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(54) **SYSTEM, AND METHOD THEREOF, FOR COMBINED MANAGEMENT OF AT LEAST ONE KEY AND AN ASSOCIATED PADLOCK**

(57) The present invention relates to a system (1) for combined management of at least one key (2) and an associated padlock (3), wherein the padlock (3) comprises a main body (3A) provided with a locking and unlocking device and a closing element (3B) linked to said main body (3A), and wherein the locking and unlocking device co-operates with said key (2) to allow said closing element (3B) to switch from a closed condition to an open condition, said system (1) comprising:

- a control unit (10);
- a user interface (20) associated with said control unit (10), wherein the user interface (20) comprises an identification system (21) for the recognition of a user by means of a unique identification code of said user, and wherein the user interface (20) comprises input means (22) and output means (23) adapted to allow the exchange of information between a user and the control unit (10);
- a key depot (30) equipped with at least one first retention device (31) for locking and unlocking said at least one key (2), wherein said at least one first retention device (31) comprises a first lock (32) provided with a pawl (33) having a latch (34) adapted to be selectively brought into a locking or unlocking position relative to said first lock (32) by means of an anchoring key (33C) adapted to actuate said pawl (33), wherein the key (2) of the padlock (3) is constrained to said anchoring key (33C), wherein the pawl (33) comprises retaining means adapted to prevent extracting the anchoring key (33C) when the pawl (33) and the latch (34) are in said locking position, and wherein said retaining means are adapted to allow extracting the anchoring key (33C) when the pawl

(33) and the latch (34) are in the unlocking position, in particular obtained by means of a rotation of the pawl (33) and of the latch (34),

wherein said at least one first retention device (31) comprises at least one first sensor (35) for detecting said locking and unlocking positions of the pawl (33) and of the latch (34) and, consequently, also the presence of the anchoring key (33C) in the pawl (33) or the extraction of the same from said pawl (33),

and wherein said first lock (32) comprises a stopper element driven by said control unit (10) in such a way as to be either activated to hold the latch (34) and the pawl (33) in said locking position or deactivated to allow the latch (34) and the pawl (33) to turn into said unlocking position;

- a padlock depot (40) equipped with at least one second retention device (41) for housing a padlock (3) corresponding to the key (2) of the respective first retention device (31),

wherein said at least one second retention device (41) comprises a second lock (42) provided with a fastening bracket (44) adapted to be coupled to the closing element (3B) of the padlock (3) and adapted to be selectively brought from a closing position to an opening position, and vice versa, in said closing position the padlock (3) being housed in a seat (43) of the retention device (41), and in said opening position the padlock (3) being positioned out of said seat (43), so that it can be decoupled from the fastening bracket (44) by opening the closing element (3B) by means of the key (2),

wherein said at least one second retention device (41) comprises at least one second sensor (45) for detecting said closing and opening positions of the fastening bracket (44) and, consequently, also the presence of the padlock (3) in the seat (43) or the extraction of the same from said seat (43),

and wherein said second lock (42) comprises a second stopper element driven by said control unit (10) in such a way as to be either activated to hold the fastening bracket (44) in said closing position or deactivated to allow the fastening bracket (44) to move into said opening position.

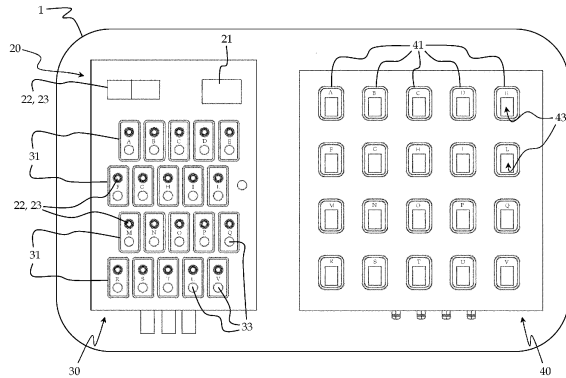


Fig. 1

## Description

**[0001]** The present invention relates to a system for combined management of at least one key and an associated padlock, according to the preamble of claim 1. The present invention also relates to a method for combined management of at least one key and an associated padlock.

**[0002]** In the automatic distribution field, numerous systems and devices are currently known which permit picking up or returning an object, whether or not tracking all operations involving such object and identifying the people who pick up such object or to whom such object is delivered.

**[0003]** Nevertheless, none of the systems or devices currently known in the art has been conceived for managing two objects in a combined and/or unitary manner. According to the logic of key/padlock elements, however, such two objects must be managed as a mutually associated pair.

**[0004]** It inevitably follows that, when using known systems and devices, there is no certainty that both objects have been actually returned, i.e. that the phase of returning such components has been conducted correctly.

**[0005]** It must be pointed out that this aspect is very important as concerns access control systems installed in modern offices, business centres, factories and institutional buildings.

**[0006]** In particular, certainty that both objects have been actually returned is very important in the safety procedure known as "lockout/tagout" (abbreviated as LOTO), which is used in industrial and research environments to make sure that dangerous machines have been properly switched off and cannot be restarted prior to completion of maintenance or repair work. This procedure requires that dangerous power sources be isolated and made inoperative before working on connected equipment. The isolated power sources are then locked by means of a suitable padlock ("lockout" procedure), whereon a tag is usually placed which identifies the worker who has positioned it and the reasons for the lockout ("tagout" procedure). The operator then keeps the padlock key, making sure to be the only person who can remove the padlock and start the previously locked-out power source: this will prevent the machine, or any component thereof, from starting accidentally while it is in a dangerous state or while a worker is directly in contact with it.

**[0007]** A first type of known systems or devices for managing a key and an associated padlock have a single compartment of a size suitable to receive both the key and the associated padlock, and the correctness of the process of returning such objects is easily jeopardized in case of mistakes and/or oversights by the person who picked them up; as a matter of fact, if the key and the associated padlock are not both correctly returned and positioned into the compartment, when a user attempts to pick up a padlock together with its key the device will

open the compartment not containing both objects, and the system will then record a series of false operations.

**[0008]** A second type of systems or devices for managing a key and an associated padlock is also currently known in the art, wherein such systems or devices are so constructed as to associate, with one of such components, a sensor (which may be an RFID sensor or a unidimensional or bidimensional barcode, or the like), which makes it possible to univocally identify them. Typically, said sensor consists of a radio-frequency chip that, when suitably excited by a reader, emits a code of a few bytes; a further microprocessor device interprets such bytes and identifies the presence of the key/padlock pair, usually on the basis of the detection of the presence of the component with which the sensor has been associated.

**[0009]** While it is rather easy to physically apply a sensor to the key, the same is however not true for the padlock; in fact, due to the nature of the operations it is intended for (particularly the operations of the LOTO safety procedure, which are the most delicate and important ones), the padlock is often a certified object, and any modification or tampering is strictly forbidden by current regulations; moreover, a padlock is not physically suited, also because of its particular shape, to receiving a sensor.

**[0010]** It is therefore apparent that also the systems for managing a key and a padlock of this second type cannot ensure an adequate management of both components (key and padlock).

**[0011]** In this frame, it is the main object of the present invention to provide a system, and a method thereof, for combined management of at least one key and an associated padlock, so conceived as to overcome the drawbacks of the prior art.

**[0012]** In particular, it is one object of the present invention to provide a system, and a method thereof, for combined management of at least one key and an associated padlock, so conceived as to allow an adequate management of both components (key and padlock). It is another object of the present invention to provide a system, and a method thereof, for combined management of at least one key and an associated padlock, so devised as to allow for properly and adequately tracking the various successive operations involving both components (key and padlock), wherein, in particular, such tracking can be effected without such components needing any modification, e.g. adding a suitable sensor to the key and to the padlock.

**[0013]** It is a further object of the present invention to provide a system, and a method thereof, for combined management of at least one key and an associated padlock, so conceived as to be easily adaptable to different contingent situations and needs without the production and implementation thereof being excessively costly.

