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(54) NEW UNIVERSAL SYSTEM FOR COMMUNICATION BETWEEN A REMOTE DEVICE AND A RECEIVING STATION

(57) A system (1) for the communication between a remote device (7, 8) and a receiving station (4) of an automation (5) is described, comprising a control unit (2), a memory unit (MEM), receiving means (TX1) configured to receive input signals, and transmission means (TX2) configured to communicate with the receiving station (4). The control unit (2) is suitably configured to store in the memory unit (MEM) information relating to the transmission procedure of an original remote control (7) which emits Rolling Codes, said control unit (2) being adapted to emit, based on the stored information, a transmission code (TC) through the transmission means (TX2) towards the receiving station (4), send, through the transmission means (TX2), a synchronization signal (Sync) towards the receiving station (4), said synchronization signal (Sync) being based on the stored information relating to the original remote control (7), and based on said synchronization signal (Sync), force the synchronization of the receiving station (4) so that the emitted transmission code (TC) is within a range of valid codes (21) of said receiving station (4), wherein the receiving means (TX1) are configured to receive a command signal (Cmd) emitted by the remote device (7, 8), said system (1) being configured to send the transmission code (TC) to the receiving station (4) for the activation thereof in response to the command signal (Cmd), interfacing said remote device (7, 8) with said receiving station (4), the system (1) comprising a casing (3) including at least the control unit (2), the memory unit (MEM), the receiving means (TX1), and the transmission means (TX2), said casing (3) being shaped to be positioned close to the receiving station (4). Suitably, the system (1) is powered by a battery (6) housed in a seat (6s) in the casing (3).

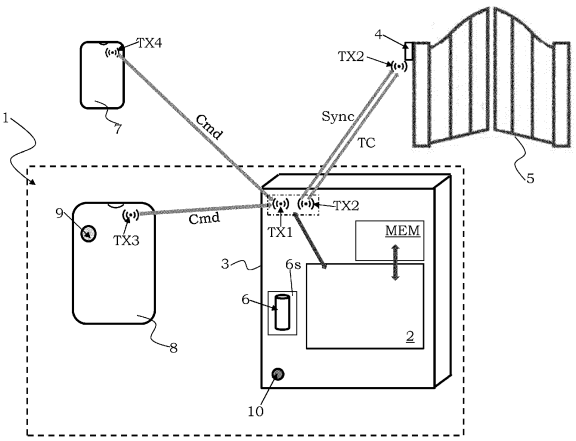

FIG. 1

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Description

Field of application

[0001] The present invention relates to a universal system for the communication between a remote device and a receiving station, for example for the communication with a receiving station close to an automation such as a house gate or garage, and the following description relates to this field of application only to simplify the exposition thereof.

Prior art

[0002] As well known, a remote control is an electronic device which allows to send signals to another device, referred to as "receiver", placed at a distance and controllable by said signals. The most common remote controls for domestic use are intended for opening and closing house doors and gates or for controlling lighting systems, as well as for opening/closing a motor vehicle or similar applications.

[0003] A remote control is able to emit electromagnetic signals which are picked up by the remote-controlled device by suitable receiving means, said signals being generally in the field of radiofrequencies, which is the reason why we speak in this case about "radio controls".

[0004] In this field, there is often the need to be able to quickly duplicate a remote control without necessarily having to call specialized technicians. To this end, there are universal remote controls (also called cloned remote controls) in order to perform a copy procedure of the code of an original remote control, being it a fixed code or a rolling code (wherein the rolling codes are also referred to in the sector as "Rolling Codes").

[0005] Particularly, as known in the sector, a remote control with rolling code emits a partly different code at each activation (more in particular with a counter increased with respect to the previous code), wherein a part of said code (comprising the counter) is suitably encoded and later decoded by the receiver, with increased safety for the user.

[0006] For said original remote controls with rolling code, there are cloned remote controls which are able to recognize said rolling codes and to generate a code similar to the original one which is stored in the memory of the cloned remote control for the following activation of the receiving station.

[0007] However, in order that the receiving station can be activated, the cloned remote control should be able to be accredited at said receiving station through a particular accreditation procedure which allows the cloned remote control to be recognized and enabled by said receiving station, so as to allow the successive use thereof after the copy.

[0008] According to a known solution developed by the Applicant, the accreditation procedure can be automatically performed by the cloned remote control by sending certain code sequences towards the receiving station, said codes allowing the receiver to recognize the cloned radio control as an enabled radio control.

[0009] However, it may happen that the above-described accreditation procedure cannot be performed with some receiving stations (which are for example not designed to provide said function), or technical problems can occur which make this process difficult, that is the reason why it is desirable to have a system which allows the code of an original remote control to be duplicated and which allows at the same time an easy installation and an immediate use.

[0010] The technical problem of the present invention is to devise a system for the communication between a remote device and a receiving station which has structural and functional characteristics such as to overcome the limitations and drawbacks reported relating to the prior art, in particular which is able to emulate the transmission procedure of an original remote control with rolling code, and which at the same time does not need a designated accreditation procedure at the receiving station, the use thereof being therefore simple, intuitive and not requiring particular accreditation/storage methods in said receiving station, being also very simple to install at the receiver.

Summary of the invention

[0011] The solution idea underlying the present invention is to provide a system which is able to activate a receiving station (such as, for example, a receiver close to a gate) firstly by cloning an original remote control (in particular of the Rolling Code type) by a copy procedure in order to emulate said original remote control, and later synchronizing said receiving station in order to be then able to emit the code expected for the activation of the latter in response to a command from a remote device, substantially acting as bridge or interface and operating the receiving station on behalf of said remote device, which can be an auxiliary remote control or also the same original remote control. This result is obtained by the system of the present invention by sending suitable synchronization signals based on the cloned code towards the receiving station, in order to force, at least at the first activation, the synchronization of the receiving station with said system, which is arranged near it. In this way, the rotation of the synchronization windows of the receiving station is forced, possibly desynchronizing the original remote control such that it cannot anymore directly communicate with said receiving station but only through the system described herein. The system of the present invention is configured to perform these operations for a large number of original remote controls on the market, so as to be able to communicate with a large number of receiving stations, thus acting as universal receiver. Suitably, all is contained in a casing, powered with battery (for example of standard type), which can be positioned in any desired position and without encumbrance and/or

obstacle.

[0012] Based on said solution idea, the above-mentioned technical problem is solved by a system for the communication between a remote device and a receiving station of an automation, the system comprising a control unit, a memory unit, receiving means configured to receive input signals, and transmission means configured to communicate with the receiving station. The control unit is suitably configured to store, in the memory unit, information relating to the transmission procedure or method (for example the transmission/communication parameters/protocols) of the code of an original remote control which emits Rolling Codes, said control unit being adapted to emit, based on the stored information, a transmission code through the transmission means towards the receiving station. The control unit is also suitably configured to send, through the transmission means, a synchronization signal towards the receiving station, said synchronization signal being based on the stored information relating to the original remote control (for example it comprises the codes which would be emitted in transmission from the cloned original remote control), and based on said sent synchronization signal, force the synchronization of the receiving station so that the emitted transmission code towards the receiving station is within a range of valid codes of said receiving station, wherein the receiving means are configured to receive a command signal emitted by a remote device, the system being configured to send the transmission code to the receiving station for the activation thereof in response to said command signal (Cmd), interfacing said remote device with said receiving station. Obviously, even if "transmission code" is used in singular, the skilled person knows that said code varies at each transmission, that is the system is able to send a plurality of codes with different counter. According to the invention, the system comprises a casing which includes at least the control unit, the memory unit, the receiving means, and the transmission means, said casing being shaped to be positioned close to the receiving station. According to the invention, the system (in particular the components included in the casing) is powered by a battery housed in a seat in the casing (or more in general housed in any suitable way).

[0013] More in particular, the invention comprises the following additional and optional characteristics, taken individually or in combination, if necessary.

[0014] According to an aspect of the present invention, the control unit can be configured to start a copy procedure wherein said control unit is able to recognize a Rolling Code emitted by the original remote control and received by the receiving means, for example by recognizing the transmission procedure or method of the code of said original remote control. At the end of the copy procedure, the control unit can be furthermore configured to store the information relating to the recognized Rolling Code in the memory unit.

[0015] According to an aspect of the present invention, the control unit can be configured to recognize the frequency of the radio signal emitted by the original remote control. Furthermore, in the copy procedure, it can be configured to perform *n* measurements of the duration of the high-low and low-high transitions of the radio signal of the original remote control, process said measurements, and perform a sampling of said radio signal.

