with a cover of the housing removed, and

Figure 5 is a block diagram of the electronic circuit of the seal.

Figures 1 to 5 illustrate a reusable seal, primarily for vehicles or containers, consisting of a housing 10 and a cable 12 permanently secured at one end to the housing and having at its other end a head 14 enabling it to be connected to the housing by means of a catch mechanism 20. The housing has a multi-digit display 70, which displays a number which is changed on each actuation of the catch mechanism 20, as described below.

The housing 10, which may be of diecast aluminium or other suitable material, is in the form of a shallow box. The housing can be secured to the outer face of the door or shutter of the vehicle or container, with the rear wall 24 of the housing lying flat against the door or shutter, by means of bolts 22, the heads of which are recessed into the front wall 26 of the housing. At each end of the housing is a bar 27, providing alternative attachment points for the cable 12. The cable 12, which may for example be a multi-stranded wire cable, is formed with a loop 13 at one end, by means of which it is secured to the housing, the cable passing around one of the bars 27 and through the loop 13. This method of securing the end of the cable to the housing enables the cable to be replaced, for ex-

ample in the event of damage. The enlarged head at the other end of the cable 12 fits into a recess 30 in the front wall 26 of the housing 10. The recess 30 opens laterally through a slot 32 wide enough to accommodate the cable 12 but narrower than the head. The catch mechanism 20 consists of a knob 34 which is rotatable mounted on the front wall of the housing 10, so that it can be turned manually. A peg 36 projects outwards from the knob 34. The knob can be moved between two positions, in one of which the peg 36 extends over the recess 30 to trap the head 14 of the cable 12 in the recess and in the other of which (shown in broken lines in Figure 2) the peg is clear of the recess so that the head can be moved into and out of the recess. The knob 34 has a shaft 38 which extends through an aperture in the front wall 26 and is retained by a nut 40. An O-ring 41 is provided to prevent moisture and dirt entering the housing.

A cam plate 42 is fixed to the shaft 38 so as to rotate with the shaft. On one side, the cam plate is formed with two recess 44 which can be engaged by a spring detent 48 to define the two positions of the knob 34. On the other side, the cam plate 42 has a cam surface 50 which engages the actuating arm of a microswitch 52, mounted in the housing 10, so that the microswitch is actuated as the knob 34 moves from the release position to the locking position.

The knob 34 has a central recess housing a sealed electric switch 58 opposed by a push-button 60 positioned in the centre of the knob. Depression of the push-button 60 closes normally-open contacts of the switch. A pair of leads 62 extend from the switch 58 through a bore in the shaft 38 of the knob 34 to the interior of the housing 10.

The part 28 of the front wall 26 on which knob 34 is mounted is set back from the remainder of the front wall, so that the knob does not stand proud of the housing. The knob 34 has hole 54 which, when the knob is in the locking position, is aligned with a groove 56 in the bottom wall of the housing 10. This enables the knob to be secured in the locking position, for example by inserting a pin or the shackle of a padlock through the hole 54 to engage in the groove 56, to prevent the knob 34 from being moved inadvertently to the release position.

The electronic components of the apparatus are mounted on two printed circuit boards 72 and 74 fixed in the housing 10. The printed circuit board 72 carries the LED display 70, positioned behind a transparent window 76 in the front wall 26 of the housing 10. The compartment of the housing containing the printed circuit boards is separated from the compartment combining the microswitch 25 and the associated moving parts by a wall 78, so

that the electronic components can be encapsulated by filling the compartment with a suitable potting material.

The remainder of the housing 10 forms a battery compartment containing a number of dry cells 78, which are permanently connected by leads to the electronic circuitry of the apparatus. The housing 10 has an opening in the base which is closed by a cover after assembly of the apparatus. The cover may be removable, to allow the dry cells 78 to be replaced. Alternatively, the dry cells may be potted and the cover may be permanently fixed in place to form a sealed-for-life unit.