**[0014]** Such objects are achieved by the present invention through a system, and a method thereof, for combined management of at least one key and an associated padlock incorporating the features set out in the append-

ed claims, which are an integral part of the present description.

**[0015]** Further objects, features and advantages of the present invention will become apparent in light of the following detailed description and the annexed drawings, which are provided herein merely by way of non-limiting explanatory example, wherein:

- Figure 1 is a schematic view of a system for combined management of at least one key and an associated padlock according to the present invention;
- Figure 2 is an exemplifying block diagram of the system of the present invention;
- Figures 3A to 3C show, respectively, a perspective view, a side view and a rear view of a component of the system according to the present invention;
- Figure 4A shows a perspective view of a further component of the system according to the present invention in a first operating condition, while Figure 4B shows a perspective view of the component of Figure 4A in a second operating condition;
- Figures 5A and 5B show a perspective view and a sectional view, respectively, of a detail of the component shown in Figures 4A and 4B;
- Fig. 6 is a flow chart of a method for combined management of at least one key and an associated padlock according to the present invention.

**[0016]** Describing now the annexed drawings, in Figures 1 and 2 reference numeral 1 designates as a whole, in a preferred embodiment thereof, a system for combined management of at least one key 2 and an associated padlock 3 according to the present invention.

**[0017]** In particular, the padlock 3 is of the type that comprises a main body 3A provided with a locking and unlocking device (not shown in the annexed drawings, and comprising, for example, a pawl which is rotatable within the main body 3A) and a closing element 3B (which may consist of a small bar, in particular bent into a U shape, as shown in Figures 5A and 5B) linked to said main body 3A, wherein the locking and unlocking device co-operates with said key 2 to allow said closing element 3B to switch from a closed condition to an open condition.

**[0018]** As is known, the switching of the closing element 3B from the open condition to the closed condition is usually accomplished by inserting a free end of said closing element 3B into a suitable housing (not shown in the annexed drawings) formed in the main body 3A.

**[0019]** The system 1 according to the present invention comprises a control unit 10 and a user interface 20 associated with said control unit 10, wherein the user interface 20 comprises an identification system 21 for the recognition of a user by means of a unique identification code of said user.

**[0020]** For example, said identification system 21 may comprise a badge reader, an optical reader (e.g. a barcode or QR-code reader), an RFID reader, a biometric reader (e.g. a fingerprint, iris, voice, etc. scanner), or the

like.

**[0021]** Said user interface 20 may then comprise input means 22 and output means 23 adapted to allow the exchange of information between a user and the control unit 10.

**[0022]** For example, said input means 22 may comprise a keypad (whether alphanumerical or digital) for inputting an identification code (e.g. a PIN), one or more selection elements (e.g. buttons) for selecting a key 2 and an associated padlock 3, and so forth.

**[0023]** As a consequence, a user's unique identification code can be supplied to the identification system 21 by reading a badge, reading a barcode or a QR code, reading an RFID tag, scanning biometric data of the user, a PIN entered by a user via a keypad, etc.

**[0024]** Said output means 23 may comprise a screen or a display (optionally a touchscreen, in which case the screen or display can also act as an input means 22) and/or further visual and/or audible signalling means.

**[0025]** The system 1 according to the present invention comprises a key depot 30 equipped with at least one first retention device 31 for locking and unlocking said at least one key 2.

**[0026]** In particular, the key depot 30 may comprise a plurality of first retention devices 31 for locking and unlocking a plurality of respective keys 2. In this regard, Fig. 1 shows twenty first retention devices 31 (wherein each first retention device 31 is indicated by a respective letter, from A to V); it is however clear that the number of first retention devices 31 may also be different than shown in Fig. 1.

**[0027]** As shown in Figures 1 to 3C, the input means 22 of the user interface 20 may comprise at least one selection element (e.g. a button) associated with the key depot 30 for selecting one of said first retention devices 31. Said output means 23 may comprise at least one signalling means (e.g. an LED associated with said at least one selection element) for signalling which first retention device 31 has been selected by a user.

**[0028]** Figures 3A to 3C show different views (i.e. a perspective view in Fig. 3A, a side view in Fig. 3B, and a rear view in Fig. 3C) of the first retention device 31 according to a preferred embodiment of the present invention.

**[0029]** Said at least one first retention device 31 comprises a first lock 32 provided with a pawl 33 having a latch 34 adapted to be selectively brought into a locking or unlocking position relative to said first lock 32 by means of an anchoring key 33C adapted to actuate said pawl 33, wherein the key 2 of the padlock 3 is constrained to said anchoring key 33C. As shown in Fig. 3A, the key 2 of the padlock 3 and the anchoring key 33C are mutually constrained by means of a seal 33S; in particular, said seal 33S may be so realized as to comprise a body to which a flexible element, e.g. a cord, is constrained, wherein said body and flexible element may be made from various materials; in this respect, the key 2 of the padlock 3 and the anchoring key 33C can be mutually

constrained by inserting the flexible element of the seal 33S through a hole formed in said key 2 of the padlock 3 and through a hole formed in said anchoring key 33C.

**[0030]** In particular, the pawl 33 comprises retaining means (not shown in the annexed drawings) adapted to prevent extracting the anchoring key 33C (along with the key 2 constrained thereto) when said pawl 33 and the latch 34 are in said locking position, and wherein said retaining means are adapted to allow extracting the anchoring key 33C (to which the key 2 of the padlock 3 is constrained) when said pawl 33 and the latch 34 are in the unlocking position, in particular obtained by means of a rotation (e.g. by approx. 90°) of the pawl 33 and of the latch 34. It should be noted that the pawl 33 is preferably of the type commonly known as "cylinder" (or "European cylinder") type, and said retaining means of the pawl 33 may consist of the pins and respective counterpins of the peripheral cylinder and of the internal cylinder (commonly referred to as "stator" and "rotor") of said pawl 33, wherein said elements only permit extracting the anchoring key 33C when the pawl 33 and the latch 34 are in the unlocking position, obtained by turning them from the locking position.

**[0031]** Furthermore, said at least one first retention device 31 comprises at least one first sensor 35 for detecting said locking and unlocking positions of the pawl 33 and of the latch 34 and, consequently, also the presence of the anchoring key 33C in the pawl 33 or the extraction of the same from said pawl 33.

**[0032]** Said first lock 32 comprises a stopper element (not shown in the annexed drawings) driven by said control unit 10 in such a way as to be either activated to keep the latch 34 and the pawl 33 in said locking position or deactivated to allow the latch 34 and the pawl 33 to turn into said unlocking position.

**[0033]** Preferably, said first lock 32 is of the electromagnetically controlled type, in particular of the normally closed type.

**[0034]** In this frame, said at least one first sensor 35 may consist of a control element (e.g. a microswitch, not shown in the annexed drawings) associated with the stopper element of said first electromagnetically controlled lock 32, wherein said control element is adapted to detect said locking position of the pawl 33 and of the latch 34 induced by the stopper element and, consequently, also the necessary and inevitable presence of the anchoring key 33C in the pawl 33; nevertheless, said first lock 32 may also be so constructed as to comprise at least one first sensor 35 conceived as a further element provided in addition to the check element of said first lock 32.

**[0035]** The system 1 according to the present invention further comprises a padlock depot 40 equipped with at least one second retention device 41 for housing a padlock 3 corresponding to the key 2 of the respective first retention device 31.

**[0036]** In particular, the padlock depot 40 may comprise a plurality of second retention devices 41, in par-

ticular a number of second retention devices 41 matching the number of first retention devices 31 in the key depot 30. In this regard, Fig. 1 shows twenty second retention devices 41 (wherein each second retention device 41 is indicated by a respective letter, from A to V), i.e. a number of second retention devices 41 corresponding to the number of first retention devices 31 in the key depot 30.

