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(54) METHOD OF CARGO SECURITY MONITORING

VERFAHREN ZUR FRACHTSICHERHEITSÜBERWACHUNG

PROCÉDÉ DE SURVEILLANCE DE SÉCURITÉ DE FRET

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Description

[0001] The invention applies to cargo sealing and can be used for both locking and sealing of doors, cargo canvas covers, containers, tank hatches etc.

[0002] There is a method of ensuring the security of a cargo by covering it with flexible canvas cover followed by canvas edge fastening to the casing of monitored item with rope (RU, C1, No. 2243907, 2005).

[0003] Disadvantage of this known solution is low safety of item covered by canvas cover.

[0004] The nearest to the claimed invention is an electronic sealing module with a socket for non-reusable mechanical locking device with flexible enveloping cord. The casing of the module hosts an electronic unit with electronic components which control the seal, track its closing, location and movements, as well as receive, process, store and transfer data for which purpose the electronic module generates electromagnetic signal registered by an external receiver (RU, U1, No. 125237, 2013).

[0005] Disadvantage of this known solution is its low sealing security.

[0006] Another security device is known from WO 03/042959 A1 facilitating sealing and tracking of a container. The device comprises a bolt which extends through openings in a latch mechanism on the container. The bolt also passes through spaced coils of the seal device. The seal device uses one coil to generate a magnetic field, while monitoring the corresponding magnetic field induced in the other coil. Tampering with the bolt affects the magnetic field, which in turn permits the seal device to detect the tampering. The seal device periodically transmits wireless signals, which can be remotely received for purposes of tracking the container and monitoring the integrity of the seal.

[0007] Another security device is known from US 5097253 A having a control box containing an electronic system and a communications loop over which the system transmits a signal. The device is constructed so that the communications loop can extend from the control box across the boundary of a portal such as a door into a sealed enclosure into which access is restricted whereby the loop must be damaged or moved in order for an entry to be made into the enclosure. The device is adapted for detecting unauthorized entries into such enclosures and for recording the time at which such entries occur for later reference. The security device includes a microprocessor-based electronic system and a detection module capable of registering changes in the voltage and phase of the signal transmitted over the loop.

[0008] The purpose of the claimed invention is to improve protection of cargo items from unauthorized access. In addition, the claimed method extends the functionality of cargo securing by implementing a method of sealing the canvas and similar items used to cover the cargo on a vehicle. The invention is defined by the appended claims.

[0009] These technical results are achieved in the

method of cargo security control by using a watchdog circuit having the form of a closed loop comprising an elongated current-conducting flexible control element that runs through eyelets in the secured cargo item or in the casing of said item, as well as through primary and secondary toroidal-core induction coils located with a gap between them in a monitoring device casing. A generator induces electromagnetic pulse signals in the primary induction coil thus originating electromotive force (EMF) in the secondary induction coil that comprises monitored signal; the EMF value is monitored by the monitoring device comprising a converter, a threshold device as analog-to-digital converter, an actuator and a microprocessor connected in series; and the data of the monitored signal are sent over a wireless channel by an electronic transmitting module. A monitoring device with a socket for replaceable mechanical seals is used.

[0010] The elongated current-conducting flexible control element may comprise a current-conducting cord made of metal or synthetic materials with metallic filament.

[0011] The elongated current-conductive flexible control element may comprise a cord made of polymer material with current-conducting metal coating applied by spraying.

[0012] The claimed method allows securing the monitored item (cargo) and tracking its location online both by replaceable non-reusable mechanical seals and without them, for instance, only by using vehicle canvas covers.

[0013] Fig.1 shows principal diagram of a device, which uses the claimed method.

[0014] To implement this method of securing an object (not shown), a watchdog circuit having the form of a closed loop made of current-conducting flexible element 1, namely, a cord, wire, braid with a metal-coated wire etc. is used; the flexible element 1 runs through holes in the body of the secured cargo item, i.e. through lugs in a closed door, hatch etc., or through the holes in the perimeter edge of flexible cover or canvas. The flexible element 1 also passes through toroidal primary 2 and secondary 3 induction coils hosted with a gap between them in the monitoring device casing, which has at least one hole to pass current-conducting flexible element 1.

