



(11)

EP 3 064 678 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.09.2016 Bulletin 2016/36

(51) Int Cl.:
E05B 39/00 (2006.01) **E05B 45/00** (2006.01)
E05B 83/02 (2014.01) **G09F 3/03** (2006.01)

(21) Application number: **16158848.8**

(22) Date of filing: **04.03.2016**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(30) Priority: **05.03.2015 IT TO20150149**

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(54) **TELEMATIC SATELLITE LOCK FOR CONTAINER**

(57) A burglary-prevention device for containers with telematic connection comprising: an electronic lock (3), which can be coupled to a first lock eye (4a) and a second lock eye (4b) of leaves of a door of the container and comprises an RFID device; and a telematic unit (10), connected to the RFID device and designed to communicate with a central control unit by transmitting the instantane-

ous position detected by the telematic unit (10). The telematic unit (10) is designed to detect the integrity of the circuit connection between the RFID device and the telematic unit itself and is designed to emit a warning of possible burglary in the case of even partial interruption of said circuit connection.

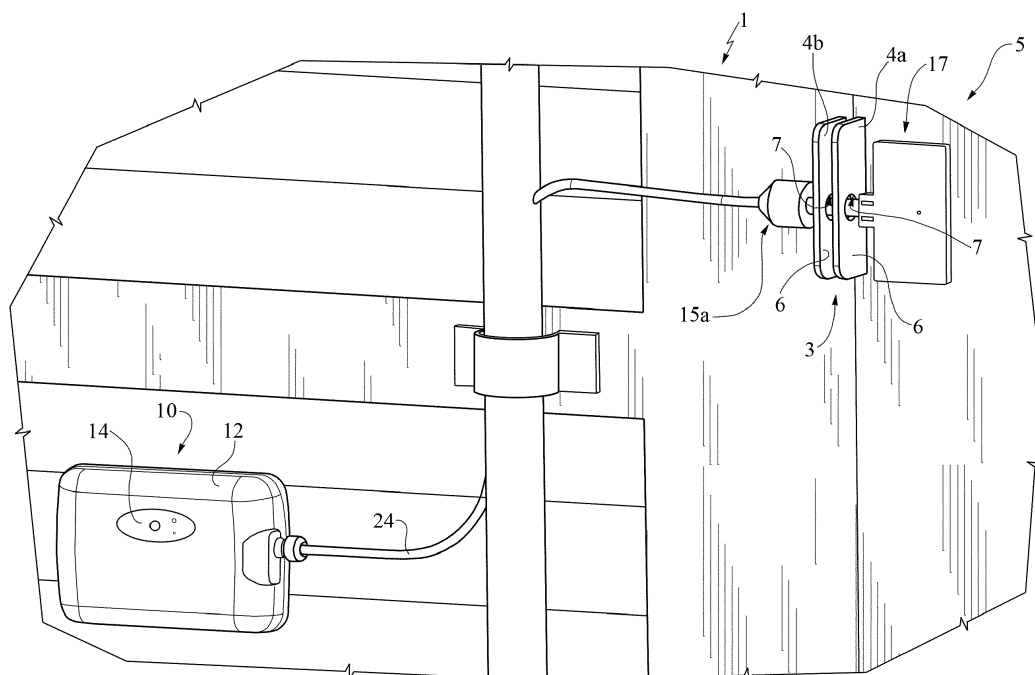


FIG. 1

Description

[0001] The present invention relates to a burglary-prevention device for containers with telematic connection.

[0002] As is known, handling of goods is carried out chiefly using containers. It is also known how many of these containers get tampered with, lost, or stolen during the shipping operations, for example by sea.

[0003] In order to trace the movement of containers, there has been proposed the use of RFID devices that are associated to the containers and are queried by reading systems arranged at check barriers, for example customs barriers, or via portable RFID reading systems. Said RFID devices may, however, be easily removed from the container, rendering in effect the querying system uncertain in so far as the container could be stolen or tampered with, while the RFID device is kept in place in order to simulate the presence of the container itself. Moreover, not all RFID devices lose their functionality following upon tampering, so that they continue to be identified, without any possibility of realizing that they have been tampered with.

[0004] The aim of the present invention is to provide a device whereby it will be easy to identify attempts at removal of the RFID device or of theft or burglary of the container.

[0005] The above aim is achieved by the present invention in so far as it regards a burglary-prevention device for containers of the type specified in Claim 1. The invention will now be described with reference to the attached drawings, which illustrate a preferred non-limiting embodiment thereof and in which:

Figure 1 is a perspective view of a burglary-prevention device for containers with telematic connection in an operating condition;

Figures 2 and 3 are perspective views of a first part (electronic lock) of the device of Figure 1;

Figure 4 is a perspective view of a first portion of the electronic lock;

Figures 5 and 6 are partially exploded perspective views of a second portion of the electronic lock; and
Figures 7, 8, and 9 illustrate installation of the burglary-prevention device.

[0006] In Figure 1 designated as a whole by 1 is a burglary-prevention device for containers with telematic connection.

[0007] The device 1 comprises an electronic lock 3, which can be coupled to a first lock eye 4a and a second lock eye 4b of a door 5 (represented partially) of a container (not illustrated as a whole). The device 1 comprises an RFID device, which will be described in greater detail hereinafter.