**[0037]** Figures 4A and 4B are perspective views of a second retention device 41 according to a preferred embodiment of the present invention. In particular, in such figures the retention device 41 is shown in two different operating conditions, i.e.: a first operating condition (which can be defined as "closing position"; see Figure 4A) and a second operating condition (which can be defined as "opening position"; see Figure 4B).

**[0038]** Said at least one second retention device 41 comprises a second lock 42 provided with a fastening bracket 44 adapted to be coupled to the closing element 3B of the padlock 3 and adapted to be selectively brought from a closing position (Fig. 4A) to an opening position (Fig. 4B), and vice versa, in said closing position the padlock 3 being housed in a seat 43 of the retention device 41, and in said opening position the padlock 3 being positioned out of said seat 43, so that it can be decoupled from the fastening bracket 44 by opening the closing element 3B by means of the key 2.

**[0039]** As can be seen in Figures 4A to 5A, the fastening bracket 44 is preferably shaped as a rectangular ring; it is however clear that it may also have a different shape.

**[0040]** Moreover, said at least one second retention device 41 comprises at least one second sensor 45 for detecting said closing and opening positions of the fastening bracket 44 and, consequently, also the presence of the padlock 3 in the seat 43 or the extraction of the same from said seat 43.

**[0041]** Said second lock 42 comprises a second stopper element (not shown in the annexed drawings) driven by said control unit 10 in such a way as to be either activated to hold the fastening bracket 44 in said closing position or deactivated to allow the fastening bracket 44 to switch into said opening position.

**[0042]** Preferably, said second lock 42 is of the electromagnetically controlled type, in particular of the normally closed type.

**[0043]** In this frame, said at least one second sensor 45 consists of a second control element (e.g. a microswitch, not shown in the annexed drawings) associated with the second stopper element of said second electromagnetically controlled lock 42, wherein said second control element is adapted to detect said closing position of the fastening bracket 44 and of the second stopper element and, consequently, also the necessary and inevitable presence of the padlock 3 in the seat 43; nevertheless, said second lock 42 may also be so realized as to comprise at least one second sensor 45 conceived as a further element provided in addition to the second check element of said second lock 42.

**[0044]** As can be seen in Fig. 5B, the seat 43 comprises

a housing 43A adapted to receive and lock at least a portion of the padlock 3 when the fastening bracket 44 is in said closing position. In particular, in Fig. 5A said at least a portion of the padlock 3 consists of the closing element 3B, and the housing 43A is designed to receive and lock said closing element 3B; it is however clear that the housing 43A may be so realized as to receive and lock at least a portion of the main body 3A of the padlock 3.

**[0045]** Figures 4A, 4B and 5A also show that the second lock 42 comprises actuating means 46, 47, 48, 49 that allow the fastening bracket 44 to move from the closing position to the opening position, and vice versa.

**[0046]** In particular, said actuating means 46, 47, 48, 49 comprise a frame 46 constrained to the fastening bracket 44, said frame 46 comprising at least one guide 47 adapted to allow the frame 46 and the fastening bracket 44 to slide on at least one bar 48 coupled to said at least one guide 47. Preferably, in order to attain an adequate sliding action, said frame 46 comprises a pair of guides 47 coupled to a pair of substantially parallel bars 48.

**[0047]** As clearly visible in Figures 5A and 5B, the coupling between the frame 46 and the fastening bracket 44 is preferably effected in such a way that a first portion of the fastening bracket 44 protrudes from the frame 46 towards the second lock 42 (so that it can engage with the second stopper element of said second lock 42), and a second portion of the fastening bracket 44 protrudes outwards from the second retention device 41 (so that it can be coupled to a padlock 3). Therefore, as clearly visible in Fig. 5A, when the fastening bracket 44 is shaped as a rectangular ring (as previously explained), a first substantially U-shaped portion of said fastening bracket 44 protrudes from the frame 46 towards the second lock 42 (so that it can engage with the second stopper element of said second lock 42), and a second substantially U-shaped portion of said fastening bracket 44 protrudes from the frame 46 outwards from the second retention device 41 (so that it can be coupled to a padlock 3), wherein the frame 46 is positioned between said first and second substantially U-shaped portions of the fastening bracket 44.

**[0048]** Furthermore, said actuating means comprise an elastic member 49, in particular associated with said at least one bar 48, which exerts a thrust on the frame 46 when the second stopper element of the second lock 42 is deactivated (by the control unit 10) to allow the fastening bracket 44 (constrained to the frame 46) to move into said opening position. It should be noted that, in Figures 4A, 4B and 5A, said elastic member 49 is represented as a spring fitted on the bar 48; however, said elastic member 49 may also consist of another technically equivalent element, and may be directly associated with different elements of said actuating means 46, 47, 48, 49.

**[0049]** It is therefore apparent that the actuating means, by acting upon the frame 46 and upon the fastening bracket 44 constrained to said frame 46, permit

an automatic movement of the padlock 3 when the second stopper element of the second lock 42 is deactivated, and in particular allow the padlock 3 to be moved from its housing within the seat 43 (as shown in Fig. 5A) to its position external to said seat 43 (as shown in Fig. 5B), in which external position it can be decoupled from the fastening bracket 44 by opening the closing element 3B by means of the key 2.

**[0050]** The following will describe, with particular reference to Figure 6, a method for combined management of at least one key 2 and an associated padlock 3 according to the present invention.

**[0051]** In accordance with the present invention, said method comprises an identification phase that comprises the following steps:

id1) supplying a unique identification code of a user to a control unit 10 by means of an identification system 21 of a user interface 20 associated with said control unit 10;

id2) verifying, by said control unit 10, said unique identification code in order to assess if the user has been authorized to proceed with the management of (in particular, to pick up or return) a key 2 and a padlock 3 associated with said key 2;

id3) if the verification of step id2) is successful (authorized user), providing an indication as to which key 2 and which padlock 3 associated with such key 2 the user is permitted to pick up from at least one first retention device 31 of a key depot 30 and from at least one second retention device 41 of a padlock depot 40, respectively, and/or to return into said first retention device 31 and second retention device 41, respectively;

id4) verifying, by said control unit 10, if the indication of step id3) refers to a first retention device 31 where an anchoring key 33C (constrained to the key 2, which is the one that works with a given padlock 3) is inserted in a pawl 33, in particular such verification being carried out by the control unit 10 by means of at least one first sensor 35 of the first retention device 31, adapted to detect the locking or unlocking position of the pawl 33 and of an associated latch 34 (the presence of the anchoring key 33C in the pawl 33 being consequently also verified in said locking position of the pawl 33, whereas the extraction of the anchoring key 33C from the pawl 33 being consequently also verified in said unlocking position).

**[0052]** It must be pointed out that said step id1) may be preceded by a step id0) of prompting the user, by said control unit 10, to identify him/herself, particularly through the activation of output means 23 adapted to issue a visual and/or audible message for the user.

**[0053]** Moreover, said step id2) may be carried out by the control unit 10 by checking a database stored either in a local memory (e.g. a memory associated with the control unit 10) or in a remote memory (e.g. an online

server).

**[0054]** If the verification of step id2) is unsuccessful (unauthorized user), the method according to the present invention may comprise a step id2.1) of sending to the user, by said control unit 10, a message indicating that the management method cannot be continued, particularly through the activation of output means 23 adapted to issue such a message in visual and/or audible form for the user.

**[0055]** As far as step id3) is concerned, it is preferably carried out through an indication supplied to the control unit 10 by the user, particularly through a step of actuating a selection element of the input means 22 in order to select a first retention device 31 of the key depot 30 and a corresponding second retention device 41 of the padlock depot 40.

**[0056]** In particular, the control unit 10 may be equipped with timer means in order to evaluate whether said step of actuating a selection element of the input means 22 has been validly executed within a predefined period of time and the user can then proceed with the next steps, or such actuation has occurred after said predefined period of time and the session must be closed (so that the user cannot proceed with the next steps).