[0015] Generator 4 sends a pulse to toroidal coil of the primary induction coil 2 the electromagnetic field of which induces EMF in the closed loop of flexible element 1. The electric current that runs through the closed loop of flexible element 1 generates electromagnetic field, which induces EMF in the secondary induction coil 3. Parameters of the induced EMF are measured and sequentially processed by converter 5, threshold device 6, and actuator 7; then the results are stored in the memory of microprocessor 8.

[0016] Toroidal coils 2, 3 and elements 4, 5, 6 and 7 that generate, measure, and check parameters of generated pulse, as well as microprocessor 8 can be located inside the casing (not shown) of the monitoring module

(device) which may also have a socket for a replaceable non-reusable seal. In such case, the cord of mechanical seal plays the role of flexible element 1. After passing the cord through the holes of the monitoring module casing, through the lugs of the secured cargo item and fastening the cord in a certain position, a loop is formed the status of which ("closed/opened") is controlled based on parameters of the signal in the toroidal induction coil 3.

[0017] If these parameters are changed as a result of violating integrity of the watchdog element or changing the parameters of the loop evidencing that its is open or that there was an attempt to open it, a wireless signal is sent to a monitoring center (situation center) and to cargo forwarding and delivery points.

[0018] A canvas-covered cargo item can be secured by passing the ends of flexible element 1 (which may be current-conducting metal cord made of natural or synthetic materials with metallic filament) through the holes along the canvas perimeter or through rings attached to canvas edges, and then passing these ends through a monitoring device with toroidal coils 2, 3 and elements 4-8; after that, the ends of the cord are tightly fixed by any well-known method, i.e. fastening, twisting or fixing with known mechanical fixers.

[0019] The elongated flexible current-conducting control element 1 can comprise a flexible cord made of polymer material with current-conducting metallic coating applied by spraying.

[0020] During cargo transportation, the electronic module (monitoring device) generates a pre-programmed signal received by an external receiver and then sent to a control room over a wireless communication channel.

Claims

1. A method of cargo security control comprising:

- forming a watchdog circuit of a control element that runs through eyelets in a secured cargo item, as well as through primary (2) and secondary (3) toroidal-core induction coils arranged with a gap between them,
- inducing of a monitored signal in the primary induction coil (2) by means of an electromagnetic pulse signal generator (4), the monitored signal inducing electromotive force (EMF) in the secondary induction coil (3),
- subsequent monitoring of value of the monitored signal in the secondary coil (3) by a monitoring device comprising a converter (5), a threshold device (6) made in the form of an analog-to-digital converter, an actuator (7) and a microprocessor (8) connected in series, and
- sending of data for the monitored signal over a wireless channel by an electronic transmitting module,

characterized by that

- placing the induction coils (2 and 3) in a casing of the monitoring device, and
- using as the watchdog circuit a closed loop of an elongated current-conducting flexible control element (1) of a replaceable mechanical seal placed in a socket in the casing of the monitoring device.

2. A method of cargo security control as per claim 1 **characterized by** using a cord made of natural or synthetic material with metallic filament as elongated flexible current-conducting control element (1).
3. A method of cargo security control as per claim 1 **characterized by** using an elongated flexible current-conducting control element (1) having the form of a cord made of polymer material with metallic coating applied by spraying.
4. A method of cargo security control as per claim 1 wherein the watchdog circuit has the form of a closed loop comprising an elongated current-conducting flexible control element (1) that runs through eyelets in the casing of the secured cargo item.