[0016] According to an aspect of the present invention, the memory unit can be adapted to contain a plurality of information relating to the transmission procedures of a respective plurality of original remote controls which emit Rolling Codes, the control unit (2) being configured to recognize a Rolling Code of a specific original remote control by means of said copy procedure, and later to select and use the information relating to the specific transmission procedure associated with said recognized original remote control for the generation and emission of the correct transmission code.

[0017] According to an aspect of the present invention, the emitted synchronization signal can comprise at least two transmission codes which are emitted one after the other, wherein a successive transmission code (Rolling Code) has a counter value that is increased with respect to a transmission code (Rolling Code) previously emitted in said sequence.

[0018] According to an aspect of the present invention, the emitted synchronization signal can be configured to cause a shift (rotation) of a set of code synchronization ranges of the receiving station, said set comprising the above-mentioned range of valid codes, a re-synchronization range, and a range of forbidden codes, wherein, through the emission of at least two successive variable transmission codes within said re-synchronization range, the control unit is adapted to synchronize the system with the receiving station.

[0019] According to an aspect of the present invention, through the synchronization signal, the control unit can be configured to force the synchronization of the receiving station so that the code emitted by the original remote control is within the range of forbidden codes of said set of synchronization ranges, thereby performing the desynchronization of the original remote control from the receiving station.

[0020] According to an aspect of the present invention, the control unit can be configured to compare the value of the counter of the code emitted by the desynchronized original remote control with extreme counter values of the ranges of the set, and force again the synchronization of the receiving station so that the code emitted by the original remote control is substantially at the center of the range of forbidden codes in case said value of the counter of the original remote control is equal to or greater than a threshold value defined at a determined distance from said extreme counter values.

[0021] According to an aspect of the present invention, the control unit can be configured to force, through the synchronization signal, the synchronization of the receiving station so that the code emitted by the original remote

control is also within the range of valid codes.

[0022] According to an aspect of the present invention, the system can further comprise an auxiliary remote control adapted to send the command signal towards the receiving means for sending the transmission code, based on the stored parameters, towards the receiving station and activating the automation.

[0023] According to an aspect of the present invention, the system can comprise a Bluetooth interface and/or a network interface, without being particularly limited to one of them.

[0024] According to an aspect of the present invention, the control unit can be further configured to store an activation key in the memory unit, process a signal received by a further remote device, the signal being received by said Bluetooth interface and/or said network interface, and cause the sending of the transmission code towards the receiving station for activating the same if the signal received from said further remote device comprises the stored activation key.

[0025] According to an aspect of the present invention, the control unit can be configured to be controllable and/or programmable by a user interface accessed through an application installed on a user device and/or through a determined internet site, said control unit interacting with the user interface by means of the Bluetooth interface and/or the network interface.

[0026] Suitably, in an aspect, there aren't wired connections.

[0027] A method to allow the communication between a remote device and a receiving station is also described, the method comprising at least the steps of storing, in a memory unit, information relating to the transmission procedure of an original remote control which emits rolling codes, so as to be able to emit, based on the stored information, a transmission code through transmission means towards the receiving station, sending, through the transmission means, a synchronization signal towards the receiving station, said synchronization signal being based on the stored information relating to the original remote control, and, based on the synchronization signal which is sent, forcing the synchronization of the receiving station such that the transmission code emitted through the transmission means towards the receiving station is inside a range of valid codes, wherein, through said transmission code sent to the receiving station in response to a command signal emitted by the remote device, said receiving station is activated, suitably interfacing the remote device with the receiving station.

[0028] The characteristics and advantages of the system according to the invention will emerge from the description, given below, of an embodiment thereof given by way of non-limiting example with reference to the attached drawings.

Brief description of the drawings

[0029] In said drawings:

- figure 1 shows a schematic view of the system according to the present invention;
- figure 2 shows an example of a set of ranges of synchronization codes of a receiving station;
- figure 3 shows a flowchart of operations performed by a control unit according to an embodiment of the present invention; and
- figure 4 shows a flowchart of operations performed by a control unit according to another embodiment of the present invention.

Detailed description

[0030] Referring to said figures, and in particular to figure 1, a system according to the present invention is globally and schematically indicated with 1.

[0031] It should be noted that the figures represent schematic views and are not drawn to scale, but they are instead drawn so as to emphasize the important characteristics of the invention. Furthermore, in the figures, the different pieces are schematically represented, their form can vary according to the desired application. It should be furthermore noted that, in the figures, identical reference numbers refer to elements which are identical in form or function. Finally, particular expedients described in relation to an embodiment illustrated in a figure are usable also for the other embodiments illustrated in the other figures.

[0032] It can be furthermore observed that, when process step sequences are illustrated, they do not necessarily follow the indicated sequence, said steps can be reversed unless it is indicated otherwise.

[0033] In general, the system 1 of the present invention finds an exemplary application in the field of the automation for opening automatic doors and/or gates, such as for example for communicating with and activating a receiving station connected to automatic house doors and gates, even if it should not be intended as limited to this specific application and other various applications are possible. For example, the system 1 of the present invention can be applied in the domotics field, just to make a furthermore non-limiting example. In general, it can be therefore said that the system 1 of the present invention allows and facilitates the communication between a remote device and a receiving station of an automation, substantially acting as an interface between them, as will be detailed in the following. It can be furthermore observed that, in the scope of the present invention, the terms "receiving station" and "receiver" are used as synonyms and are interchangeable.

[0034] As will be seen in detail in the following, the system 1 of the present invention allows cloning an original remote control, also a rolling code, emulating its transmission procedure of the code. Generally, the remote controls of interest emit signals in the range of the

radiofrequencies, which is the reason why they are indicated as "radio controls" and the code emitted therefrom is defined as "radio code". It can be furthermore observed that, in the following, when reference is made to an emitted transmission code it is intended a rolling code with a determined counter value emitted towards the receiving station, which changes at each transmission.

[0035] With reference to figure 1, the system 1 comprises a control unit 2, and a memory unit (MEM) operatively connected to the control unit 2. The control unit 2 is not limited by a particular architecture and can be for example a suitably programmed microprocessor, without being limited to a particular type. Analogously, the memory unit MEM can be any one suitable memory, and the term "operatively connected" is not limiting the type of implemented connection; for example, the memory unit MEM can be integrated in the control unit 2 (and thus be an integrated memory in a microcontroller), as well as it can be an external unit and connected thereto. Figure 1 shows a memory MEM connected to the control unit 2 only for illustrative purposes in order to better understand the invention even if, as said above, it can be contained in the control unit 2. As will be detailed in the following, the memory unit MEM contains program instructions for performing specific operations of the system 1.

[0036] In any case, it can be generally observed that the present invention is not limited by the particular architecture and/or connection of the components, which can vary according to the needs and/or necessities.

[0037] The system 1 further comprises receiving means TX1 configured to receive input signals (for example from an original remote control) and transmission means TX2 configured to communicate with a receiving station. Also in this case, the receiving and transmission means are not limited by a particular architecture; for example, they can comprise circuit components separate from each other and connected to the control unit 2 (as represented in figure 1 only by way of example), or they can be integrated in a single component, that is they can share at least common circuitry and be integrated in a single transceiver, connected to the control unit 2, as known in this technical sector; it is also possible an embodiment in which the receiving and transmission means are actually a single component which is able to perform both said functions. In other words, the skilled person certainly recognizes that such a partition is a partition to better comprise the operation of the invention which does not necessarily correspond to a physical partition.

[0038] The control unit 2, the memory unit MEM, the receiving means TX1 and the transmission means TX2, as well as all the other main components of the system 1, are enclosed in a casing 3. The casing 3 can have any one suitable form (for example a cube or parallelepiped, generally with a compact and easily handleable form) and is generally shaped to be positioned close to a receiving station 4 in order to control an automation 5 such as for example a house gate. The arrangement of the above-mentioned components with respect to the casing is not limited to a particular one (they can all be enclosed in the casing, or some of them, such as for example the receiving and transmission means TX1 and TX2, can be arranged on the casing and other enclosed therein).

[0039] Suitably, the system 1 of the present invention is powered by a simple battery 6 housed in a seat 6s in the casing 3. In this way, there is a great freedom in arranging the casing 3 close to the receiving station 4, according to the needs and/or necessities. In particular, the casing 3 is placed quite near the receiving station 4 in order to allow the correct sending/receiving of the radio signals, however without being limited by the necessity to provide a power supply from the electric network to the components of the system 1.

[0040] In this way, advantageously according to the present invention, all is contained/supported in the casing 3 and is powered by a battery (for example of a standard type, without being limited to a particular type), said casing 3 being able to be positioned in any desired position and without the slightest encumbrance and obstacle, since it is not necessary to integrate the components in existing structures (they are already integrated in the casing 3) and wired connections are not necessary, a simple battery being enough.