[0008] According to the example of embodiment illustrated, the lock eyes 4a, 4b are formed by first and second rectangular metal plates 6, stably connected to edges of respective leaves of the door 5 and provided with circular

through holes 7 for housing of the lock 3 with the modalities that will be clarified hereinafter.

[0009] The device 1 further comprises a telematic unit 10 connected via cable to the RFID device and designed to communicate, by means of known technologies, with a central control unit (not illustrated) for transmitting the detected instantaneous position of the telematic unit and other information. The telematic unit 10 is designed to detect the integrity of the circuit connection between the RFID device and the telematic unit 10 itself and is designed to emit a warning of possible burglary in the case of even partial interruption of the circuit connection. The data connection between the telematic unit and the central unit is made by means of known technologies, for example cellular and/or satellite data network.

[0010] The telematic unit 10 is housed within a protective casing 12 made of high-strength plastic material and provided with permanent magnets (see Figure 9) for connection of the protective casing 12 to a metal wall of the container 5. In the example of embodiment illustrated, the protective casing 12 has a parallelepipedal shape with rounded corners and is provided with a base wall (Figure 9), provided on which are four cylindrical lowered seats, within which the permanent magnets 13, which have a cylindrical shape, are arranged. The permanent magnets 13 project by a few millimetres from the base wall. The base wall is also provided with an optional central biadhesive element. The protective casing 12 is provided with a pushbutton 14 that can be operated for activating the device 10, and with a warning LED that, when lit up, indicates that the telematic unit 10 is operating. The telematic unit 10, following upon its activation, can only be deactivated in a remote way by means of technologies of a known type that will not be described any further. It is consequently not possible to act from outside the telematic unit 10 to deactivate it.

[0011] With reference to **Figures 2 and 3**, the electronic lock 3 comprises a body 15, elongated along an axis 16 and configured for engaging, in use, the lock eyes 4a, 4b setting itself with its axis 16 coinciding with the axis of the holes 7 of the lock eyes 4a, 4b.

[0012] The elongated body 15 has a first end portion 15a widened in a radial direction designed to come to bear, in use, upon the plate 6 of a first lock eye 4a, and a second end portion 15b of the elongated body is configured for providing, in a stable coupling position (described in greater detail hereinafter, an electrical and mechanical connection with a supporting structure 17 that houses the RFID device. The supporting structure 17 is configured for bearing, in use, upon the plate 6 of the second lock eye 4b.

[0013] With particular reference to **Figure 4**, the elongated body 15 comprises a cylindrical tubular element that defines an internal cylindrical cavity 18 sharing the axis 16.

[0014] The elongated body 15, at its second end portion 15b, has a plane rectangular portion 19, which extends in an axial direction and onto which a rectangular

window 21 communicating with the internal cylindrical cavity 18 opens. Conveniently but not exclusively, the elongated body 15 is made of polycarbonate with glass-fibre filler.

[0015] The internal cylindrical cavity houses an elongated rectangular printed circuit 23, which is set parallel to the axis 16 and is stably fixed within the cavity 18. The printed circuit 23 defines a plurality of electrical lines (bus) having first ends communicating with an electrical cable 24 (see also Figures 1, 2, and 3) that exits from the first end portion 15a and ensures connection between the electronic lock 3 and the telematic unit 10.

[0016] The electrical lines (bus) have second free end portions that provide pads 26 (in the example, six rectangular pads, but the number and shape may obviously be different) configured for providing an electrical connection with the RFID device when the supporting structure 17 is properly coupled to the second end portion 15b of the elongated body 15 in the stable coupling position. In this way, decoupling of the supporting structure 17 from the second end portion 15b causes interruption of the electrical connection between the pads 26 and the RFID device.

[0017] Typically, the first end portion of the body 15 is obtained by co-moulding, on the cylindrical tubular element, a rigid plastic that englobes the electrical cable 24 and seals the internal cavity 18.

[0018] The supporting structure 17 (**Figure 5**) comprises a plane casing 30, entirely housing the RFID device, and centring and locking elements 31, designed to provide a positioning of the plane casing 17 on the elongated body 15 in the stable coupling position in which the pads 26 are connected to the RFID device.

[0019] The plane casing 17 has a rectangular shape and comprises a shell 32 that defines a lowered rectangular seat 33, which houses a plane rectangular printed circuit 34, provided on which is the RFID device, which can operate both in passive mode and in active mode. The electronic circuits (UHF antenna, transmitter/receiver device, microprocessor unit, energy-storage unit, etc.) provided on the printed circuit 34 are of a standard type and for this reason will not be described any further.

[0020] The shell 32 is closed by a plane wall 35 (not illustrated in Figure 6) provided with a central rectangular window 36, accessible through which, from outside the casing 30, are elastic electrical terminals 37 carried by a base 38, which extends from the printed circuit at the window 35. The rectangular window 36 can be provided with a rectangular perimetral gasket made of soft material. The electrical terminals 37 (in the example, six electrical terminals, but the number and shape may obviously be different) are designed to couple with respective pads 26 when the plane casing 17 is set in the stable coupling position. The connection between the shell 32 and the plane wall 35 can be obtained by gluing or by ultrasonic welding.