As shown in Figure 5, the microswitch 52 is connected to a pulse shaping circuit 80 which, on actuation of the microswitch, supplies an input signal pulse to an integrated circuit 82 which incorporates a free-running oscillator, counter and driver. The oscillator runs continuously, so that the counter, which is driven by the oscillator, counts repeatedly through a cycle from 0 to 9999. On receipt of the signal pulse from the pulse shaping circuit, the count of the circuit 82 is latched at the instantaneous count of the counter. The circuit thus acts as a random number generator, producing a random number as a result of each actuation of the microswitch 52, the number being stored in the circuit 82 until the next actuation of the microswitch. The output of the counter is supplied to the four-digit LED display 70. The display 70 is energised through four AND gates 86, which also receive an input from a timer 88 connected to push-button switch 58, so that the display is enabled only for a pre-set time, say for five seconds after actuation of the push-button switch 58. A sensing circuit 90 is provided to sense when the battery voltage falls below a predetermined threshold and to give a warning display, for example by causing decimal points to appear on the display 70. The microswitch 52, cam plate 42 and knob 34 are so arranged that, when the knob is moved from the release position to the locking position, the microswitch is actuated before the knob reaches a point at which the head 14 will remain held in the recess 30 by the peg 36, to ensure that a new number is generated even if the knob is not moved fully to the locked position. This can be achieved by arranging for the microswitch to be actuated before the peg 36 reaches the recess 30, or before it reaches a point at which the spring detent will allow the knob 34 to remain in position without returning it to the release position.

The circuit can be arranged so that a new number is generated only when the knob 34 is moved to the locking position. Alternatively, the circuit can be arranged so that a new number is generated both when the knob is moved to the release position and also when it is moved to the

locking position. In a further alternative, the device could be arranged to generate a new number only when the knob 34 moves to the release position, in which case it is necessary to ensure that the microswitch 52 operates before the head 14 is released. In use of the seal, after the vehicle or container has been loaded and the door or shutter closed, the free end of the cable 12 is detached from the housing 10 and passed through the door or shutter catch 200, in similar manner to a conventional wire seal, so that the door or shutter cannot be opened without withdrawing the cable. The free end of the cable is then reattached to the housing 10 and the knob 34 turned to the locking position. Turning the knob 34 actuates the microswitch 52 to cause a new random to be generated. Button 60 is pressed to display the number on the LED display 70, and the number is entered on the vehicle documents. When the vehicle has reached its destination, the button is again depressed and the number displayed checked against the number entered on the vehicle documents, to check that the seal has not been opened during the journey.

It will be appreciated that modifications could be made in the described embodiment. For example, the method of releasably attaching the free end of the cable to the housing could take different forms. The other end of the cable could be permanently attached to the housing in different ways or could be attached to the door or shutter near the housing, rather than to the housing itself. Instead of having one end permanently secured to the housing, both ends of the cable could be releasably attached to the housing. Instead of generating and displaying random number, other recognisable codes could be used, for example a series of letters.

Claims

1. Apparatus for recording the opening or closing of a closure member such as a door controlling access to an enclosed space, the apparatus comprising a housing (10), a flexible element (12) attached at one end to the housing (10) or to the closure member and adapted to be linked to a catch of the closure member so that the flexible element (12) must be withdrawn from the catch before the closure member can be opened, attachment means (20) for releasably attaching the other end of the flexible element (12) to the housing (10), means in the housing for generating and displaying a random code on operation of the attachment means (20) and for storing the generated code, characterised in that the attachment means (20) comprises a recess (30) in the housing (10) adapted to receive an enlarged head (14)



that the electronic components can be encapsulated by filling the compartment with a suitable potting material.

The remainder of the housing 10 forms a battery compartment containing a number of dry cells 78, which are permanently connected by leads to the electronic circuitry of the apparatus. The housing 10 has an opening in the base which is closed by a cover after assembly of the apparatus. The cover may be removable, to allow the dry cells 78 to be replaced. Alternatively, the dry cells may be potted and the cover may be permanently fixed in place to form a sealed-for-life unit.

As shown in Figure 5, the microswitch 52 is connected to a pulse shaping circuit 80 which, on actuation of the microswitch, supplies an input signal pulse to an integrated circuit 82 which incorporates a free-running oscillator, counter and driver. The oscillator runs continuously, so that the counter, which is driven by the oscillator, counts repeatedly through a cycle from 0 to 9999. On receipt of the signal pulse from the pulse shaping circuit, the count of the circuit 82 is latched at the instantaneous count of the counter. The circuit thus acts as a random number generator, producing a random number as a result of each actuation of the microswitch 52, the number being stored in the circuit 82 until the next actuation of the microswitch. The output of the counter is supplied to the four-digit LED display 70. The display 70 is energised through four AND gates 86, which also receive an input from a timer 88 connected to push-button switch 58, so that the display is enabled only for a pre-set time, say for five seconds after actuation of the push-button switch 58. A sensing circuit 90 is provided to sense when the battery voltage falls below a predetermined threshold and to give a warning display, for example by causing decimal points to appear on the display 70. The microswitch 52, cam plate 42 and knob 34 are so arranged that, when the knob is moved from the release position to the locking position, the microswitch is actuated before the knob reaches a point at which the head 14 will remain held in the recess 30 by the peg 36, to ensure that a new number is generated even if the knob is not moved fully to the locked position. This can be achieved by arranging for the microswitch to be actuated before the peg 36 reaches the recess 30, or before it reaches a point at which the spring detent will allow the knob 34 to remain in position without returning it to the release position.