[0041] Suitably, the system 1 is able to operate as auxiliary receiver placed close to the original receiving station 4 of the automation 5. In particular, it is able to learn the communication parameters (that is all the relevant information for emitting the correct code, for example relating to the used communication/transmission protocol) of an existing original remote control (herein indicated with reference number 7 and provided with own transmission/receiving means TX4), listening for transmissions emitted therefrom, as well it is able to learn the communication parameters of many other different original remote controls, operating the original receiving station 4 via radio on behalf of them. In this way, the system 1 of the present invention is able to clone any one original remote control 7, also a remote control which emits rolling codes (known in the field with the term "Rolling Code"), and activate the receiving station 4 in a simple way. The commands are received by receiving means in the casing, arranged in any suitable way.

[0042] It can be generally observed that, in the present description, the term "information relating to the transmission procedure or method of a remote control" indicates all those information which are necessary to and are stored by the cloned remote control for the generation or the successive transmission of the correct code (in particular Rolling Code) to be sent towards the receiving station 4, that is those parameters which are stored and then used to perform the correct generation of the code (for example with generation and encoding algorithms which are previously stored and indeed performed based on the learned information), that is to generate the correct transmission codes (herein indicated with the reference TC, which are indeed codes which vary at each transmission, for example at each pressing of a command

button, that is they are Rolling Codes) to be emitted towards the receiving station 4.

[0043] Said information can furthermore include the frequency, the modulation, the level of the signal and so on, that is the transmission parameters which generally characterize the transmission, of many original remote controls. In an example, instructions for recognizing the code are also stored, as described below.

[0044] In this way, the control unit 2 is thus configured to store, in the memory unit MEM, the information about the transmission procedure (that is the transmission/communication parameters) of the original remote control 7 which emits Rolling Codes, so as to be able to communicate with the receiving station 4 using said parameters and thus acting on behalf of said original remote control 7, thereby acting as bridge or interface between the remote control and the receiver.

[0045] To this end, in a preferred embodiment of the present invention, the control unit 2 is suitably programmed to receive, through receiving means TX1 connected thereto, the radio signal emitted by the original remote control 7 and recognize the code of said original remote control 7 with rolling codes by a copy procedure performed by said control unit 2, as will be detailed below, in order to be able to successively emulate/clone the transmission of said original remote control 7.

[0046] In an embodiment, the above-mentioned copy procedure firstly provides that the frequency of the radio signal emitted by the original remote control 7 is recognized. Thereafter, *n* measurements of the duration of the high-low and low-high transitions of the radio signal of the original remote control 7 are performed by the control unit 2. Said measurements are then processed and a sampling of the received radio signal is performed.

[0047] While measuring the duration of the high-low and low-high transitions of the received radio signal, the minimal and maximal durations of these transitions are obtained. For the maximal duration of the transitions, the respective level of the radio signal is also stored. In the processing step, the duration of the period of the radio signal, corresponding to the duration of the shortest transmission element, as well as the duration and the level of the pause, corresponding to the duration and the level of the longest level is obtained. In the sampling step, the radio signal is finally sampled in different moments, beginning half period after a transition and then continuing after each whole period until the following transition from which half period and so on will be again counted.

[0048] Once the code of the original remote control 7 is recognized by the control unit 2 through the above-mentioned copy procedure, the information relating to said recognized Rolling Code (and also the frequency of the original remote control) is stored in the memory unit MEM for the following use thereof by the system 1.

[0049] Suitably, in an embodiment, the memory unit MEM is adapted to contain a plurality of information on the transmission procedure of a respective plurality of original remote controls, for example (but not necessarily) previously stored in said memory unit MEM. The control unit 2 is thus able to recognize, during the copy procedure, the code of a specific original remote control 7 using the stored information, for example recognizing/learning the received transmission parameters, then comparing them with stored parameters, and verifying which of the stored parameters (and associated with a specific original remote control) correspond more to said recognized parameters in order to recognize the remote control, then store this information for the successive use and send the correct transmission code.

[0050] Although the above-mentioned embodiment is preferred, other ways to store, in the memory unit MEM, the respective transmission parameters to be used are also possible. For example, in another embodiment, it is also possible to force the storing of the information on the transmission procedure to be used by a suitable programming operation of the system 1, without performing the recognition of the radio code provided by the copy procedure; for example, it is possible to directly load in the memory MEM the transmission parameters to be used through a programming unit which is external and connected to the system 1, such that, through said loaded information, the central unit 2 is able to perform the correct algorithms for generating the desired rolling codes to be sent towards the receiving station, that is for generating the correct transmission codes. In this embodiment, the programming of the codes in the system 1 can take place through a suitable external programmer or through a Bluetooth signal.

[0051] In any case, once the transmission parameters of the original remote control 7 has been stored in the memory unit MEM (in any suitable way as described above), the system 1 is able to emit the correct transmission codes TC through the transmission means TX2 towards the receiving station 4 in response to a command signal Cmd from a remote device, as will be described in detail in the following.

[0052] Once the desired information has been stored, the actual communication of the system 1 with the receiving station 4 should be enabled for the activation thereof and thus for the activation of the automation 5 connected thereto; in other words, the system 1 should be synchronized with the receiving station 4.

[0053] As mentioned above, the receiving stations 4, which the system 1 is able to interface with, work on the principle of the Rolling Code, wherein the original remote controls send a numerical code with a counter which is increased at each transmission. This code is set to zero after it reached a specific value. The receivers accept the transmissions only if the code which they receive is in a specific range or window of valid codes (also called activation window), which include the value subsequent to the code of the last received transmission and a limited quantity of successive codes, as will be detailed in the following. If a remote control emits various transmissions (for example following an unintentional pressing of the command button which causes an increasing of the coun-

ter without a corresponding activation of the receiver), it is possible that the code thereof exits said window of valid codes, such that, when this takes place, a re-synchronization procedure is carried out, which aligns (or better re-aligns) the windows of the receiver with the code emitted by the remote control. In order to carry out this procedure of re-synchronization, the remote control must be in a second range or window of codes, which is wider than the first (called re-synchronization range), generally including half of the possible value subsequent to the one of the last received transmission.

[0054] Through the re-synchronization procedure is thus possible to shift the windows of the receiver such that these are centred on any desired value.

[0055] Based on the above-mentioned principle, advantageously according to the present invention, once the information about the transmission procedure of the cloned original remote control have been stored, the control unit 2 is configured to send suitable synchronization signals (herein indicated with the reference "Sync") towards the receiving station 4, in order to enable the actual communication between them and the activation of the latter. For example, the sending of the synchronization signals Sync can be activated by a suitable pressing of the buttons, as will be detailed in the following. It can be furthermore observed that the term "synchronization signals" used in the text and in the claims does not limit the number of said sent signals, even only one signal (for example comprising more codes) being able to be sent, as will be clear from the following description.

[0056] More in particular, as will be described in the following more in detail, the synchronization signals Sync are based on the transmission parameters of the original remote control with rolling code which should be cloned and previously stored in the memory unit MEM (that is, they generally comprise sequences of rolling codes corresponding to the codes which would be emitted by the original remote control) and, based on said synchronization signals Sync, it is possible to force the synchronization of the receiving station 4 such that the transmission code TC emitted by the interface system 1 through the transmission means TX2 (for example following the command signal Cmd) is recognized as a valid code, that is it is within the above-mentioned window of valid codes (or activation window) of the receiving station 4.

[0057] To better understand what was discussed above, it should be considered the embodiment in which the system 1 is configured to communicate with a receiving station 4 provided with a set of synchronization ranges or windows, as schematically indicated in figure 2, said set being globally identified with the reference 20 and being represented by a circumference divided in various portions corresponding to various ranges or windows.

[0058] In the case, for example, of a control unit 2 which comprises a microcontroller of the Microchip HCS family, as well as in the case of many other known microcontrollers, the set 20 comprises the range or window of valid codes (identified with the reference 21 and, as seen above, also called activation window o single-operation window), the re-synchronization range or window (identified with the reference 22 and also called double-operation window), and a range or window of forbidden codes 23 (also called blocked window). Generally, the extent of the different windows of the set 20 is defined by the producer, but it can vary according to the needs and/or circumstances. It can be also said that the set 20 is a set of counter values of the activation codes emitted towards the receiving station.

[0059] In general, during the normal operation, at each sending of the Rolling code towards the receiving station 4, a designated counter is increased (the rolling code is generated by a pre-set algorithm both on the transmitter and on the respective receiver). When the rolling Code arrives at the receiving station 4, it decodes the encoded part thereof and evaluates the counter thereof so as to evaluate in which window of the set 20 it is placed.