[0021] The locking elements 31 comprise a pair of rectilinear elastic appendages 40 set facing and parallel to

one another carried by a rectangular flange 42 that extends from a central portion of a side wall of the shell 32. The appendages 40 extend perpendicular to the plane defined by the wall 35 and are provided with widened end portions 42d. The distance between the appendages 40 is a little less than the diameter of the tubular elongated body 15. Said appendages 40 are configured for pressing on the elongated body when this is set between the appendages 40 themselves in the stable coupling position.

[0022] The centring elements 31 comprise a cylindrical pin 50, which extends from the flange 42 parallel to the appendages 40 between which it is set, and a cylindrical seat 52 (see Figure 4), provided on the side wall of the elongated body 15 and designed to house the pin 52 in the stable coupling position.

[0023] Finally, the supporting structure has a first through hole 70 (Figures 5 and 6), and the second end portion 15b of the elongated body 15 has a second through hole 72, said holes being arranged coaxial and in communication with one another in the stable coupling position. These holes 70, 72 can be used for passage of a filiform element 74 of a mechanical security seal of a known type (Figure 8).

[0024] In use, to install the device 1 the door of the container is closed by means of the mechanical closing devices of a known type. In this position, the plates 6 are parallel to one another and the holes 7 are coaxial. The protective casing 12 is then fixed to a portion of the door of the container 5 using the permanent magnets (see Figure 1), and the elongated body 15, without the supporting structure 17, is inserted in the holes 7 until the first end portion 15a comes to bear upon the first lock eye 4a. In this position, the second end portion 15b of the elongated body exits for a stretch from the second lock eye 4b. The supporting structure 17 is then pushed against the second end portion that exits from the lock eye 4b. In this way, the appendages 40 divaricate by being elastically loaded, and then the tubular body 15 snaps between the appendages 40, which push it to come so that it bears upon the wall 35. Conveniently, during these operations the end of the second end portion 15 sets itself bearing upon a contrast wall 55 that extends from the wall 35 (Figure 7).

[0025] The pin 50 engages the cylindrical seat 52, thus providing the stable coupling position in which the pads 26 couple with the electrical terminals 37 (Figure 8). The telematic unit 10 recognises a complete connection between the RFID unit and the electronic circuits (not illustrated) that query the RFID unit. The electronic unit 10 associates to said complete connection a completely closed state of the electronic lock. This state is sent to the central control unit by data transmission.

[0026] When the container is in the proximity of an electronic barrier provided with system for querying the RFID unit a connection is set up between said querying system and the telematic unit 10 for control of the passage of the containers through the barrier, which may, for example, be a customs barrier. These operations occur according

to known technologies and are consequently not described any further.

[0027] Any possible mechanical tampering of the electronic lock leads to interruption of the connection between the RFID unit and the telematic unit 10, for example:

- a) cutting of the electrical cable 24 involves interruption of the connection between the RFID unit and the telematic unit 10;
- b) cutting of the elongated body 15 involves cutting of the printed circuit 23 and of the buses formed thereon; also in this case, the telematic unit 10 is disconnected from the RFID unit;
- c) the attempt at tampering with the supporting structure 17 generally involves decoupling between the pads 26 and the electrical terminals 37 in so far as the parts move away from the stable coupling position; also in this case, the telematic unit 10 is disconnected from the RFID unit;
- d) removal of the supporting structure 17 necessarily involves decoupling between the pads 26 and the electrical terminals 37; also in this case, the telematic unit 10 is disconnected from the RFID unit.

[0028] The unit 10 promptly sends an alarm message in the conditions a) - d) referred to above, notifying the control centre of and attempt in progress at burglary of the container. The central unit can hence activate all the operations necessary for management of the event. In this way, the burglary event is immediately detected and is associated to a precise geographical position, enabling effective intervention.

Claims

1. A burglary-prevention device for containers with telematic connection comprising:

- an electronic lock (3), which can be coupled to a first lock eye (4a) and a second lock eye (4b) of leaves of a door of the container and comprises an RFID device; and
- a telematic unit (10), connected to the RFID device and designed to communicate with a central control unit by transmitting the instantaneous position detected by the telematic unit (10); said telematic unit (10) being designed to detect the integrity of the circuit connection between the RFID device and the telematic unit itself and being designed to emit a warning of possible burglary in the case of even partial interruption of said circuit connection,

said device being **characterized in that** the electronic lock (3) comprises:

- an elongated body (15) configured for engag-

ing, in use, said lock eyes setting itself with its axis (16) coinciding with the axis of the holes (7) of the lock eyes (4a, 4b) themselves;

said elongated body (15) having a first end portion (15a) widened in a radial direction designed to bear upon a first lock eye (4a);
a second end portion (15b) of said elongated body (15) being configured for providing an electrical and mechanical connection with a supporting structure (17) that houses the RFID device; the supporting structure (17) is configured for bearing, in use, upon a second lock eye (4b); said elongated body (15) houses, within it, a plurality of electrical lines, which present first ends communicating with an electrical cable (24) that ensures the connection between said electronic lock (3) and said telematic unit (10);
said electrical lines having second free end portions that provide pads (26) configured for providing an electrical connection with said RFID device when the supporting structure (17) is properly coupled to the second end portion (15b) of said elongated body (15); decoupling of the supporting structure (17) from said second end portion (15b) causes interruption of the electrical connection between the pads and the RFID device.

