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(54) **Joystick for the execution of controls on operating machines**

Joystick zur Ausführung von Steuerungen von Betriebsmaschinen

Joystick pour exécuter des commandes de machines en marche

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Description

[0001] The name joystick is used to identify control devices with a lever articulated on one or more axes, like for example to control the combined movements of building yard operating machines.

[0002] It is also possible to position control and safety buttons on the control lever.

[0003] Joysticks are known that have a so-called "dead man's button", the function of which is to enable the other controls only if it is kept pressed while the individual commands are carried out (see the document US 6.178.841 B1).

[0004] Such a button performs a safety function upon which all of the manoeuvring commands of the aforementioned machines are dependent for them to be enabled.

[0005] Continuously pressing the "dead man's button" for hours, however lightly, is perceived as unpleasant and stressful.

[0006] There are cases in which the operator has complained of physiological pathologies as a result of performing this task.

[0007] Moreover, it is possible to tamper with the function of the "dead man's button" by simply blocking it in pressed position, for example by means of an elastic band or sticky tape, nullifying its safety function. There are safety systems that do not foresee the use of the conventional "dead man's button". In its place a sensor is used that detects the presence of a conductive body, like for example the operator's hand.

[0008] Normally, such a sensor is of the capacitive type and is sensitive to the presence of any conductive mass, like parts of the human body, but also metallic objects that could activate the sensor even when the operator is not present. It is therefore possible for the controls to be accidentally knocked which could be potentially dangerous.

[0009] Document US2004011154A1 describes a joystick that includes one or more sensors that define sensitive areas on the gripping portion of the joystick itself.

[0010] Such sensors are adapted for passively detecting the presence of people or objects close to such a gripping area, during the normal control operations that can be carried out with the joystick itself.

[0011] It should be observed that the sensors described in such a document are of the capacitive type (thus not mechanical), and given the kind of devices that they are, they must necessarily both be positioned on the gripping part of the joystick, or close to it, to allow a correct detection of the user's hand.

[0012] Moreover, the types of sensors used do not make it possible to tell the difference between the joystick being held accidentally, or even an object being close to the joystick, and it being intentionally held by an operator. This is because, since the sensors are of the passive type, they simply check for the interaction and/or the presence of an object in their area of sensitivity.

[0013] The present invention proposes to improve the safety level that the control devices of the prior art achieve, without requiring that the aforementioned button be continuously pressed.

[0014] An aspect of the present invention concerns a joystick for operating machines and relative operating principle of the safety system comprised in such a joystick having the characteristics of the attached claim 1.

[0015] Further additional characteristics are contained in the attached dependent claims.

[0016] The characteristics and advantages according to the invention refer to the attached drawings, in which:

- Figs. 1 and 2 are perspective views of the device according to the invention;
- Fig. 3 is a "flow chart" that illustrates the operating sequences of the device according to the invention.

[0017] With reference to the quoted figures joystick 10 for executing commands on operating machines is equipped with a safety system, comprising a special enabling button 12 and at least one sensor 13, positioned in an area 11 of joystick 10; sensor 13 is adapted for detecting the presence of the operator's hand on such a joystick 10, and therefore area 11 is preferably positioned in a central portion and in the front part.

[0018] Safety controls are defined as type A controls; whereas type B controls are the controls that depend on the activation of type A safety controls and that control the operating machine with which the joystick is associated.

[0019] The safety system foresees that a control device checks that the sensor and the button have not been tampered with, or permanently blocked in active position. In the case of correct operation and the absence of tampering, the control device activates the controls if: it receives the signal of detection of the operator's hand by sensor 13 and then, with the hand still present, button 12 is pressed; after the activation of such controls the presence of the hand on joystick 10 makes it possible to stop pressing on button 12, keeping all of the functionalities on joystick 10 and on type B controls.

[0020] Sensor 13 adapted for detecting the operator's hand on such a joystick 10 is preferably of the capacitive type or equivalent.