[0060] The window of valid codes 21 generally comprises a limited number of codes (for example sixteenth codes subsequent to the one corresponding to the counter of the last received and stored Rolling Code, indicated by the arrow F'). If the code sent by the system 1 toward the receiving station 4 is within this window of valid codes 21, the receiving station 4 is immediately activated.

[0061] If the code sent by the system 1 towards the receiving station 4 is instead within the re-synchronization window 22, it is required to send the code a second time such that the receiving station 4 resynchronizes on the value of the sent counter.

[0062] As will be observed also in the following, according to the present invention, by emitting at least two successive activation codes (that is two Rolling Codes, each characterized by an own counter) within the re-synchronization window 22, the synchronization of the interface system 1 with the receiving station 4 is carried out, which is used to align the system 1 with said receiving station 4. In other words, it is precisely this re-synchronization window 22 which is used by the system 1 of the present invention to always have it synchronized with the receiver 4, suitably managing the windows of the latter and allowing to align the window of valid codes 21 as desired based on the copied code which is desired to be used.

[0063] The re-synchronization window 22 starts at the end of the window of valid codes 21 and is much wider (it contains around half of the possible codes, for example more or less thirty-two thousand codes).

[0064] The window of forbidden codes 23 instead comprises the remaining codes which are ignored by the receiving station 4 (the extent of this window is similar to the one of the re-synchronization ranges 22). Each time a code within the window of valid codes 21 is received, the set 20 rotates, as indicated in arrow F of figure 2. In this way, the code which was just received is rejected and enters in the window of forbidden codes 23 and is thus ignored by the receiving station 4; this code can be reused when the set 20 has carried out a complete rota-

tion (e.g. after rotating sixty-four thousand times).

[0065] So, as previously mentioned, advantageously according to the present invention, the synchronization signal Sync emitted by the system 1 is configured to cause the rotation (shift) of the set 20 of code windows of the receiving station 4, for example based on the above-explained mechanism, when the synchronization with said receiving station 4 should be obtained.

[0066] In an embodiment, the memory unit MEM contains information relating to the windows 21, 22 and 23 of the receiver 4 (for example the extent thereof, so as to be able to truly effectively use said re-synchronization procedure for the desired aligning of the emitted and received codes, that is so as to be able to send the suitable synchronization codes within the re-synchronization window 22 so as to be able to really perform the desired rotation of the windows.

[0067] It can be in general observed that, when the transmission procedure of a new original remote control 7 is learned (for example through the receiving and processing of the code transmitted by said original remote control), it is very likely that the transmission codes TC emitted by the system 1 based on the information learned are within the window of valid codes 21 (they are at most within the re-synchronization window 22), while it is very rare that said codes are within the window of forbidden codes 23. Accordingly, in an embodiment, starting from this hypothesis (and possibly knowing the extent of the windows 21, 22 and 23), the control unit 2 is always able to select the correct synchronization signal for the desired alignment of the windows (for example, selecting two successive codes in the range 22) starting from the stored information (transmission parameters). As said above, the re-synchronization 22 window being quite wide, knowing the extent of said window and the transmission parameters of the original remote control, the control unit 2 is thus able to always select the correct synchronization codes (for example centring said synchronization window) with a good margin of error, so as to be able to always perform the alignment of the windows when desired.

[0068] As mentioned above, through the emission of at least two successive Rolling Codes within the re-synchronization window 22, the control unit 2 is able to cause the synchronization of the interface system 1 with the receiving station 4 thanks to the suitable rotation of the set 20 of windows which allows to align said system 1 to said receiving station 4. Obviously, the emission of the two rolling codes one after another (having the counter of one of them increased with respect to the previous one) is only an applicative example, some original radio controls being possibly able to provide other suitable re-synchronization methods, which the system 1 is able to perform thanks to the instructions contained in its memory MEM.

[0069] In any case, in a preferred embodiment, the synchronization signal Sync emitted by the system 1 of the present invention thus comprises at least two transmission codes TC (which are generated by the control unit 2 based on the stored information related to the transmission procedure of the original remote control) which are emitted one after the other within the re-synchronization window 22, wherein the second emitted Rolling Code differs from the previous emitted Rolling Code and has an increased counter value.

[0070] In this way, the set 20 of windows of the receiving station 4 is forced to rotate such that it synchronizes on the value of the counter of the transmission code TC sent by the system 1.

[0071] At the end of this synchronization operation, each Rolling Code sent by the system 1 towards the receiving station 4 is within the window of valid codes 21. In other words, once the above-described synchronization is carried out, the interface system 1 is adapted to activate the receiving station 4 (through the sent transmission code TC) in response to the command signal Cmd emitted by a remote device, interfacing said remote device with said receiving station 4.

[0072] It is therefore clear that the system 1 of the present invention is very advantageous since it allows to arbitrarily manage the synchronization windows of the receiving station, allowing to clone an original remote control without having to perform complicated accreditation procedures.

[0073] The system 1 thus works as a universal receiver which allows for example to interface non-compatible remote controls with an existing receiver ensuring their compatibility. It acts as a second receiver placed close to the receiving station 4 of the existing automation 5, learning the communication parameters of an existing remote control, listening for transmissions emitted thereby or by other new remote controls and operating the original receiver via radio on behalf of them.

[0074] In an embodiment of the present invention, the interface system 1 comprises an auxiliary remote control 8, provided with own receiving/transmission means TX3, adapted to send the command signal Cmd towards the receiving means TX1 for sending the transmission code TC towards the receiving station 4 and activating the automation 5. In this way, the auxiliary remote control 8 acts as remote device (coupled to the casing 3) which is physically used by the user to activate the receiving station 4. The auxiliary remote control 8 can comprise two or more command buttons 9, when they are pressed, the command signal Cmd is sent from the receiving/transmission means TX3 towards the receiving means TX1 of the system 1 for sending the stored radio code towards the receiving station 4. The auxiliary remote control 8 can also be used, while installing the system 1, to send the synchronization signals Sync, for example by successively pressing two times the command button 9.

[0075] The casing 3 can be provided with own command buttons 10 for interacting with the system 1, for example to start the synchronization of the receiving station 4, said casing being in any case easily handleable.

[0076] Once the above-mentioned basic technical con-

cept is defined, there are two main implementation methods, which will be detailed in the following paragraphs.

[0077] In a first embodiment of the present invention, considered as preferred, through the synchronization signal Sync, the control unit 2 is able to force the synchronization of the receiving station 4 such that, when the cloned original remote control 7 is used, the code emitted by said original remote control 7 is within the window of forbidden codes 23 of the set 20. In other words, in this embodiment, the de-synchronization of the original remote control 7 of the receiving station 4 is performed. The main steps of this embodiment are represented in figure 3. In this way, the original remote control 7 is not able to directly communicate with the receiver 4 but it can make it only through the system 1.

[0078] This embodiment is particularly advantageous since it avoids that the original remote control 7 directly communicates with the receiving station 4 without being intercepted by the system 1 of the present invention (for example if the original remote control 7 is in a place in which it is in the range of the receiver 4 but not of the receiving means TX1 of the system 1), thus avoiding possible future synchronisation problems.

[0079] In other words, in this desynchronized method, the device takes the transmission parameters of the original remote control 7 and using these, it desynchronizes the receiver 4 (that is, using the above-described procedure, allowing the transmission method to be used to send the correct codes and the extent of the windows, suitably shifts the latter and selects a suitable transmission code which will be emitted by the system 1) such that said original remote control 7 is outside the two windows 21 and 22, such that this is no more able to operate the original receiver 4. The transmissions of this original remote control 7 are instead received by the receiving means TX1 of the system 1, which will provide to emit a transmission which is correctly synchronized to operate the original receiving station 4 (that is the transmissions of the original remote control are in this case viewed only as a command signal Cmd for the system 1). This transmission synchronized to operate the receiver 4 can be also emitted following another input, for example a signal from another remote control, such as for example the auxiliary remote control 8, the pressure of another button, a message received through internet or Bluetooth (as will be described in detail in the following) and other suitable means. In this case, only the system 1 remains synchronized with the receiver.

[0080] In this embodiment, the code emitted from the desynchronized original remote control 7 is substantially at the centre of the window of forbidden codes 23. If the original remote control 7 is operated many times outside the range of the system 1, the emitted code would have a counter which would come too close to the window 21, possibly being within it. If this would happen, the original remote control 7 would operate the receiver 4 by bypassing the system 1. Furthermore, it can happen that the system 1 carries out various transmissions (without using the original remote control 7, for example using the auxiliary remote control 8); in this case, the window 22 can come too close to the value of the counter of the Rolling Code of the original remote control 7 which was never increased. If this would happen, the original remote control 7 could lead to a new undesired synchronization of the windows of the receiver 4 by aligning them to the counter value of the own emitted Rolling code and by accordingly leading the system 1 out of synchronization. In these undesired cases, the system 1 (or better the control unit 2) is able to detect this condition and carry out the appropriate transmissions to realign the windows, that is a further desynchronization transmission is carried out.