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It will be appreciated that modifications could be made in the described embodiment. For example, the method of releasably attaching the free end of the cable to the housing could take different forms. The other end of the cable could be permanently attached to the housing in different ways or could be attached to the door or shutter near the housing, rather than to the housing itself. Instead of having one end permanently secured to the housing, both ends of the cable could be releasably attached to the housing. Instead of generating and displaying random number, other recognisable codes could be used, for example a series of letters.

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on the end of the flexible element (12) and a catch member (34, 36) movable on the housing between a clamping position in which the catch member (34, 36) prevents the head (14) from being moved from the recess (30) and a release position in which the head (14) can be moved into and from the recess (30), and in that the means for generating and displaying the random code comprises means (52) for providing an electrical signal in response to actuation of the catch member (34, 36) to attach the flexible element (12) to or detach it from the housing (10), an electronic circuit (80, 82) adapted to generate a random code on receipt of the electrical signal and to store the generated code, and electronic display means (70) adapted to display the generated code.

2. Apparatus as claimed in Claim 1, in which the electronic circuit (80, 82) is adapted to generate a random or quasi-random number on receipt of the electrical signal.

3. Apparatus as claimed in Claim 2, characterised in that electronic circuit (80, 82) includes a free-running oscillator, a counter connected to the output of the oscillator, means for storing the count of the counter at the instant the electrical signal is received, and a multi-digit display (70) arranged to display the value of the stored count.

4. Apparatus as claimed in any one of Claims 1 to 3, characterised in that the means for providing an electrical signal comprises a switch (52) in the housing (10) actuated on movement of the catch member (34, 36) from one of the said positions to the other.

5. Apparatus as claimed in any of claims 1 to 4 characterised in that a battery (78) for energising the electronic circuit (80, 82) and display means (70) is mounted within the housing (10), and manually operated means, such as a switch (58) operated by a push-button (60) mounted on the housing (10), are provided to cause actuation of the display means (70) to display the code stored by the electronic circuit (80, 82).

Revendications

1. Appareil pour l'enregistrement de l'ouverture ou de la fermeture d'un élément de fermeture, tel qu'une porte commandant l'accès à un espace clos, l'appareil comprenant un boîtier (10), un élément flexible (12) attaché, à une extrémité, au boîtier (10) ou à l'élément de

fermeture et pouvant être relié à un loquet de l'élément de fermeture de manière telle qu'il faut retirer l'élément flexible (12) du loquet avant de pouvoir ouvrir l'élément de fermeture, des moyens d'attache (20) pour attacher de façon libérable l'autre extrémité de l'élément flexible (12) au boîtier (10), des moyens contenus dans le boîtier pour engendrer et afficher un code aléatoire lors de la manœuvre des moyens d'attache (20) et pour stocker le code engendré, caractérisé en ce que les moyens d'attache (20) comprennent un logement (30), ménagé dans le boîtier (10) et prévu pour recevoir une tête élargie (14) formée sur l'extrémité de l'élément flexible (12), et un verrou (34,36) déplaçable sur le boîtier entre une position de blocage, dans laquelle le verrou (34,36) empêche la tête (14) de sortir du logement (30), et une position de libération dans laquelle la tête (14) peut être introduite dans le logement (30) et extraite de celui-ci, et en ce que les moyens de génération et d'affichage du code aléatoire comprennent des moyens (52) d'émission d'un signal électrique en réponse à la manœuvre du verrou (34,36) pour attacher ou détacher l'élément flexible (12) du boîtier (10), un circuit électronique (80,82) capable d'engendrer un code aléatoire lors de la réception du signal électrique et de stocker le code engendré, et des moyens d'affichage électroniques (70) capables d'afficher le code engendré.

2. Appareil suivant la revendication 1, dans lequel le circuit électronique (80,82) est conçu pour engendrer un nombre aléatoire ou quasi-aléatoire lors de la réception du signal électrique.

3. Appareil suivant la revendication 2, caractérisé en ce que le circuit électronique (80,82) comprend un oscillateur à fonctionnement libre, un compteur connecté à la sortie de l'oscillateur, des moyens de stockage du compte du compteur à l'instant où le signal électrique est reçu, et un affichage à plusieurs chiffres (70) prévu pour afficher la valeur du compte stocké.