[0021] When the operator's hand is placed on joystick 10 and button 12 is pressed (type A control), the control device, implemented for example electrically, electronically or by other equivalent methods, enables type B controls keeping them in such a state even when button 12 is released.

[0022] An analogous variant of the invention foresees that the special enabling button can be placed outside of the joystick, for example on the panel of the control booth or it can be actuated by a pedal or equivalent actuation.

[0023] The operating process of the safety system is illustrated in the "flow chart" of figure 3.

[0024] When the system is activated none of the ma-

noeuvres and controls of joystick 10 are active.

[0025] Advantageously, there is an anti-tampering checking step 1 adapted for detecting the presence of tampering with the safety system.

[0026] Such a step 1 comprises a test 1a and a test 1b for determining the presence of tampering on such a joystick of the safety system.

[0027] Test 1a is the test for detecting tampering with button 12 and checks the state of the special enabling button 12.

[0028] In the case in which the button is pressed the path "Yes" will be followed, going back to test 1a and repeating it.

[0029] If button 12 is disengaged the path "No" will be followed, moving on to test 1b.

[0030] Test 1b is the test for detecting tampering with sensor 13.

[0031] From such a test 1b, in the case in which sensor 13 detects the presence of a conductive body close to it, the path "Yes" will be followed, going back to repeat test 1a, otherwise, following path "No", it moves on to a subsequent step 2.

[0032] Step 2 of activation of type B controls, which require the authorisation of the safety system comprises a test 2a for detecting the presence of the operator's hand on area 11 of joystick 10, for detecting the presence of the hand through sensor 13, and a test 2b for detecting whether button 12 has been pressed.

[0033] In test 2a path "Yes" is followed if the presence of the hand is detected, otherwise path "No" is followed, staying in such a test 2a until the hand is actually detected on the joystick.

[0034] Following path "Yes" of test 2a it moves to test 2b.

[0035] From test 2b path "Yes" will be followed in the case of button 12 being pressed. Path "No" will have to be followed, going back to test 2a, if button 12 is not pressed.

[0036] During such tests type B controls still remain disabled.

[0037] If button 12 is pressed it passes to a step 3 of activation of type B controls that require the authorisation of such a safety system.

[0038] Such a step 3 comprises a sub-step 3a of activation of the devices that require the authorisation of such a safety system, allowing said type B controls to be executed and a sub-step 3b of disabling the control of the special enabling button 12 and a test 3c for detecting the presence of the operator's hand on the joystick, for maintaining the approval to execute the commands, for detecting the presence of the hand on the joystick.

[0039] From sub-step 3a it is possible to use the joystick 10 and the controls of type B associated with it.

[0040] Thereafter, in sub-step 3b it is possible to release the special enabling button 12. The safety system keeps the functionalities of the joystick and of type B controls active, continuing to monitor the state of the sensor detecting the presence of the hand with test 3C.

[0041] The following two paths can be followed:

- "Yes" if sensor 13 detects the presence of the hand;
- "No" if the hand is released from sensitive area 11 in joystick 10, going back to step 1 at test 1a.

[0042] So long as the sensor detects the presence of the hand any movement or control activated on joystick 10 correspond to an actual manoeuvre on the machine.

[0043] All of the passages between the various steps and the tests are carried out and managed by the control device, which comprises an internal control logic.

[0044] In order to avoid accidental activation, button 12 is preferably placed in a position that cannot be reached accidentally.

[0045] With such a process accidental enabling of the manoeuvres is prevented.

[0046] For example, it is preferred to arrange it in a depression or recess in joystick 10 of button 12. Alternatively, the position of the button requires an unusual and awkward intentional rotation of the hand wishing to actuate it; in this way, the need to continuously press the button is also avoided.

[0047] The detachment of the hand from the sensitive area is necessary and sufficient to disable all of type B controls in question, reacting for example to a possible illness of the operator, to him turning his attention to other emergencies, or to the need to move away from the control post.

[0048] Such a safety system makes accidental activation of type B devices extremely improbable, thanks to the sequence of operations required to activate such controls making the machines adopting such a system safe and reliable.