[0081] In other words, in this case, the control unit 2 is configured to compare the value of the counter of the code emitted by the desynchronized original remote control 7 with extreme value (or threshold values) of the ranges of the set 20, in particular the extremes of the ranges 21 and 22, and again force the synchronization of the receiving station 4 such that the code emitted by the original remote control 7 is substantially at the centre of the range of forbidden codes 23 if said value of the counter of the original remote control 7 is equal or higher than a threshold counter value, said threshold value being defined at a determined distance from said extreme values.

[0082] Alternatively, according to another embodiment of the present invention, the receiving station 4 is maintained constantly synchronized both with the system 1 and with the original remote control 7. In this way, when the system 1, through the transmission means TX2, sends a transmission to operate the receiving station 4, by accordingly shifting the range 20 of windows of the same, it is possible to send further synchronization transmissions to take the windows back to their original value thus maintaining the windows aligned with the original remote control 7. Accordingly, in this method, the system 1 is not intercepting the transmissions of the original remote control 7.

[0083] In other words, in this other embodiment, through the synchronization signal Sync, the control unit 2 forces the synchronization of the receiving station 4 such that the code emitted by the original remote control 7 is also within the window of valid codes 21. The main steps of this alternative embodiment are represented in figure 4. In this case, the control unit 2 is configured to send the synchronization signals Sync after each activation, so as to maintain all aligned, as described above.

[0084] As mentioned above, in an embodiment of the present invention, the system 1 also comprises a Bluetooth interface to allow a connection with other devices, and/or also comprises a network interface to allow the internet connection thereof, for example connecting to a WiFi network (such as for example the WiFi network of the house of the automation 5). These further interfaces, with which the system 1 is provided, allow many further advantageous functions.

[0085] For example, according to an advantageous

embodiment, the control unit 2 is furthermore configured to store a determined activation key in the memory unit MEM, for example provided by a smartphone of a user through the Bluetooth interface and/or the above-mentioned network interface. The stored activation key is substantially a code which the user owning the system 1 can provide to a further user, said further user being thus able to send said activation code towards the system 1 like a command signal to cause the sending of the Rolling Code towards the receiving station 4 and the activation thereof. The further user can send said activation code towards the system 1 for example through a smartphone, which communicates with said system 1 through the Bluetooth interface. In this way, the control unit 2 is configured to process the signal received by the further remote device of the further user and to cause the sending of the Rolling Code towards the receiving station 4 for the activation thereof if the received signal by said further remote device comprises the stored activation key. This solution is very advantageous since it allows to select the users which can activate the receiving station, by simply giving them the activation key. Said activation key can be temporary, for example it can be only used a determined number of times and/or for a pre-set time.

[0086] Furthermore, the system 1, in particular the control unit thereof 2, can be controlled and/or programmed through a suitable user interface accessed through an application resident on a device of a user (for example a smartphone, a tablet, a laptop and similar) and/or through a determined Internet site. In this way, through said particular application, it is possible to interact with the control unit 2, for example to provide the activation keys, as well as to set some further functionalities thereof, or also to directly provide the transmission parameters of original remote controls (that is, in general, the information on the transmission procedures) and provide programming operations. As indicated above, the communication can take place by means of the Bluetooth interface or a network interface, or in general in any suitable way.

[0087] Finally, the present invention provides a system which is able to activate a receiving station (such as for example, a receiver close to a gate) firstly cloning an original remote control (also of the Rolling Code type) by a copy procedure for emulating said original remote control, and thereafter synchronizing said receiving station so as to be then able to emit the expected code for activating the latter in response to a command from a remote device, substantially acting as bridge or interface and operating the receiving station on behalf of said remote device, which can be an auxiliary remote control or also the same original remote control. This result is obtained by the system of the present invention by sending suitable synchronization signals towards the receiving station based on the cloned code, so at to force, at least at the first activation, the synchronization of the receiving station with said system, which is arranged near it, in this way, the rotation of the synchronization windows of the receiving station is forced, possibly desynchronizing the original remote control such that it cannot anymore directly communicate with said receiving station but only through the system described herein. The system of the present invention is configured to perform these operations for a great number of original remote controls on the market, so as to able to communicate with a great number of receiving stations, thus acting as universal receiver.

[0088] In this way, suitably, through a procedure herein indicated as "re-synchronization procedure", which provides the sending of codes in sequence towards the receiving station (in particular the sending of at least two successive codes (that is with the counter of one of them increased with respect to the other one) of the copied original remote control), it is possible to shift the windows of said receiving station such that these are centred on any desired value. In other words, the system of the present invention is able to use the re-synchronization process (which provides the emission of transmission codes in the re-synchronization window of the receiver) to align the windows of the receiver and thus work as universal receiver.

[0089] Advantageously according to the present invention, a universal system is obtained which allows to clone the code of any one original remote control (in particular which works according to the principle of the Rolling Codes) and which does not require to perform complicate recognition procedures of the clone in the receiving station, providing a system which is simple to install and use.

[0090] Thanks to the system of the present invention, it is possible to arbitrarily manage, according to the specific needs, the synchronization windows of each receiving station on the market, so as to be able to easily activate said receiving stations through a remote device which causes the emission of the expected transmission code by part of the control unit close to the automation and which would have emitted the cloned original remote control. This system can be used in any context by anybody, without the help of specialized operators and for a great number of original models (whose operative parameters/protocols can be stored for example in the memory of the system), thus providing a completely universal system.

[0091] Essentially, as mentioned above, thanks to the system of the present invention, it is possible to force the rotation of the synchronization window of the receiving station through the emission of suitable synchronization signals, such that the transmission code emitted by the system (based on the transmission parameters of the cloned original remote control) is always recognized by the receiving station as a valid code. It is furthermore possible to rotate said window such that the original remote control is always de-synchronized from the receiving station, activating the receiver on behalf of it.

[0092] A universal system, simple but extremely effective and functional, is thus obtained, which solves the technical problem of the present invention, by performing the synchronization procedure with the receiver in a com-

pletely automatic way without performing further complicated accreditation procedures but using the standard synchronization procedures in a new way.

[0093] Obviously, the system of the present invention is also able to operate with fixed codes, even if all the above-mentioned advantages are to be appreciated for the Rolling Codes.

[0094] Finally, the fact that the system of the present invention is powered by a battery and is compact makes the arrangement thereof extremely simple, together with all the above-mentioned advantages, thus obtaining a significant improvement with respect to the prior art.

[0095] Obviously, a skilled person, in order to in order to satisfy contingent and specific needs, may make various modifications and variations to the system described above, all of which are included in the scope of protection of the invention as defined by the attached claims.

Claims

1. A system (1) for the communication between a remote device (7, 8) and a receiving station (4) of an automation (5), comprising:

   - a control unit (2);
   - a memory unit (MEM);
   - receiving means (TX1) configured to receive input signals; and
   - transmission means (TX2) configured to communicate with the receiving station (4),

   wherein the control unit (2) is configured to:

   - store in the memory unit (MEM) information relating to the transmission procedure of an original remote control (7) which emits Rolling Codes, said control unit (2) being adapted to emit, based on said stored information, a transmission code (TC) through the transmission means (TX2) towards the receiving station (4);
   - send, through the transmission means (TX2), a synchronization signal (Sync) towards the receiving station (4), said synchronization signal (Sync) being based on the stored information relating to the original remote control (7); and
   - based on said synchronization signal (Sync), force the synchronization of the receiving station (4) so that the emitted transmission code (TC) is within a range of valid codes (21) of said receiving station (4),

   wherein the receiving means (TX1) are configured to receive a command signal (Cmd) emitted by the remote device (7, 8), said system (1) being configured to send said transmission code (TC) to the receiving station (4) for the activation thereof in response to said command signal (Cmd), interfacing said remote device (7, 8) with said receiving station (4), and wherein said system (1) comprises a casing (3) including at least the control unit (2), the memory unit (MEM), the receiving means (TX1), and the transmission means (TX2), said casing (3) being shaped to be positioned close to the receiving station (4), **characterized in that** it is powered by a battery (6) housed in a seat (6s) in said casing (3).

2. The system (1) according to claim 1, wherein the control unit (2) is configured to start a copy procedure wherein said control unit (2) is adapted to recognize a Rolling Code emitted by the original remote control (7) and received by the receiving means (TX1), by recognizing the transmission procedure of said original remote control (7).

3. The system (1) according to claim 2, wherein, in said copy procedure, the control unit (2) is configured to:

   - recognize the frequency of the radio signal emitted by the original remote control (7);
   - perform *n* measurements of the duration of the high-low and low-high transitions of the radio signal of the original remote control (7);
   - process said measurements; and
   - perform a sampling of said radio signal.