**[0057]** Alternatively, said step id3) may also be carried out directly by the control unit 10, which (in addition to verifying, at step id2), the unique identification code in order to assess if the user is authorized to proceed) also verifies the correspondence between said unique code and peculiar authorizations of the user to use at least one particular and predetermined first retention device 31 and the corresponding second retention device 41. With reference to step id4), such verification is carried out by means of a detection, made by the first sensor 35 of the first retention device 31 and signalled to the control unit 10, of the locking position of the pawl 33 and of the latch 34; as previously explained, such locking position also corresponds to the presence of the anchoring key 33C in the pawl 33. Moreover, the verification of step id4) may also be carried out by means of an additional detection, made by the second sensor 45 of the second retention device 41 and signalled to the control unit 10, of the closing position of the fastening bracket 44; as previously explained, such closing position also corresponds to the presence of the padlock 3 in the seat 43 of the second retention device 41.

**[0058]** If the verification of step id4) is successful (i.e. the pawl 33 and the latch 34 are in the locking position = the anchoring key 33C is inserted in a pawl 33), the method according to the present invention comprises a phase of picking up the key 2 (constrained to the anchoring key 33C) and the associated padlock 3.

**[0059]** In accordance with the present invention, said pick-up phase comprises the following steps:

pr1) driving, by said control unit 10, a stopper element of the first lock 32 so as to deactivate said stopper element, in particular in order to allow the latch

34 and the pawl 33 to turn;

pr2) extracting the anchoring key 33C (to which the key 2 of the padlock 3 is constrained) from the pawl 33, in particular following a rotation of the pawl 33 and of the latch 34 bringing them into an unlocking position;

pr3) driving, by said control unit 10, a second stopper element of the second lock 42, in particular of the normally closed and electromagnetically controlled type, so as to deactivate said second stopper element, in particular in order to allow the fastening bracket 44 to move into an opening position in which the padlock 3 is positioned externally to a seat 43, so that it can be decoupled from the fastening bracket 44;

pr4) decoupling the padlock 3 from the fastening bracket 44, in particular by moving the closing element 3B of the padlock 3 into an open position, wherein such movement is obtained by actuating the locking device of the padlock 3 by means of the key 2 constrained to the anchoring key 33C.

**[0060]** As regards said steps pr1) and pr3), it can be noted that they may also be executed substantially simultaneously. In particular, the control unit 10 may drive both the first stopper element of the first lock 32 and the second stopper element of the second lock 42 substantially at the same time.

**[0061]** Furthermore, with reference to step pr3), it can be noted that the switching of the fastening bracket 44 from the closing position to the opening position may be effected through the activation of actuating means 46, 47, 48, 49 of the second lock 42; as previously described, the activation of the actuating means 46, 47, 48, 49 occurs substantially automatically as a consequence of the deactivation of the second stopper element of the second lock 42.

**[0062]** If the verification of step id4) is unsuccessful (i.e. the pawl 33 and the latch 34 are in the unlocking position = the anchoring key 33C is not inserted in a pawl 33), the method according to the present invention comprises a phase of returning the key 2 (constrained to the anchoring key 33C) and the associated padlock 3.

**[0063]** In accordance with the present invention, said returning phase comprises the following steps:

res1) constraining, by the user, the padlock 3 to the fastening bracket 44, in particular by moving the closing element 3B of the padlock 3 into a closed position;

res2) causing, by the user, the passage of the fastening bracket 44 into a closing position, in particular a position in which the padlock 3 is positioned inside the seat 43 (and, preferably, cannot be decoupled from the fastening bracket 44);

res3) driving, by said control unit 10, the second stopper element of the second lock 42 in order to hold the fastening bracket 44 in the closing position;

res4) inserting, by the user, the anchoring key 33C

into the pawl 33 in order to bring said pawl 33 and the latch 34 into the locking position, in particular by means of a rotation of the pawl 33 and of the latch 34, said locking position preventing the extraction of the anchoring key 33C from the pawl 33 (e.g. through the activation of retaining means of said pawl 33); res5) activating, by said control unit 10, the stopper element of the first lock 32 in order to hold the latch 34 and the pawl 33 in the locking position.

**[0064]** The method according to the present invention may comprise a step of activating, by the control unit 10, output means 23 in order to provide the user with information (e.g. in visual and/or audible form) about the steps of the identification phase and/or the steps of the phases of picking up and returning the key 2 (constrained to the anchoring key 33C) and the associated padlock 3.

**[0065]** The method according to the present invention further comprises the step of recording into a memory, which may be either local or remote, one or more steps of the identification phase and/or one or more steps of the pick-up phase and/or one or more steps of the returning phase.

**[0066]** The method according to the present invention further comprises a step of detecting, by means of the second sensor 45, possibly periodically and with a certain frequency (e.g. set via the control unit 10 and via the input means 22), the closing position of the fastening bracket 44 (and the consequent positioning of the padlock 3 inside the seat 43), and sending such detection to the control unit 10.

**[0067]** In addition, the method according to the present invention comprises a step of detecting, by means of the first sensor 35 (in this case as well, possibly periodically and with a certain frequency, e.g. set via the control unit 10 and via the input means 22), the locking position of the latch 34 and of the pawl 33 (and the consequent presence of the anchoring key 33C in the pawl 33), and sending such detection to the control unit 10.

**[0068]** The features of the system 1 and of the method according to the present invention, as well as the advantages thereof, are apparent from the above description.

**[0069]** In particular, the system 1 and the method for combined management of at least one key 2 and an associated padlock 3 according to the present invention allow an adequate management of both components (key 2 and associated padlock 3).

**[0070]** From the above description it has clearly emerged, in fact, that the system 1 and the management method of the present invention make it possible to correctly and adequately track the various operations carried out in succession on both components, i.e. the key 2 and the associated padlock 3; in particular, such operations have been illustrated in detail in the various steps of the identification phase and of the phases of picking up and returning a key 2 and an associated padlock 3.

**[0071]** It is therefore apparent that the system 1 and the method according to the present invention ensure a

more thorough tracking than is currently allowed by prior-art systems, without nevertheless requiring any modifications to the key 2 and/or to the padlock 3, e.g. the addition of a suitable sensor.

**[0072]** In particular, the system 1 and the method of the present invention provide certainty about the fact that both objects, i.e. the key 2 and the associated padlock 3, have been actually returned; as already explained, this aspect is very important in safety procedures like, for example, the "lockout/tagout" procedure known in the art, and it is therefore clear that the system 1 and the method according to the present invention make it possible to complete such procedures in a safer and more accurate, efficient and effective manner. The system 1 and the related method for combined management of at least one key 2 and an associated padlock 3 according to the present invention are so conceived as to be easily adaptable to different contingent situations and needs without the production and implementation thereof being excessively costly.

**[0073]** The system 1 and the related method for combined management of at least one key 2 and an associated padlock 3 described herein by way of example may be subject to many possible variations without however departing from the novelty spirit of the inventive idea; it is also clear that in the practical implementation of the invention the illustrated details may have different shapes or be replaced with other technically equivalent elements.