Patentansprüche

1. Verfahren zur Frachtgutsicherheitskontrolle, umfassend:
 - Bilden eines Überwachungsschaltkreises eines Steuerelements, das durch Ösen in einem gesicherten Frachtgut sowie durch Primär- (2) und Sekundär- (3) Ringkern-Induktionsspulen verläuft, die mit einem Spalt dazwischen angeordnet sind,
 - Induzieren eines überwachten Signals in der Primärinduktionsspule (2) mittels eines elektromagnetischen Impulssignalgenerators (4),
 - das überwachte Signal, das die elektromotorische Kraft (EMK) in der sekundären Induktionsspule (3) induziert,
 - anschließende Überwachung des Wertes des überwachten Signals in der Sekundärspule (3) durch eine Überwachungseinrichtung mit einem Wandler (5), einer Schwellwerteinrichtung (6) in Form eines Analog-Digital-Wandlers, einem Aktuator (7)) und einem in Reihe geschalteten Mikroprozessor (8) und
 - Senden von Daten für das überwachte Signal über einen drahtlosen Kanal durch ein elektronisches Sendemodul,**gekennzeichnet durch**
 - Platzieren der Induktionsspulen (2 und 3) in einem Gehäuse des Überwachungsgeräts, und

- Verwenden als Überwachungsschaltkreis eines geschlossenen Regelkreises eines länglichen, stromleitenden, flexiblen Steuerelements (1) eines austauschbaren mechanischen Siegels, das in einer Buchse im Gehäuse des Überwachungsgeräts untergebracht ist. 5
2. Verfahren zur Frachtgutsicherheitskontrolle nach Anspruch 1, **dadurch gekennzeichnet, daß** als längliches stromleitendes flexibles Steuerelement (1) eine Schnur aus natürlichem oder synthetischem Material mit metallischem Faden verwendet wird. 10
3. Verfahren zur Frachtgutsicherheitskontrolle nach Anspruch 1, **dadurch gekennzeichnet, dass** ein längliches, flexibles, stromleitendes Steuerelement (1) in Form einer Schnur aus Polymermaterial mit einer durch Sprühen aufgetragenen Metallbeschichtung verwendet wird. 15
4. Verfahren zur Frachtgutsicherheitskontrolle nach Anspruch 1, wobei der Überwachungsschaltkreis die Form einer geschlossenen Schleife aufweist, die ein längliches stromleitendes flexibles Steuerelement (1) umfasst, das durch Ösen in dem Gehäuse des gesicherten Frachtguts verläuft. 20 25
- dans un boîtier du dispositif de surveillance, et
- pour le circuit de surveillance il est utilisé une boucle fermée d'un élément de commande (1) électro-conducteur allongé et flexible d'une fermeture mécanique remplaçable qui est placée dans une cavité du boîtier du dispositif de surveillance.
2. Méthode de contrôle de la sécurisation d'un fret selon la revendication 1, **caractérisée par** l'utilisation d'un cordon fait d'un matériau naturel ou synthétique avec un filament métallique en tant qu'élément de commande (1) électro conducteur allongé et flexible. 10
3. Méthode de contrôle de la sécurisation d'un fret selon la revendication 1, **caractérisée par** l'utilisation d'un élément de commande (1) électro conducteur allongé et flexible ayant la forme d'un câble fait d'un matériau polymère avec un revêtement métallique déposé par pulvérisation. 15 20
4. Méthode de contrôle de la sécurisation d'un fret selon la revendication 1, selon laquelle le circuit de surveillance présente la forme d'une boucle fermée comprenant l'élément de commande (1) électro conducteur allongé et flexible qui circule à travers des œillets dans un boîtier de l'article de fret sécurisé. 25 30