4. The system (1) according to claim 2 or 3, wherein the memory unit (MEM) is adapted to contain a plurality of information relating to the transmission procedures of a respective plurality of original remote controls which emit Rolling Codes, the control unit (2) being configured to recognize a Rolling Code of a specific original remote control (7) by means of said copy procedure, and to use the information relating to the specific transmission procedure associated with said recognized original remote control (7) for the transmission of the transmission code (TC).

5. The system (1) according to any one of the preceding claims, wherein the emitted synchronization signal (Sync) comprises at least two transmission codes (TC) which are emitted one after the other, wherein a transmission code of said synchronization signal (Sync) has a counter value that is increased with respect to a transmission code previously emitted in said synchronization signal (Sync).

6. The system (1) according to any one of the preceding claims, wherein the emitted synchronization signal (Sync) is configured to cause a shift of a set (20) of code ranges of the receiving station (4), said set (20) comprising said range of valid codes (21), a re-synchronization range (22), and a range of forbidden codes (23), wherein, through the emission of at least two successive variable transmission codes (TC) within said re-synchronization range (22), the control

unit (2) is adapted to synchronize said system (1) with the receiving station (4).

7. The system (1) according to claim 6, wherein, through the synchronization signal (Sync), the control unit (2) is configured to force the synchronization of the receiving station (4) so that the code emitted by the original remote control (7) is within the range of forbidden codes (23) of said set (20), thereby performing the desynchronization of the original remote control (7) from the receiving station (4).

8. The system (1) according to claim 7, wherein the control unit (2) is configured to:

- compare the value of the counter of the code emitted by the desynchronized original remote control (7) with extreme counter values of the ranges (21, 22) of the set (20); and
- force again the synchronization of the receiving station (4) so that the code emitted by the original remote control (7) is substantially at the center of the range of forbidden codes (23) in case said value of the counter of the original remote control (7) is equal to or greater than a threshold value defined at a determined distance from said extreme counter values.

9. The system (1) according to claim 6, wherein, through the synchronization signal (Sync), the control unit (2) is configured to force the synchronization of the receiving station (4) so that the code emitted by the original remote control (7) is within the range of valid codes (21).

10. The system (1) according to any one of the preceding claims, further comprising an auxiliary remote control (8) adapted to send the command signal (Cmd) towards the receiving means (TX1) for transmission of the transmission code (TC) towards the receiving station (4).

11. The system (1) according to any one of the preceding claims, comprising a Bluetooth interface and/or a network interface.

12. The system (1) according to claim 11, wherein the control unit (2) is further configured to:

- store an activation key in the memory unit (MEM);
- process a signal from a further remote device and received by said Bluetooth interface and/or said network interface; and
- cause the sending of the transmission code (TC) towards the receiving station (4) for activating the same if the signal received from said further remote device comprises the stored activation key.

13. The system (1) according to claim 11 or 12, wherein the control unit (2) is configured to be controllable and/or programmable by a user interface accessed through an application installed on a user device, said control unit (2) interacting with said user interface by means of said Bluetooth interface and/or said network interface.

14. The system (1) according to any one of the preceding claims, wherein there aren't wired connections.

Amended claims in accordance with Rule 137(2) EPC.

1. A system (1) for the communication between a remote device (7, 8) and a receiving station (4) of an automated device (5), comprising:

- a control unit (2);
- a memory unit (MEM);
- receiving means (TX1) configured to receive input signals; and
- transmission means (TX2) configured to communicate with the receiving station (4),

wherein the control unit (2) is configured to:

- store in the memory unit (MEM) information relating to the transmission procedure of an original remote control (7) which emits Rolling Codes, said control unit (2) being adapted to emit, based on said stored information, a transmission code (TC) through the transmission means (TX2) towards the receiving station (4);
- send, through the transmission means (TX2), a synchronization signal (Sync) towards the receiving station (4), said synchronization signal (Sync) being based on the stored information relating to the original remote control (7); and
- based on said synchronization signal (Sync), force the synchronization of the receiving station (4) so that the emitted transmission code (TC) is within a range of valid codes (21) of said receiving station (4),

wherein the receiving means (TX1) are configured to receive a command signal (Cmd) emitted by the remote device (7, 8), said system (1) being configured to send said transmission code (TC) to the receiving station (4) for the activation thereof in response to said command signal (Cmd), interfacing said remote device (7, 8) with said receiving station (4), and wherein said system (1) comprises a casing (3) including at least the control unit (2), the memory unit (MEM), the receiving means (TX1), and the

transmission means (TX2), said casing (3) being shaped to be positioned close to the receiving station (4),
characterized in that it is powered by a battery (6) housed in a seat (6s) in said casing (3).

2. The system (1) according to claim 1, wherein the control unit (2) is configured to start a copy procedure wherein said control unit (2) is adapted to recognize a Rolling Code emitted by the original remote control (7) and received by the receiving means (TX1), by recognizing the transmission procedure of said original remote control (7).

3. The system (1) according to claim 2, wherein, in said copy procedure, the control unit (2) is configured to:

- recognize the frequency of the radio signal emitted by the original remote control (7);
- perform *n* measurements of the duration of the high-low and low-high transitions of the radio signal of the original remote control (7);
- process said measurements; and
- perform a sampling of said radio signal.

4. The system (1) according to claim 2 or 3, wherein the memory unit (MEM) is adapted to contain a plurality of information relating to the transmission procedures of a respective plurality of original remote controls which emit Rolling Codes, the control unit (2) being configured to recognize a Rolling Code of a specific original remote control (7) by means of said copy procedure, and to use the information relating to the specific transmission procedure associated with said recognized original remote control (7) for the transmission of the transmission code (TC).

5. The system (1) according to any one of the preceding claims, wherein the emitted synchronization signal (Sync) comprises at least two transmission codes (TC) which are emitted one after the other, wherein a transmission code of said synchronization signal (Sync) has a counter value that is increased with respect to a transmission code previously emitted in said synchronization signal (Sync).

6. The system (1) according to any one of the preceding claims, wherein the emitted synchronization signal (Sync) is configured to cause a shift of a set (20) of code ranges of the receiving station (4), said set (20) comprising said range of valid codes (21), a re-synchronization range (22), and a range of forbidden codes (23), wherein, through the emission of at least two successive variable transmission codes (TC) within said re-synchronization range (22), the control unit (2) is adapted to synchronize said system (1) with the receiving station (4).

7. The system (1) according to claim 6, wherein, through the synchronization signal (Sync), the control unit (2) is configured to force the synchronization of the receiving station (4) so that the code emitted by the original remote control (7) is within the range of forbidden codes (23) of said set (20), thereby performing the desynchronization of the original remote control (7) from the receiving station (4).

8. The system (1) according to claim 7, wherein the control unit (2) is configured to:

- compare the value of the counter of the code emitted by the desynchronized original remote control (7) with extreme counter values of the ranges (21, 22) of the set (20); and
- force again the synchronization of the receiving station (4) so that the code emitted by the original remote control (7) is substantially at the center of the range of forbidden codes (23) in case said value of the counter of the original remote control (7) is equal to or greater than a threshold value defined at a determined distance from said extreme counter values.

9. The system (1) according to claim 6, wherein, through the synchronization signal (Sync), the control unit (2) is configured to force the synchronization of the receiving station (4) so that the code emitted by the original remote control (7) is within the range of valid codes (21).

10. The system (1) according to any one of the preceding claims, further comprising an auxiliary remote control (8) adapted to send the command signal (Cmd) towards the receiving means (TX1) for transmission of the transmission code (TC) towards the receiving station (4).

11. The system (1) according to any one of the preceding claims, comprising a Bluetooth interface and/or a network interface.

12. The system (1) according to claim 11, wherein the control unit (2) is further configured to:

- store an activation key in the memory unit (MEM);
- process a signal from a further remote device and received by said Bluetooth interface and/or said network interface; and
- cause the sending of the transmission code (TC) towards the receiving station (4) for activating the same if the signal received from said further remote device comprises the stored activation key.

13. The system (1) according to claim 11 or 12, wherein

the control unit (2) is configured to be controllable and/or programmable by a user interface accessed through an application installed on a user device, said control unit (2) interacting with said user interface by means of said Bluetooth interface and/or said network interface.