2. The device according to Claim 1, wherein said elongated body (15) has a tubular shape and houses, within it, an elongated printed circuit (23) defining said electrical lines; said tubular elongated body having a window (21) through which said pads (26) are accessible in such a way as to provide the electrical connection between the RFID device and the pads themselves when the supporting structure (17) is properly coupled to the second end portion (15b) of said elongated body (15).
3. The device according to Claim 2, wherein said tubular elongated body (15) has a cylindrical shape and is provided with a plane end portion (19) onto which said window (21) opens.
4. The device according to Claim 1, wherein said supporting structure (17) comprises a plane casing (30) entirely housing said RFID device; the supporting structure (17) being provided with centring and locking elements (31) designed to provide a stable positioning of the plane casing (30) on said elongated body (15) where there is obtained a stable coupling position in which said pads (26) are connected to said RFID device.
5. The device according to Claim 4, wherein said locking elements comprise elastic elements (40), which extend from said plane casing (30) and are configured for snap-action coupling on said elongated body (15) in said stable coupling position.

6. The device according to Claim 5, wherein said locking elements comprise a pair of elastic appendages (40) set facing and parallel to one another that extend in a direction transverse to said plane casing (30); in said stable coupling position said elastic appendages pressing on the elongated body set between the elastic appendages themselves. 5
7. The device according to Claim 4, wherein said centring elements (31) comprise a pin (50), which extends from the plane casing (30), and a seat (52), which is provided on the side wall of the elongated body (15) and is designed to house the pin (52) in the stable coupling position. 10 15
8. The device according to Claim 4, wherein said plane casing (30) has a rectangular shape and comprises a shell (32), which defines a lowered seat (33) that houses a printed circuit (34) defining said RFID; said shell (32) being closed by a plane wall (35) provided with a window (36), through which electrical terminals (37) are available designed to couple with respective pads (26). 20
9. The device according to Claim 4, wherein said supporting structure has a first through hole and said elongated body has a second through hole that are set in communication with one another in said stable coupling position and used for passage of an elongated element of a mechanical security seal. 25 30
10. The device according to any one of the preceding claims, wherein the telematic unit (10) is housed within a protective casing (12) made of high-strength plastic material and provided with permanent magnets for connection of the protective casing (12) to a metal wall of the container. 35 40 45 50 55