Revendications

1. Méthode de contrôle de la sécurisation d'un fret, comprenant : 30
- la formation d'un circuit de surveillance d'un élément de contrôle traversant des œillets dans un article de fret sécurisé, ainsi que traversant des bobines d'induction primaire (2) et secondaire (3) à noyau toroïdal avec un espace ménagé entre elles, 35
 - la génération d'un signal de surveillance dans la bobine d'induction primaire au moyen d'un générateur (4) d'un signal d'impulsion électromagnétique, 40
 - la production d'une force électromotrice (EMF) par le signal de surveillance dans la bobine d'induction secondaire (3), 45
 - ensuite la surveillance de la valeur du signal de surveillance dans la bobine secondaire (3) par un dispositif de surveillance comprenant un convertisseur (5), un dispositif à seuil (6) réalisé sous forme d'un convertisseur analogique-numérique, un actionneur (7) et un microprocesseur (8) connectés en série, et 50
 - la transmission de données au signal de surveillance via un canal sans fil par un module électronique de transmission, 55
- caractérisée en ce que,**
- les bobines d'induction (2 et 3) sont placées

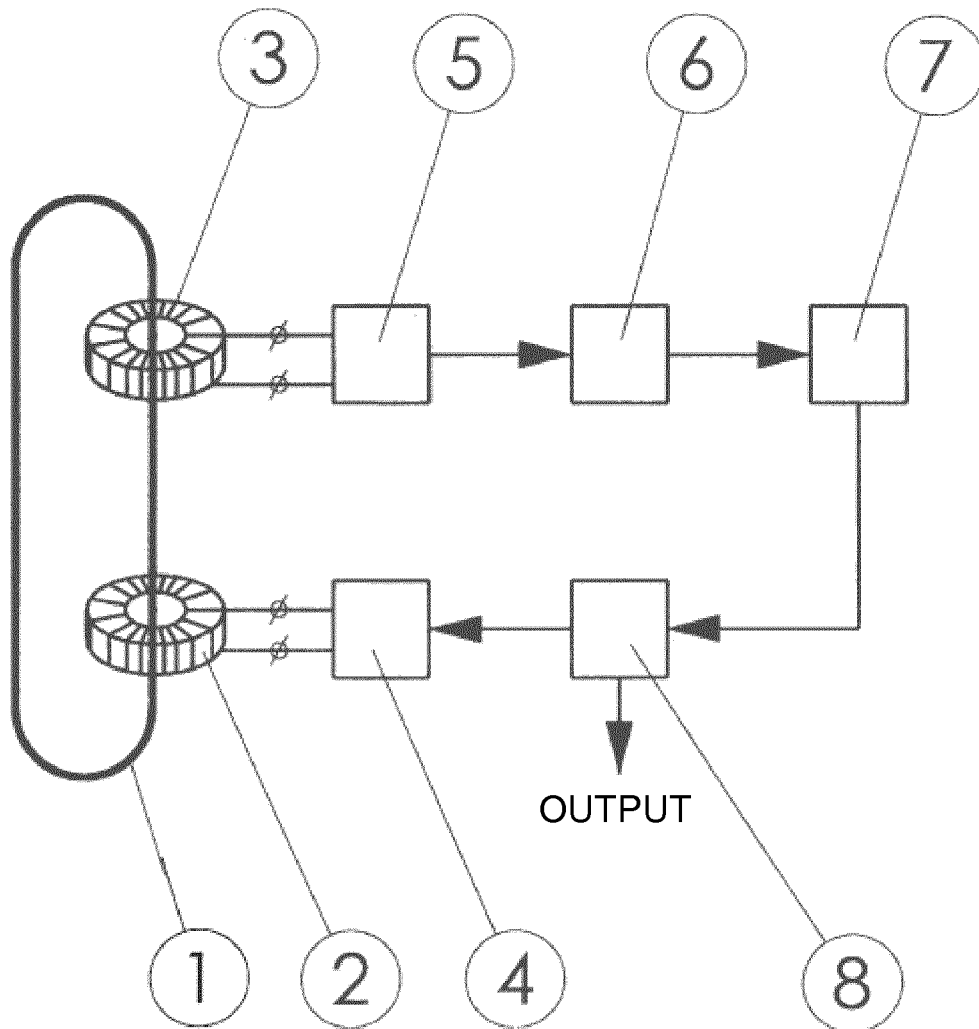


Fig. 1

REFERENCES CITED IN THE DESCRIPTION

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