## Claims

1. System (1) for combined management of at least one key (2) and an associated padlock (3), wherein the padlock (3) comprises a main body (3A) provided with a locking and unlocking device and a closing element (3B) linked to said main body (3A), and wherein the locking and unlocking device co-operates with said key (2) to allow said closing element (3B) to switch from a closed condition to an open condition, said system (1) comprising:

- a control unit (10);
- a user interface (20) associated with said control unit (10), wherein the user interface (20) comprises an identification system (21) for the recognition of a user by means of a unique identification code of said user, in particular said user interface (20) comprising input means (22) and output means (23) adapted to allow the exchange of information between a user and the control unit (10);
- a key depot (30) equipped with at least one first retention device (31) for locking and unlocking said at least one key (2), wherein said at least one first retention device (31) comprises a first lock (32) provided with a pawl (33) having a latch (34) adapted to be selectively brought



into a locking or unlocking position relative to said first lock (32) by means of an anchoring key (33C) adapted to actuate said pawl (33), wherein the key (2) of the padlock (3) is constrained to said anchoring key (33C),

wherein the pawl (33) comprises retaining means adapted to prevent extracting the anchoring key (33C) when the pawl (33) and the latch (34) are in said locking position, and wherein said retaining means are adapted to allow extracting the anchoring key (33C) when the pawl (33) and the latch (34) are in the unlocking position, in particular obtained by means of a rotation of the pawl (33) and of the latch (34), wherein said at least one first retention device (31) comprises at least one first sensor (35) for detecting said locking and unlocking positions of the pawl (33) and of the latch (34) and, consequently, also the presence of the anchoring key (33C) in the pawl (33) or the extraction of the same from said pawl (33),

and wherein said first lock (32) comprises a stopper element driven by said control unit (10) in such a way as to be either activated to hold the latch (34) and the pawl (33) in said locking position or deactivated to allow the latch (34) and the pawl (33) to turn into said unlocking position;

- a padlock depot (40) equipped with at least one second retention device (41) for housing a padlock (3) corresponding to the key (2) of the respective first retention device (31),

wherein said at least one second retention device (41) comprises a second lock (42) provided with a fastening bracket (44) adapted to be coupled to the closing element (3B) of the padlock (3) and adapted to be selectively brought from a closing position to an opening position, and vice versa, in said closing position the padlock (3) being housed in a seat (43) of the retention device (41), and in said opening position the padlock (3) being positioned out of said seat (43), so that it can be decoupled from the fastening bracket (44) by opening the closing element (3B) by means of the key (2), wherein said at least one second retention device (41) comprises at least one second sensor (45) for detecting said closing and opening positions of the fastening bracket (44) and, consequently, also the presence of the padlock (3) in the seat (43) or the extraction of the same from said seat (43),

and wherein said second lock (42) comprises a second stopper element driven by said control unit (10) in such a way as to be either activated to hold the fastening bracket (44) in said closing position or deactivated to allow the fastening bracket (44) to move into said opening position.

2. System (1) according to claim 1, **characterized in that** said first lock (32) is of the electromagnetically controlled type, in particular of the normally closed type.
3. System (1) according to claim 2, **characterized in that** said at least one first sensor (35) consists of a control element associated with the stopper element of said first electromagnetically controlled lock (32), wherein said control element is adapted to detect said locking position of the pawl (33) and of the latch (34) induced by the stopper element and, consequently, also the necessary and inevitable presence of the anchoring key (33C) in the pawl (33).
4. System (1) according to one or more of the preceding claims, **characterized in that** said pawl (33) is of the "cylinder" type and said retaining means of the pawl (33) consist of pins and counterpins of a peripheral cylinder and an internal cylinder of said pawl (33).
5. System (1) according to one or more of the preceding claims, **characterized in that** said second lock (42) is of the electromagnetically controlled type, in particular of the normally closed type.
6. System (1) according to claim 5, **characterized in that** said at least one second sensor (45) consists of a second control element associated with the second stopper element of said second electromagnetically controlled lock (42), wherein said second control element is adapted to detect said closing position of the fastening bracket (44) and of the second stopper element and, consequently, also the presence of the padlock (3) in the seat (43).
7. System (1) according to one or more of the preceding claims, **characterized in that** said seat (43) comprises a housing (43A) adapted to receive and lock at least a portion of the padlock (3) when the fastening bracket (44) is in said closing position.
8. System (1) according to one or more of the preceding claims, **characterized in that** said second lock (42) comprises actuating means (46, 47, 48, 49) that allow the fastening bracket (44) to move from the closing position to the opening position, and vice versa.
9. System (1) according to claim 8, **characterized in**

that said actuating means (46, 47, 48, 49) comprise:

- a frame (46) constrained to the fastening bracket (44), said frame (46) comprising at least one guide (47) adapted to allow the frame (46) and the fastening bracket (44) to slide on at least one bar (48) coupled to said at least one guide (47);
- an elastic member (49), in particular associated with said at least one bar (48), which exerts a thrust on the frame (46) when the second stopper element of the second lock (42) is deactivated by the control unit (10), in order to allow the fastening bracket (44) constrained to the frame (46) to move into said opening position.

10. Method for combined management of at least one key (2) and an associated padlock (3), said method comprising an identification phase that comprises the following steps:

- id1) supplying a unique identification code of a user to a control unit (10) by means of an identification system (21) of a user interface (20) associated with said control unit (10);
- id2) verifying, by said control unit (10), said unique identification code in order to assess if the user has been authorized to proceed with the management of a key (2) and a padlock (3) associated with said key (2);
- id3) if the verification of step id2) is successful, providing an indication as to which key (2) and which padlock (3) associated with such key (2) the user is permitted to pick up from at least one first retention device (31) of a key depot (30) and from at least one second retention device (41) of a padlock depot (40), respectively, and/or to return into said first retention device (31) and second retention device (41), respectively;
- id4) verifying, by said control unit (10), if the indication of step id3) refers to a first retention device (31) where an anchoring key (33C) constrained to said key (2) is inserted in a pawl (33), in particular such verification being carried out by the control unit (10) by means of at least one first sensor (35) of the first retention device (31), adapted to detect the locking or unlocking position of the pawl (33) and of an associated latch (34) and the consequent presence of the anchoring key (33C) in the pawl (33), said at least one first sensor (35) being adapted to detect the unlocking position of the pawl (33) and of the latch (34) and the consequent extraction of the anchoring key (33C) from the pawl (33).

11. Method according to claim 10, **characterized in that**, if the verification of step id4) is successful, resulting in the detection of the locking position of the pawl (33) and of the latch (44), said method com-

prises a pick-up phase comprising the following steps:

- pr1) driving, by said control unit (10), a stopper element of the first lock (32) so as to deactivate said stopper element, in particular in order to allow the latch (34) and the pawl (33) to turn;
- pr2) extracting the anchoring key (33C) from the pawl (33), in particular following a rotation of the pawl (33) and of the latch (34) bringing them into an unlocking position;
- pr3) driving, by said control unit (10), a second stopper element of the second lock (42), in particular of the normally closed and electromagnetically controlled type, so as to deactivate said second stopper element, in particular in order to allow the fastening bracket (44) to move into an opening position in which the padlock (3) is positioned externally to a seat (43), so that it can be decoupled from the fastening bracket (44);
- pr4) decoupling the padlock (3) from the fastening bracket (44), in particular by moving the closing element (3B) of the padlock (3) into an open position, wherein such movement is obtained by actuating the locking device of the padlock (3) by means of the key (2) constrained to the anchoring key (33C).

12. Method according to one or more of claims 10 and 11, **characterized in that**, if the verification of step id4) fails, resulting in the detection of the unlocking position of the pawl (33) and of the latch (44), said method comprises a returning phase of returning the key (2), constrained to the anchoring key (33C), and the associated padlock (3), wherein said returning phase comprises the following steps:

- res1) constraining, by the user, the padlock (3) to the fastening bracket (44), in particular by moving the closing element (3B) of the padlock (3) into a closed position;
- res2) causing, by the user, the passage of the fastening bracket (44) into a closing position, in particular a position in which the padlock (3) is positioned inside the seat (43);
- res3) driving, by said control unit (10), the second stopper element of the second lock (42) so as to hold the fastening bracket (44) in the closing position;
- res4) inserting, by the user, the anchoring key (33C) into the pawl (33) and bringing said pawl (33) and the latch (34) into the locking position, in particular by means of a rotation of the pawl (33) and of the latch (34), said locking position preventing the extraction of the anchoring key (33C) from the pawl (33);
- res5) activating, by said control unit (10), the stopper element of the first lock (32) in order to

hold the latch (34) and the pawl (33) in the locking position.

13. Method according to one or more of claims 10 to 12, **characterized in that** the verification of step id4) is carried out through one or more of the following steps:

- detecting, by the first sensor (35) of the first retention device (31), the locking position of the pawl (33) and of the latch (34), and sending such detection to the control unit (10), in particular said locking position corresponding to the presence of the anchoring key (33C) in the pawl (33);
- detecting, by the second sensor (45) of the second retention device (41), the closing position of the fastening bracket (44), and sending such detection to the control unit (10), in particular said closing position corresponding to the presence of the padlock (3) in the seat (43) of the second retention device (41).