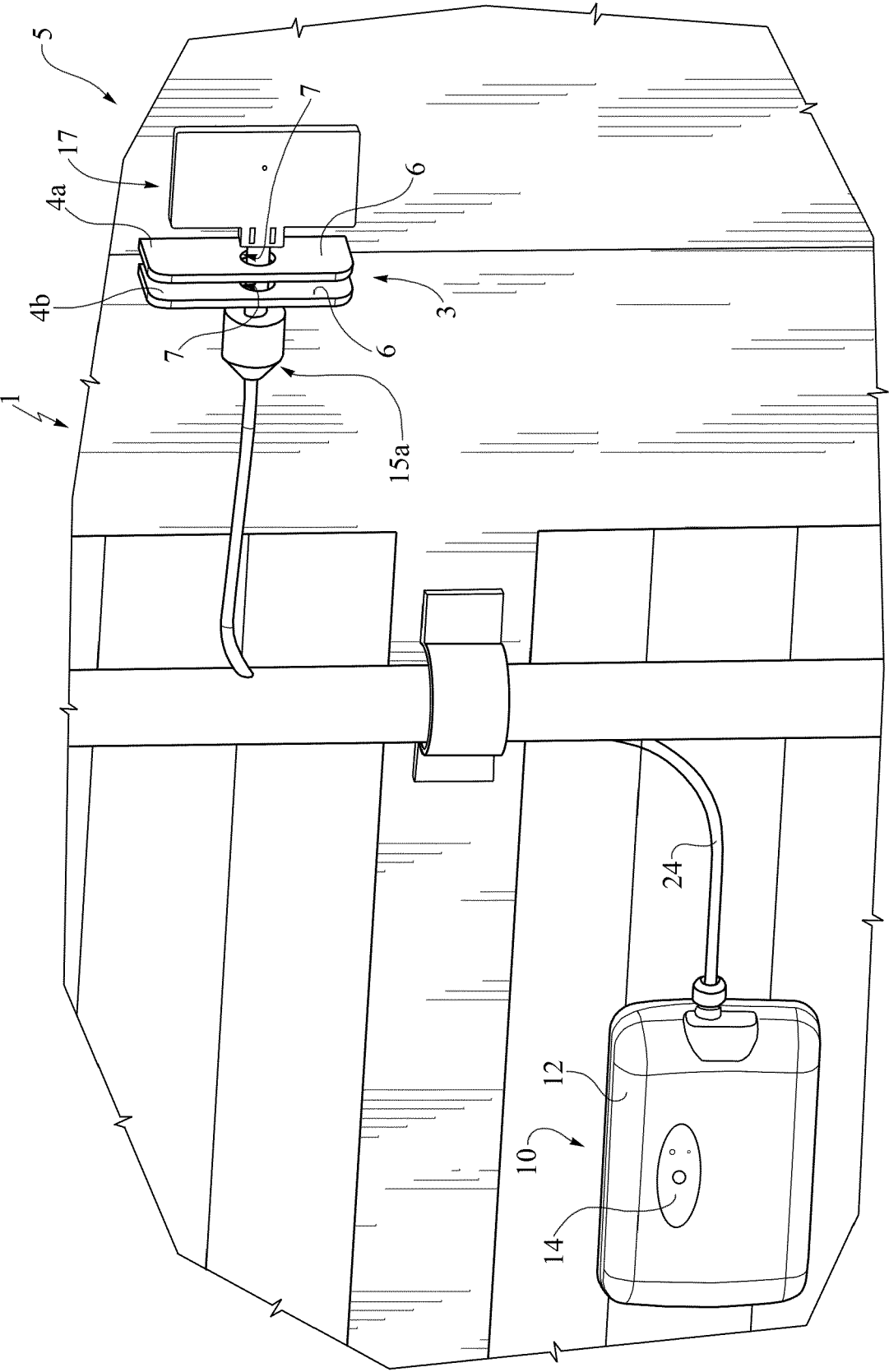
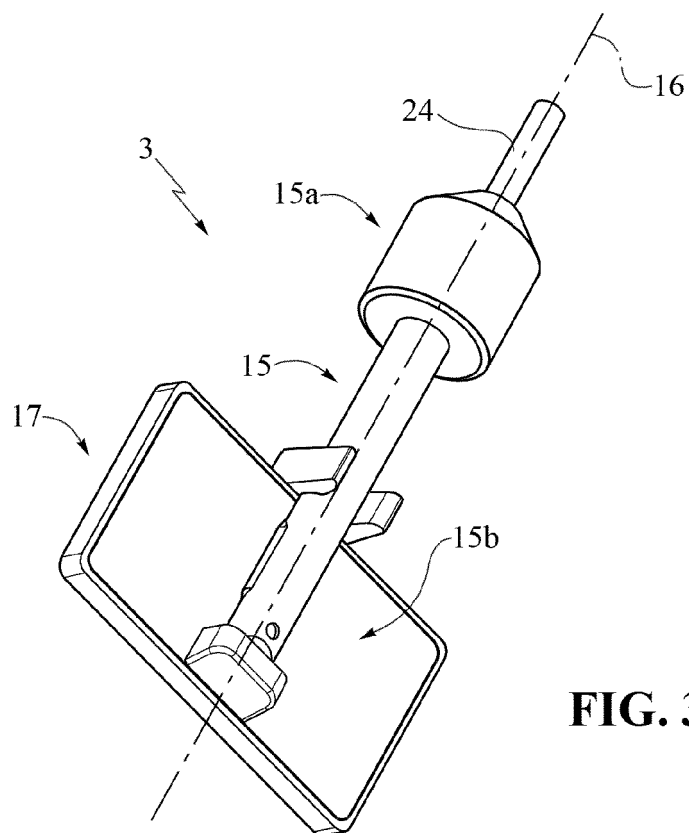
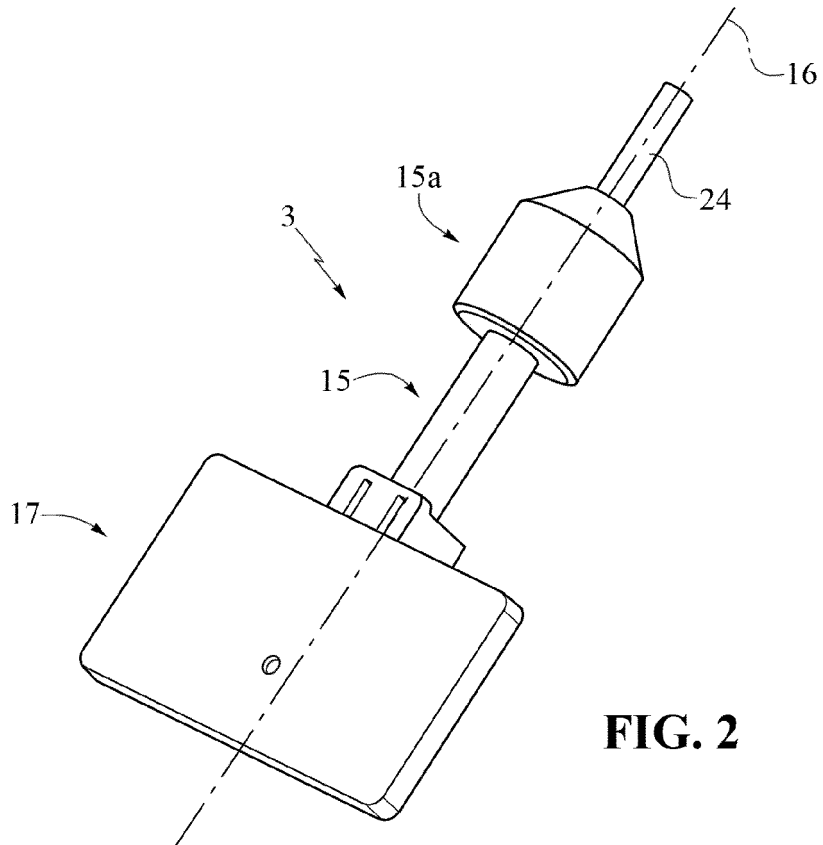