14. The system (1) according to any one of the preceding claims, wherein there aren't wired connections.

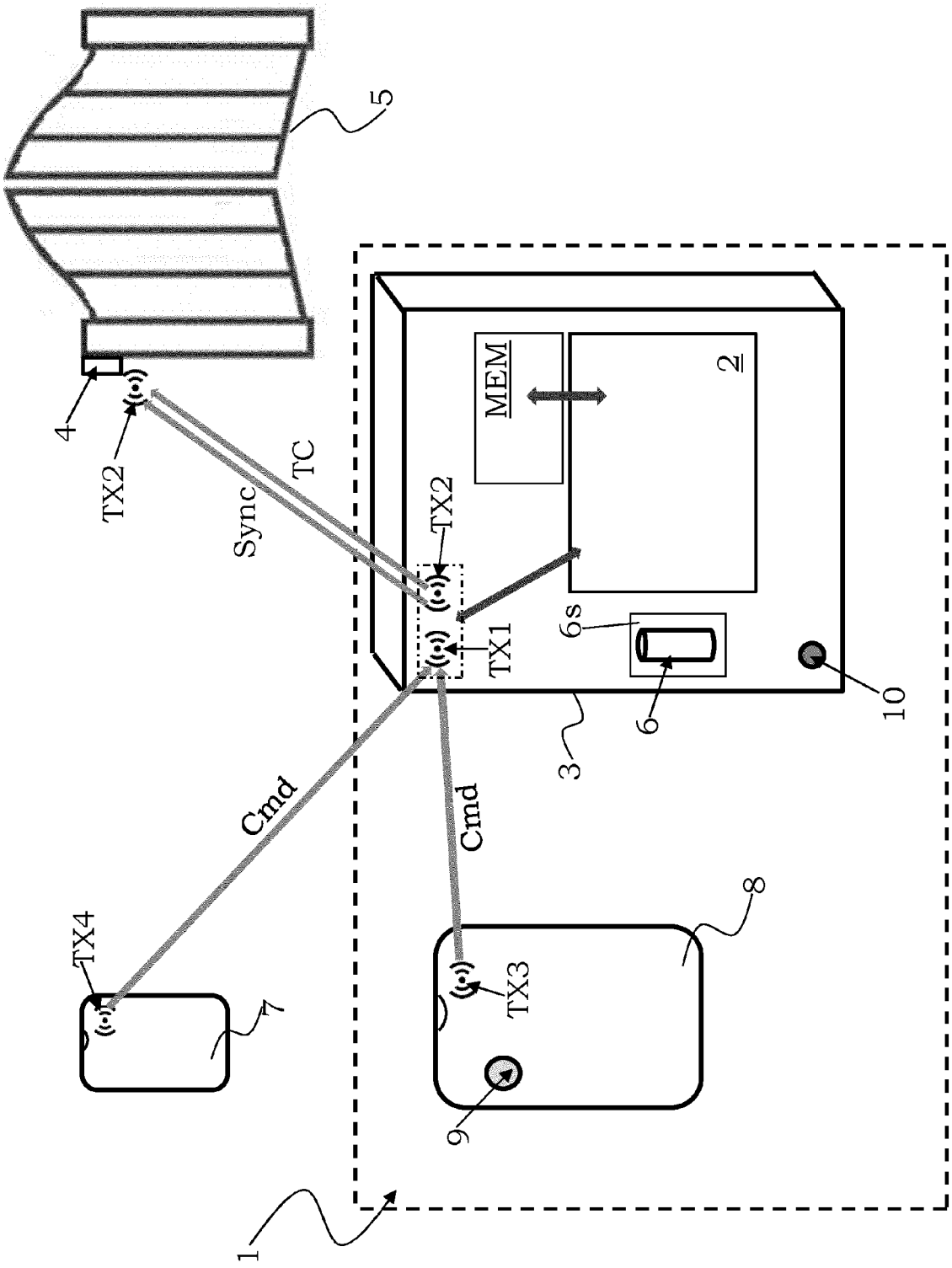

FIG. 1

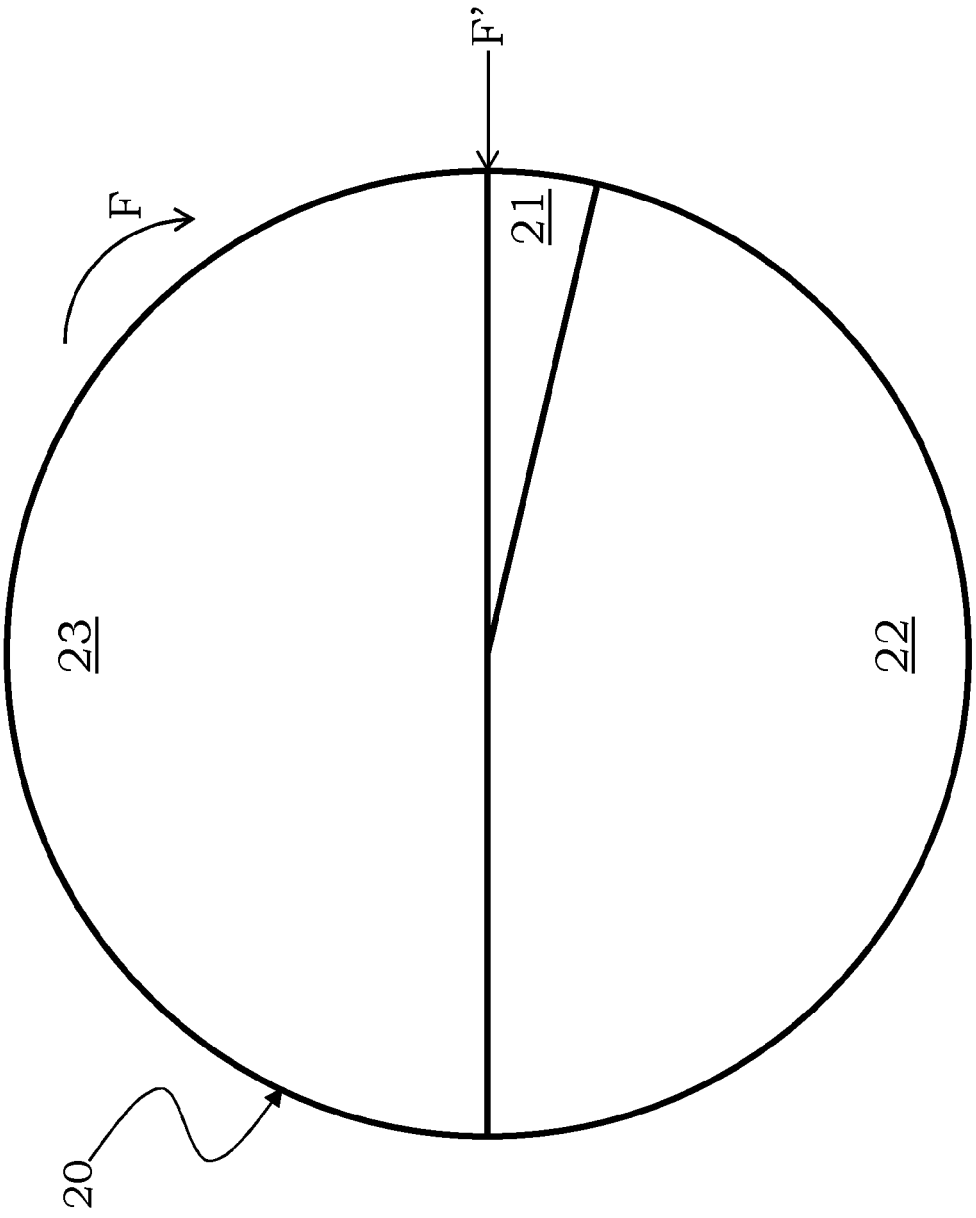

FIG. 2

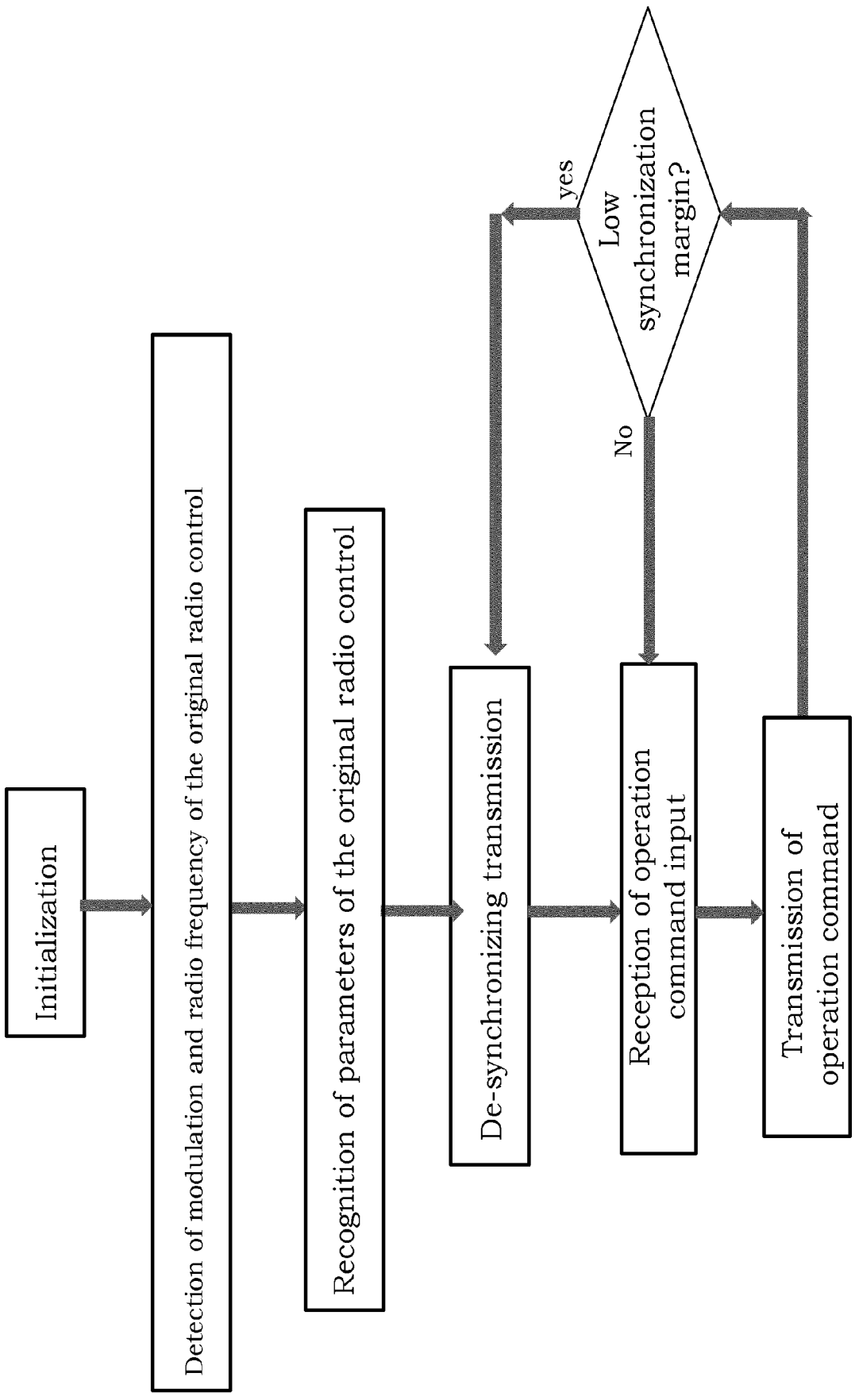
Initialization
Detection of modulation and radio frequency of the original radio control
Recognition of parameters of the original radio control
De-synchronizing transmission
Reception of operation command input
Transmission of operation command
Low synchronization margin?
yes
No

FIG. 3

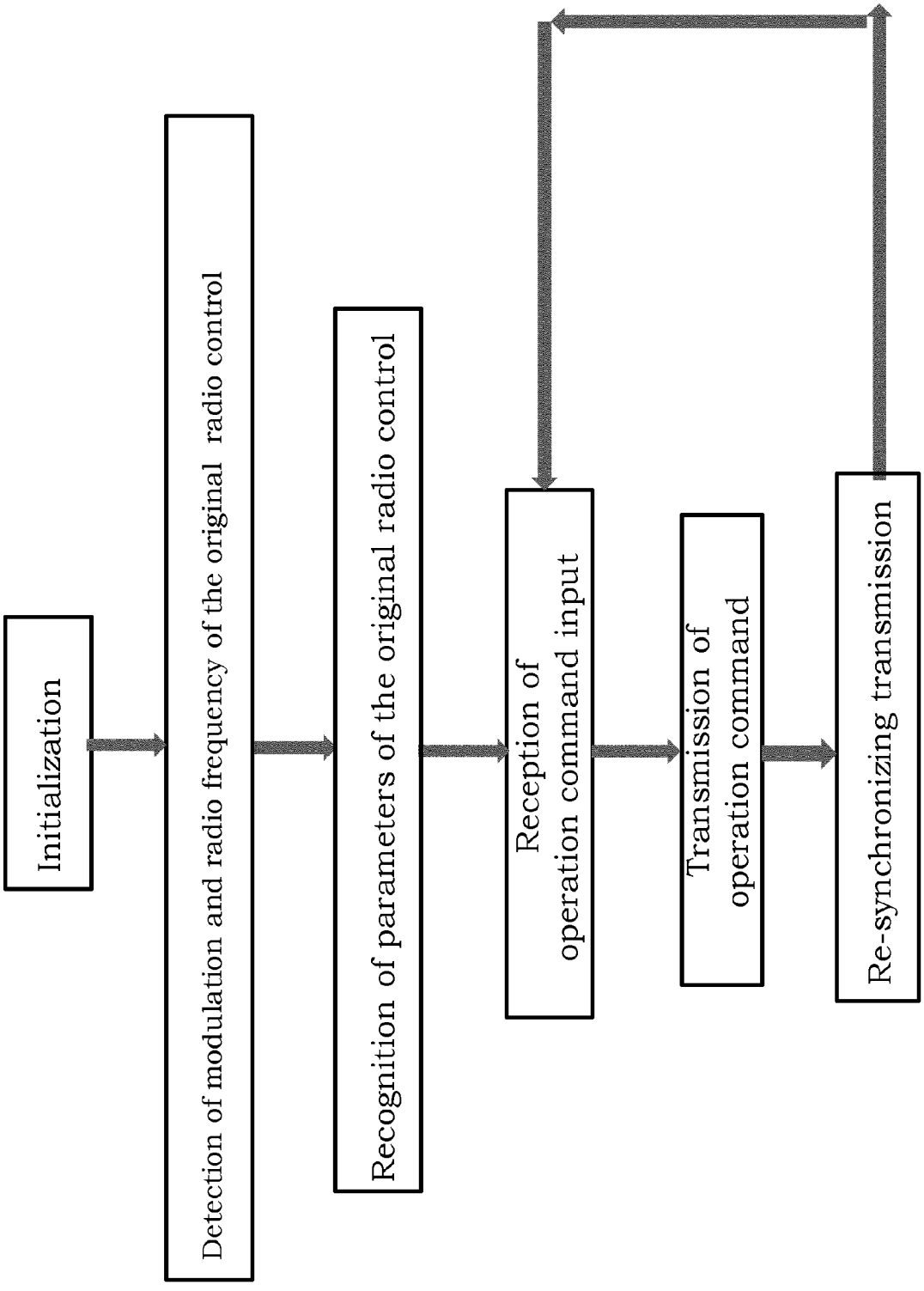
Initialization
Detection of modulation and radio frequency of the original radio control
Recognition of parameters of the original radio control
Reception of operation command input
Transmission of operation command
Re-synchronizing transmission

FIG. 4

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 7209

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2005/024254 A1 (CHUEY MARK D [US]) 3 February 2005 (2005-02-03) * paragraph [0007] - paragraph [0008] * * paragraph [0010] - paragraph [0011] * * paragraph [0014] * * paragraph [0027] - paragraph [0031] * * paragraph [0034] * * paragraph [0041] * * paragraph [0049] * * paragraph [0054] * * paragraph [0058] - paragraph [0059] * * paragraph [0061] - paragraph [0065] * * claims 1, 10, 13 * * figures 1, 7, 9 *	1-14	INV. G08C17/02 G08C19/28
Y	EP 3 089 134 A1 (SICE TECH S R L [IT]) 2 November 2016 (2016-11-02) * paragraph [0001] * * paragraph [0014] - paragraph [0020] * * paragraph [0028] - paragraph [0031] * * paragraph [0040] * * paragraph [0052] * * paragraph [0064] * * paragraph [0070] - paragraph [0077] * * claim 1 *	1-14	TECHNICAL FIELDS SEARCHED (IPC) G08C
Y	US 2006/217850 A1 (GEERLINGS STEVEN L [US] ET AL) 28 September 2006 (2006-09-28) * paragraph [0020]; figure 3 *	13	
A	US 2003/118187 A1 (FITZGIBBON JAMES J [US]) 26 June 2003 (2003-06-26) * paragraph [0012] * * paragraph [0047] - paragraph [0049] *	1	

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 August 2022	Barbelanne, Alain

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
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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 7209

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2019/076946 A1 (SICE TECH S R L [IT]) 25 April 2019 (2019-04-25) * page 5, lines 2-11 * * page 8, line 21 - page 9, line 9 * * page 17, line 25 - page 19, line 21 * * page 24, lines 18-26 * -----	1-14	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 August 2022	Barbelanne, Alain

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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