4. Appareil suivant l'une quelconque des revendications 1 à 3, caractérisé en ce que les moyens d'émission d'un signal électrique comprennent un contact (52) placé dans le boîtier (10) et actionné lors du déplacement du verrou (34,36) d'une desdites positions à l'autre.

5. Appareil suivant l'une quelconque des revendications 1 à 4, caractérisé en ce qu'une pile électrique (78), pour l'alimentation du circuit



électronique (80,82) et des moyens d'affichage (70), est placée dans le boîtier (10), et des moyens commandés manuellement, tels qu'un interrupteur (58) commandé par un bouton-poussoir (60) monté sur le boîtier (10), sont prévus pour commander l'allumage des moyens d'affichage (70) afin d'afficher le code stocké par le circuit électronique (80,82).

Patentansprüche

1. Vorrichtung zum Aufzeichnen des Öffnens oder Schließens eines Schließelementes wie beispielsweise einer Tür, welches den Zugang zu einem umschlossenen Raum kontrolliert, wobei die Vorrichtung ein Gehäuse (10) aufweist, ein an einem Ende an dem Gehäuse (10) oder an dem Schließelement befestigtes flexibles Element (12), welches zur Verbindung mit einer Verriegelung des Schließelementes ausgebildet ist, so daß das flexible Element (12) von der Verriegelung entfernt werden muß, bevor das Schließelement geöffnet werden kann, eine Befestigungseinrichtung (20), um lösbar das andere Ende des flexiblen Elements (12) an dem Gehäuse (10) zu befestigen, eine Einrichtung in dem Gehäuse zur Erzeugung und zur Anzeige eines Zufallscodes bei einer Betätigung der Befestigungseinrichtung (20) und zum Speichern des erzeugten Codes, dadurch gekennzeichnet, daß die Befestigungseinrichtung (20) eine Ausnehmung (30) in dem Gehäuse (10) aufweist, die zur Aufnahme eines vergrößerten Kopfes (14) am Ende des flexiblen Elements (12) ausgebildet ist, und ein Verriegelungsteil (34, 36), welches auf dem Gehäuse zwischen einer Klemmposition bewegbar ist, in welcher das Verriegelungsteil (34, 36) verhindert, daß der Kopf (14) aus der Ausnehmung (30) herausbewegt wird, und einer Löseposition, in welcher der Kopf (14) in die Ausnehmung (30) hinein und aus dieser heraus bewegt werden kann, und daß die Einrichtung zur Erzeugung und zur Anzeige des Zufallscodes eine Einrichtung (52) aufweist, um in Reaktion auf die Betätigung des Verriegelungsteils (34, 36), um das flexible Element (12) an dem Gehäuse (10) zu befestigen oder es von diesem zu entfernen, ein elektrisches Signal zur Verfügung zu stellen, eine elektronische Schaltung (80, 82), die zur Erzeugung eines Zufallscodes beim Empfang des elektrischen Signals und zum Speichern des erzeugten Codes ausgebildet ist, und eine elektronische Anzeigeeinrichtung (70), die zur Anzeige des erzeugten Codes ausgebildet ist.
2. Vorrichtung nach Anspruch 1, bei welcher die elektronische Schaltung (80, 82) dazu ausgebildet ist, eine Zufallszahl oder eine Quasi-Zufallszahl beim Empfang des elektrischen Signals zu erzeugen.
3. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß die elektronische Schaltung (80, 82) einen freilaufenden Oszillator aufweist, einen an den Ausgang des Oszillators angeschlossenen Zähler, eine Einrichtung zum Speichern des Zählwertes des Zählers in dem Moment, in welchem das elektrische Signal empfangen wird, und eine Mehrziffernanzeige (70), die zur Anzeige des gespeicherten Zählwertes ausgebildet ist.
4. Vorrichtung nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die Einrichtung zur Bereitstellung eines elektrischen Signals einen Schalter (52) in dem Gehäuse (10) aufweist, der bei einer Bewegung des Verriegelungsteils (34, 36) von der einen in die andere Position betätigt wird.
5. Vorrichtung nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß eine Batterie (78) zur Stromversorgung der elektrischen Schaltung (80, 82) und die Anzeigeeinrichtung (70) innerhalb des Gehäuses (10) angebracht sind, und daß manuell betätigte Einrichtungen, beispielsweise ein durch eine Drucktaste (60), die auf dem Gehäuse (10) angebracht ist, betätigter Schalter (58) vorgesehen sind, um ein Einschalten der Anzeigeeinrichtung (70) zur Anzeige des von der elektronischen Schaltung (80, 82) gespeicherten Codes zu veranlassen.