FIG. 1



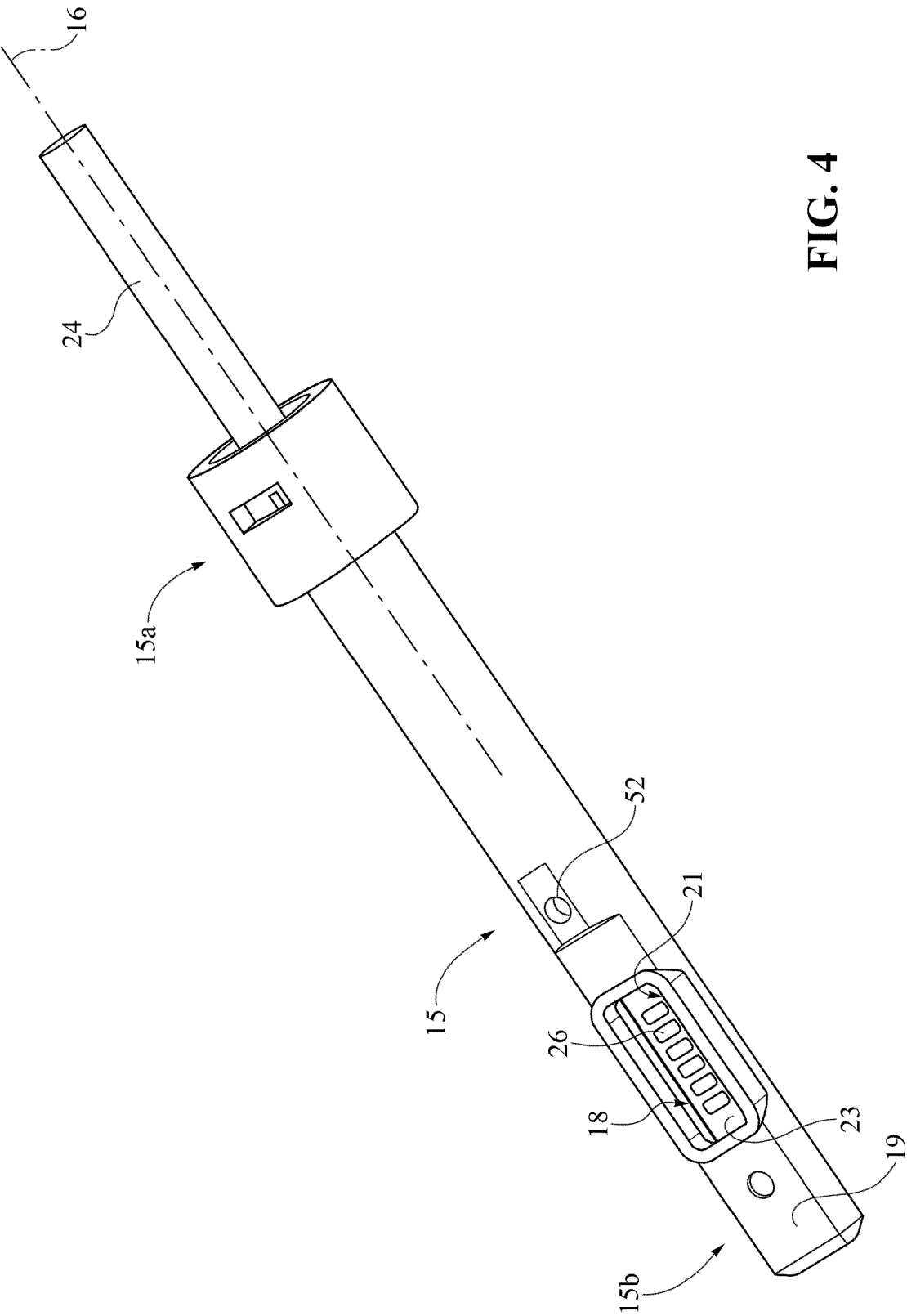


FIG. 4

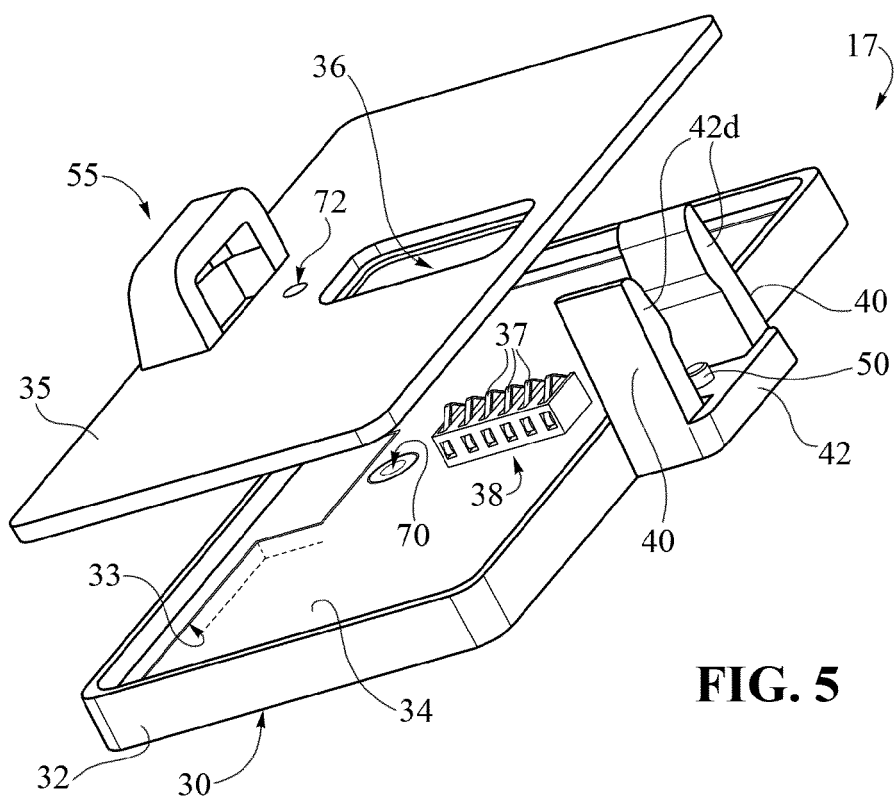


FIG. 5

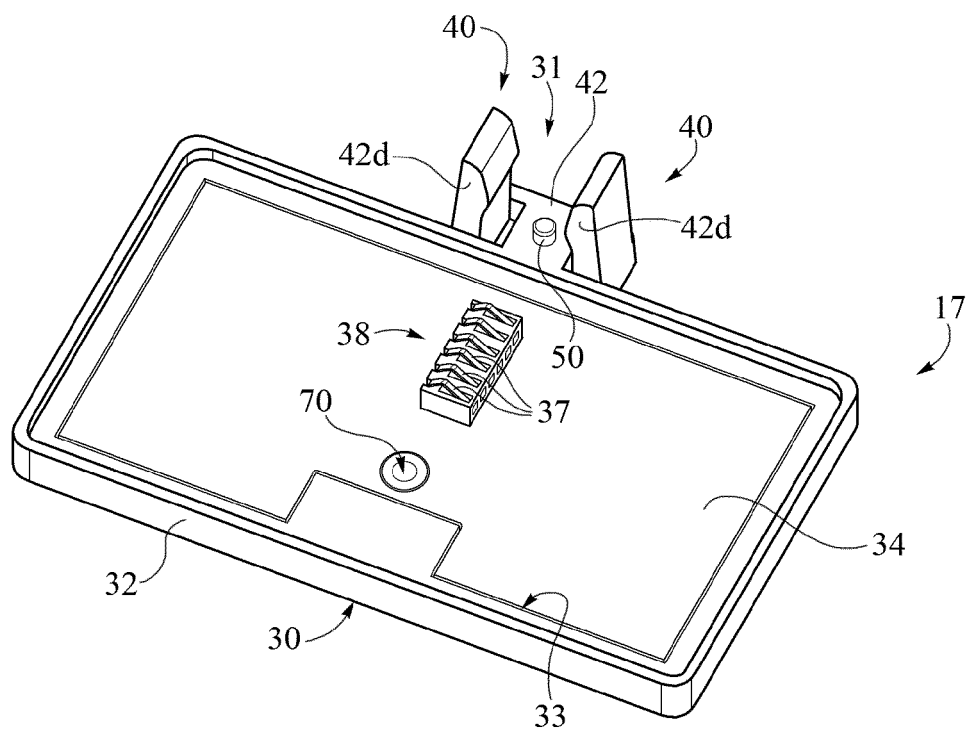


FIG. 6

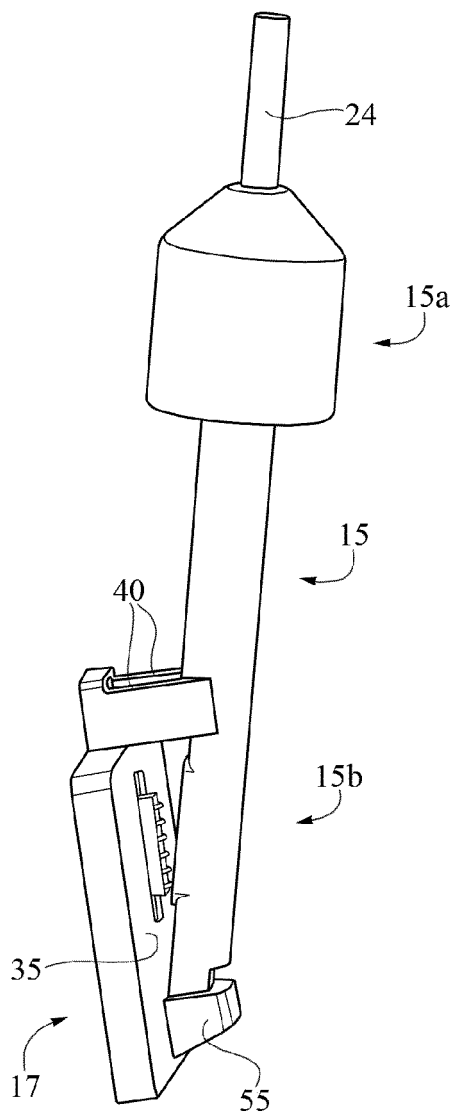