14. Method according to one or more of claims 10 to 13, **characterized in that** said step id3) is carried out through the step of actuating, by the user, a selection element of input means (22) of a user interface (20) in order to select a first retention device (31) of the key depot (30) and a corresponding second retention device (41) of the padlock depot (40).

15. Method according to one or more of claims 10 to 14, **characterized in that** the switching of the fastening bracket (44) from the closing position to the opening position occurring during step pr3) is effected through the activation of actuating means (46, 47, 48, 49) of the second lock (42), in particular said activation being executed in a substantially automatic manner as a consequence of the deactivation of the second stopper element of the second lock (42).

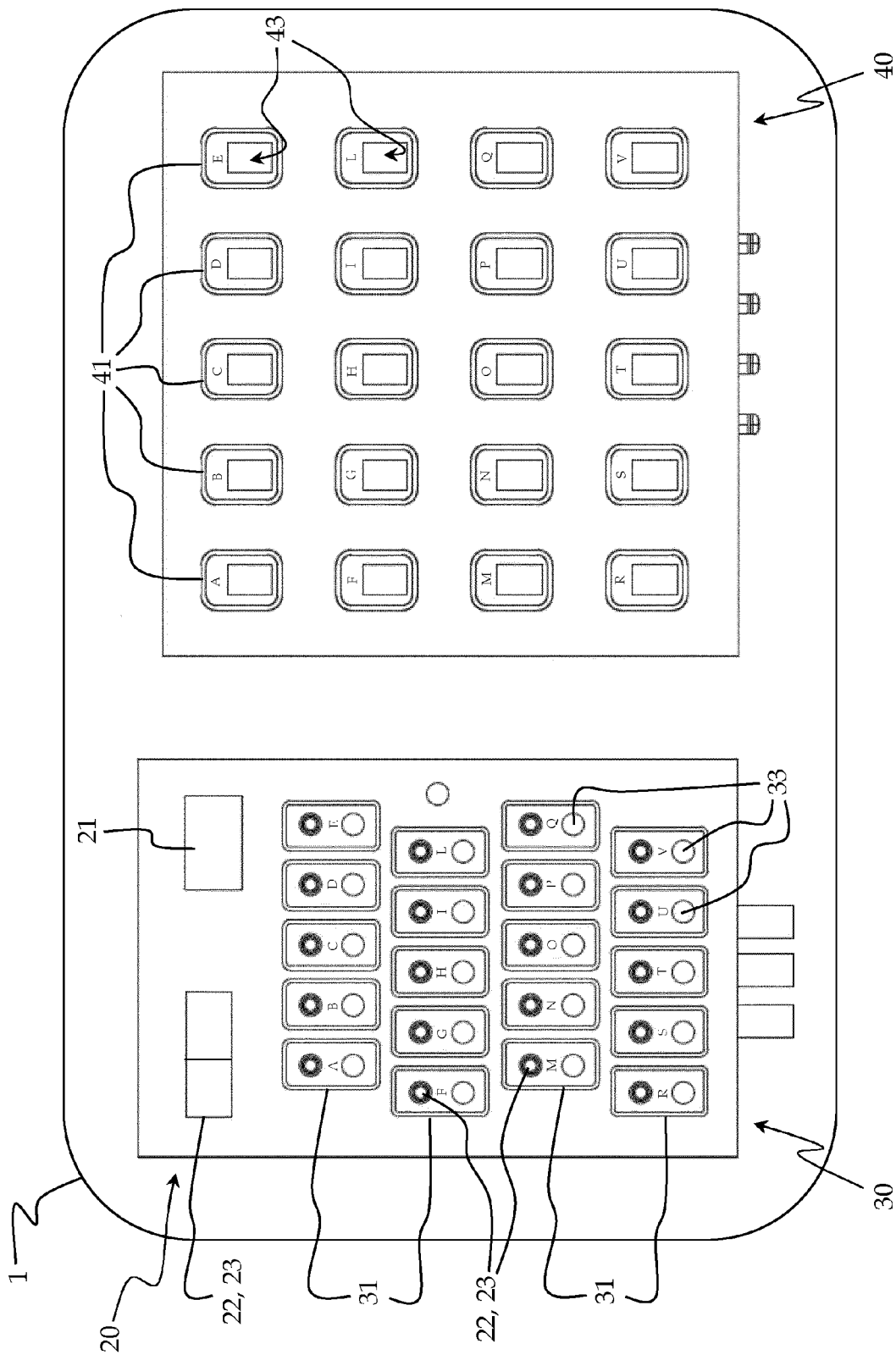


Fig. 1

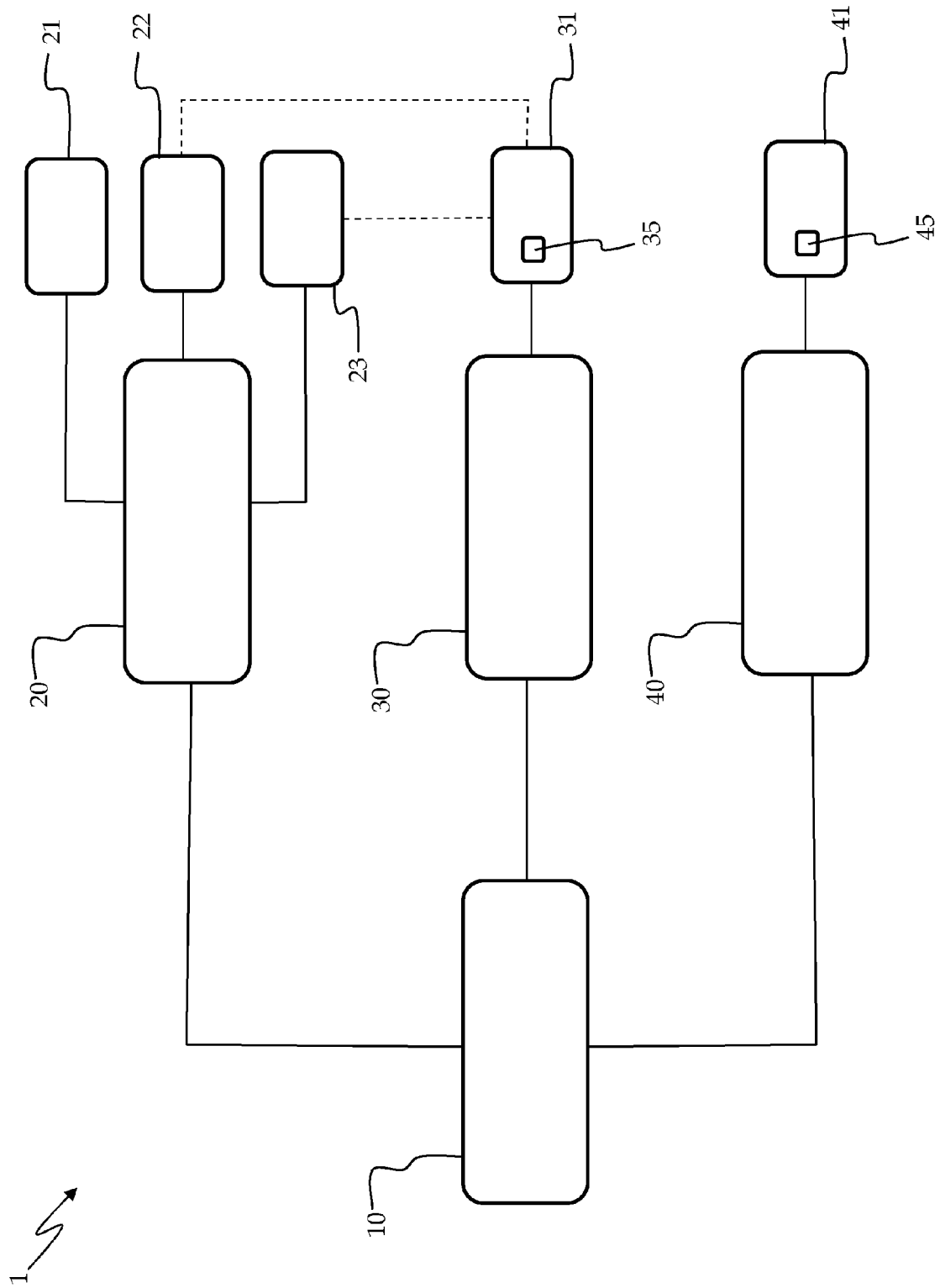


Fig. 2

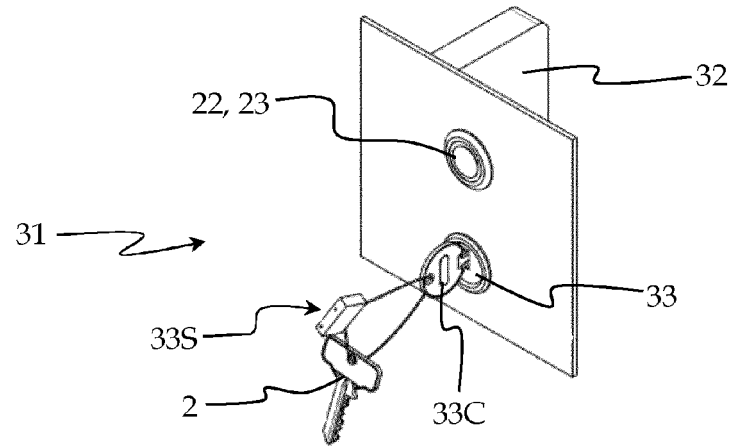


Fig. 3A

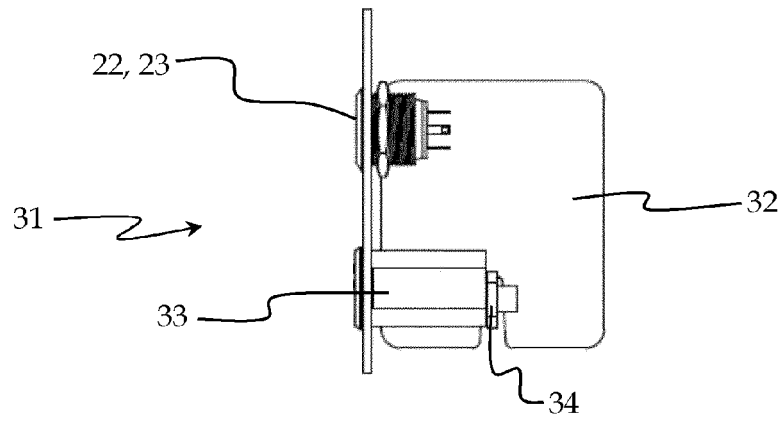


Fig. 3B

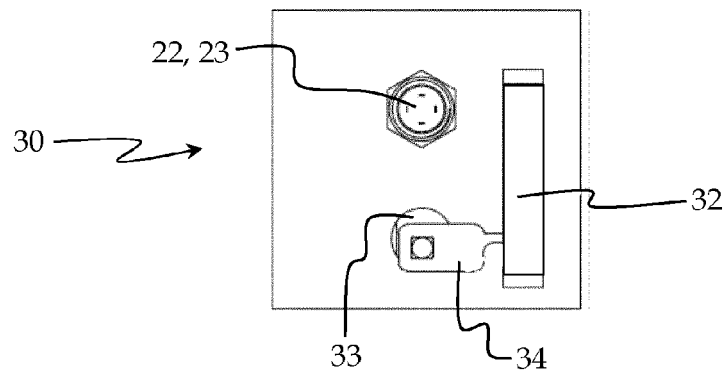


Fig. 3C

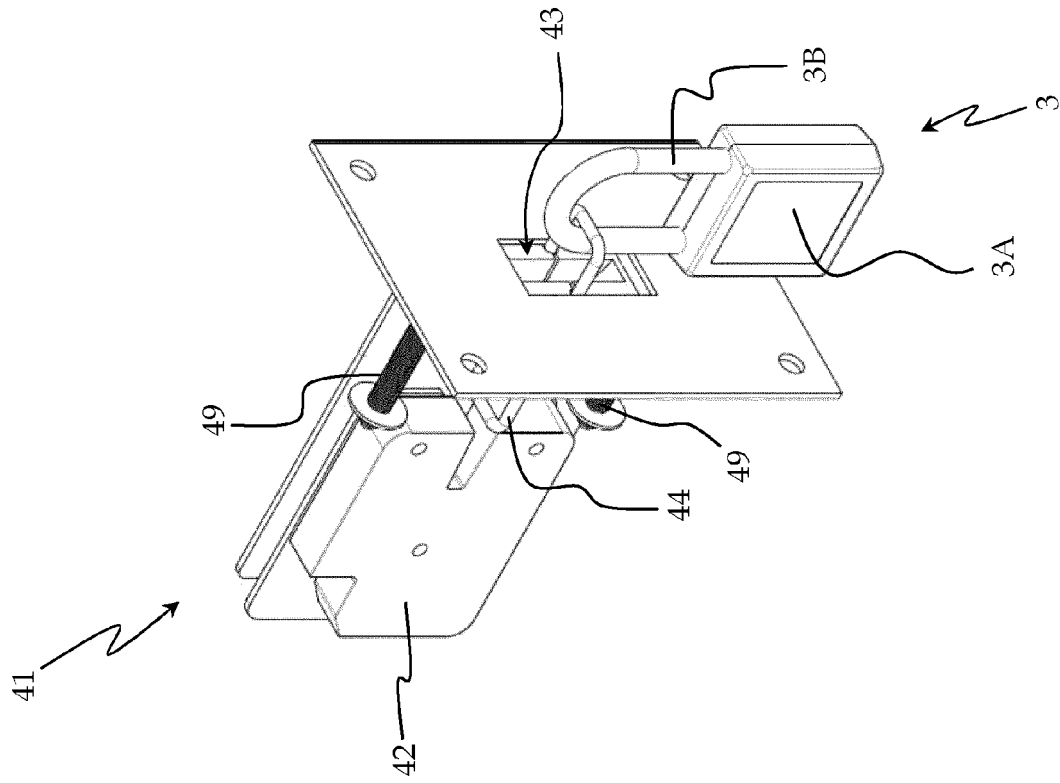


Fig. 4B

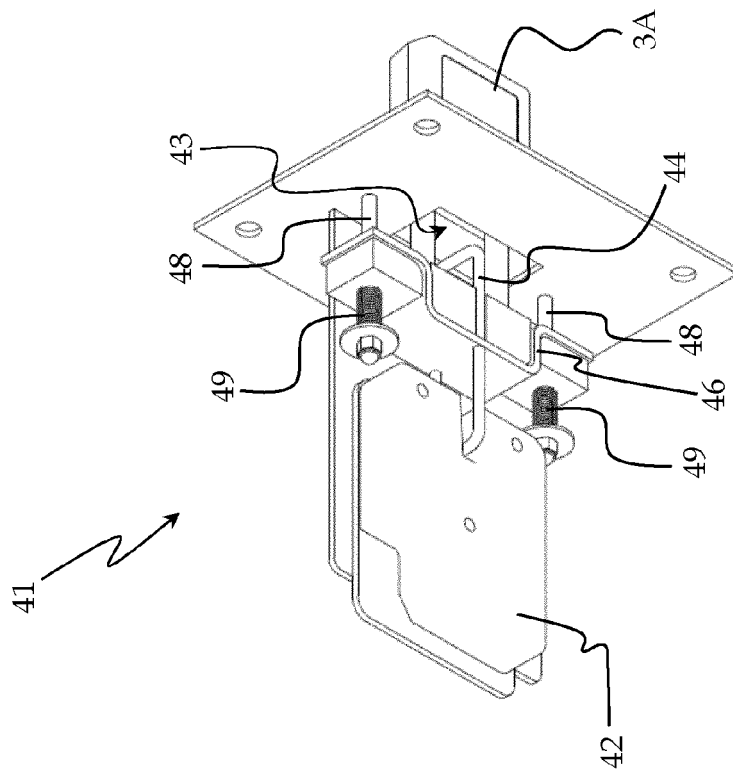


Fig. 4A

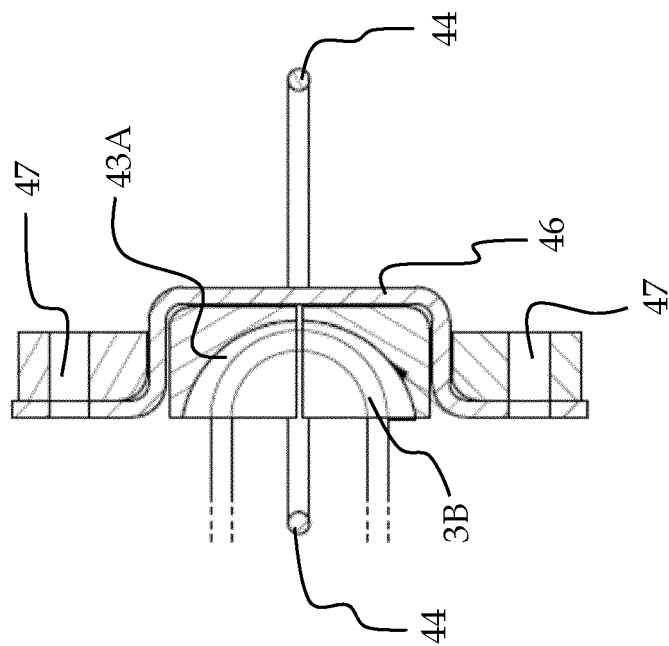


Fig. 5B

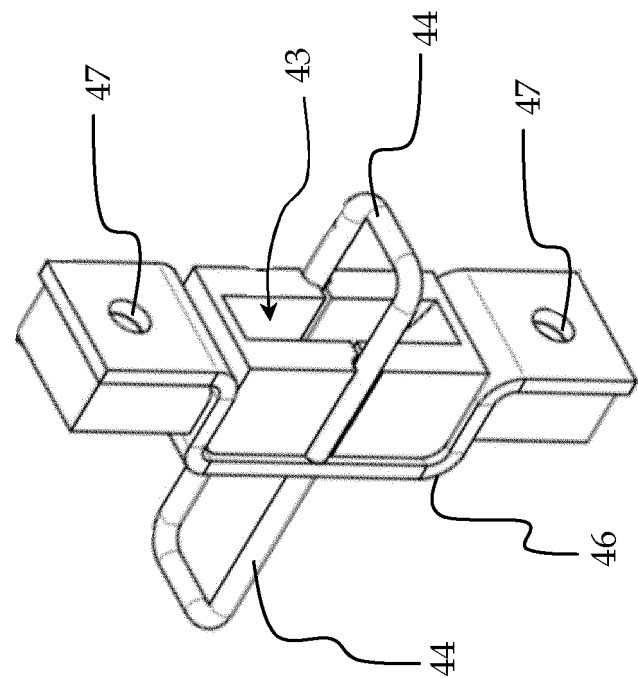


Fig. 5A



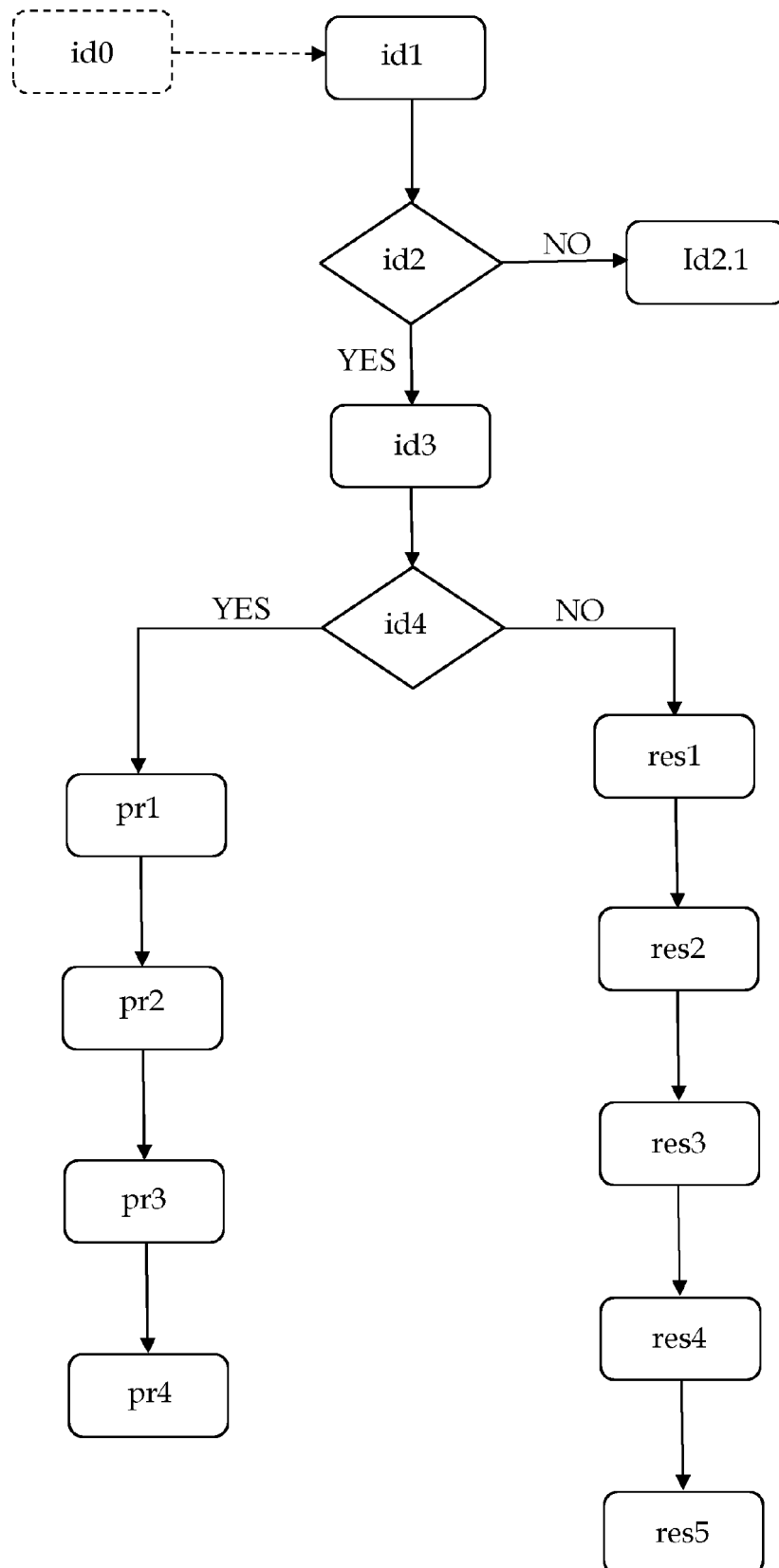


Fig. 6



## EUROPEAN SEARCH REPORT

Application Number

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A	ES 2 345 751 B1 (FERNANDEZ-CORMEZANA PRESA LUIS [ES]; CIGES FAURA MANUEL) 11 July 2011 (2011-07-11) * figures 1-3 * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47G
The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>19 April 2023</b>	Examiner <b>Fidalgo Marron, B</b>
CATEGORY OF CITED DOCUMENTS 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		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	

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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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.  
The members are as contained in the European Patent Office EDP file on  
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19-04-2023

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