FIG. 7

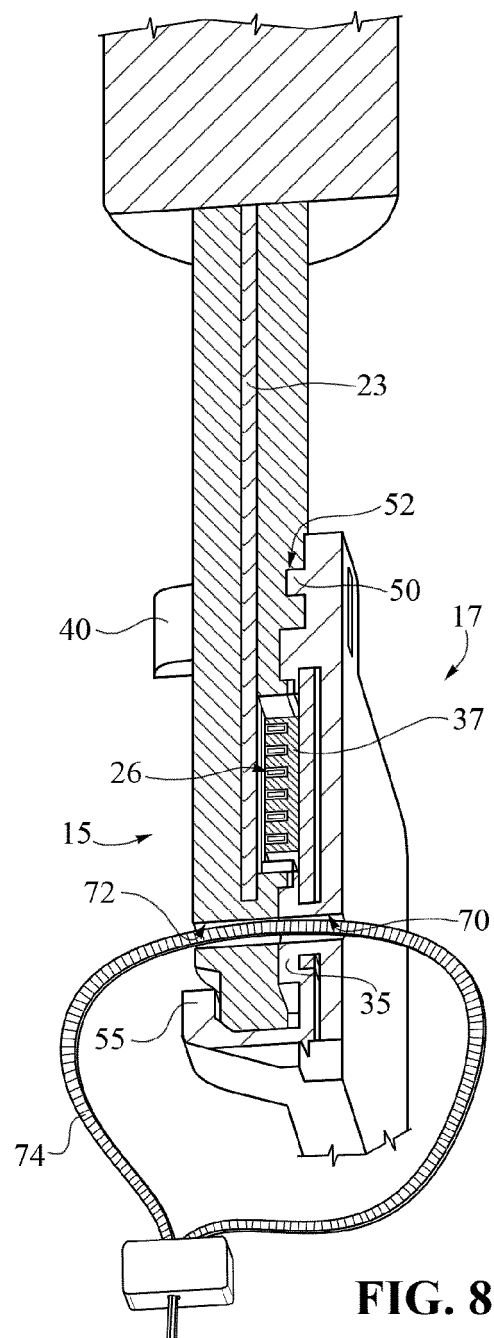


FIG. 8

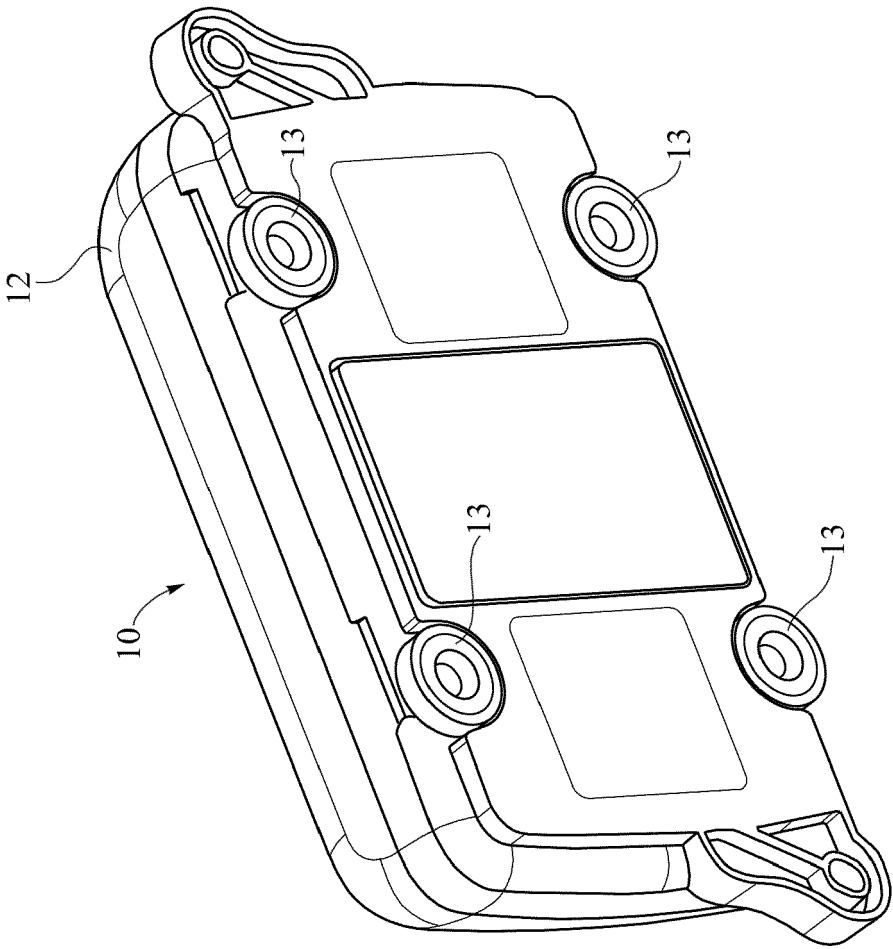


FIG. 9



EUROPEAN SEARCH REPORT

 Application Number
 EP 16 15 8848

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 6 July 2016	Examiner Geerts, Arnold
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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