[0049] An analogous variant of the invention foresees that the special enabling button can be placed outside of the joystick, for example on the panel of the control booth or it can be actuated by a pedal or equivalent actuation.

Claims

1. System for the execution of controls on operating machines equipped with a safety system, the system comprising a joystick (10) which includes at least one area (11), the area (11) comprising at least one sensor (13) for detecting the presence of the operator's hand on such a joystick (10), the system further comprises a special enabling button (12) arranged in a position that cannot be reached accidentally, and a control device, said sensor (13) and said special enabling button (12) being electronically connected to the control device of the joystick, wherein the control device, in use, firstly checks that the sensor and the button have not been tampered with, or permanently blocked in active position and if it receives the signal of detection of the operator's hand by the sensor (13) and then, with the hand still present placed on the

joystick (10) and the button (12) is pressed by an operator, allows commands for the execution of controls on the operating machine to be executed and allows the pressing of the button (12) to be released, keeping the possibility of executing such commands.

2. System according to claim 1, wherein the special enabling button (12) is positioned on the joystick (10).

3. System according to claim 1, wherein the control device checks in advance that the sensor (13) and the button (12) are not blocked in activated/pressed position.

4. System according to claim 1, wherein the sensor (13) is of the capacitive type.

5. Method for activating the joystick of a safety system according to one or more of claims 1 to 4 or 9, the method applied to a joystick (10) for execution of controls on operating machines, comprising at least one area (11), in turn comprising at least one sensor (13) for detecting the presence of the operator's hand on such a joystick (10), and a special enabling button (12) arranged in a position that cannot be reached accidentally; the process comprising the following steps in sequence:

- activation of the system;
- checking if the sensor and the button have not been tampered with, or permanently blocked in active position,
- detection of the presence of the operator's hand on the area (11) of the joystick (10);
- detection of the press of the button (12) by the operator having the hand still present placed on the joystick (10);
- activation of devices that allow said commands to be executed on such operating machines;
- release of the special enabling button (12);
- maintaining the consent to execute said commands so long as the operator's hand is detected as being present on said area (11) of the joystick (10).

6. Method for activating the safety system according to claim 5, wherein prior to the step of detecting the presence of the operator's hand on the area (11) of the joystick there is an anti-tampering control step comprising the following steps:

- checking the state of the button (12);
- detecting the presence of a conductive body close to the sensor (13).

7. Method for activating according to claim 5, wherein the presence of the operator's hand on the joystick

is monitored by the sensor (13).

8. Method for activating according to claim 5 or 6, wherein passages between the various steps and the monitoring of the button and/or sensor are carried out and managed by the control device.

9. System according to claim 1, in which the button (12) is arranged in a depression or recess of the joystick, or alternatively, the button (12) is arranged in a position that requires an unusual and awkward intentional rotation of the hand wishing to actuate it.

15 Patentansprüche

1. System zum Ausführen von Steuerungen an Arbeitsmaschinen, die mit einem Sicherheitssystem ausgestattet sind, wobei das System einen Joystick (10) umfasst, der mindestens einen Bereich (11) umfasst, welcher mindestens einen Sensor (13) zum Detektieren der Präsenz der Hand des Bedieners an einem solchen Joystick (10) enthält, wobei das System des Weiteren einen speziellen Aktivierungsknopf (12) umfasst, der an einer Position angeordnet ist, die nicht versehentlich erreicht werden kann, und eine Steuerungsvorrichtung umfasst, wobei der Sensor (13) und der spezielle Aktivierungsknopf (12) elektronisch mit der Steuerungsvorrichtung des Joysticks verbunden sind, wobei die Steuerungsvorrichtung während des Gebrauchs zuerst überprüft, dass der Sensor und der Knopf nicht manipuliert oder dauerhaft in der aktiven Position blockiert wurden, und wenn sie das Signal der Detektion der Hand des Bedieners durch den Sensor (13) empfängt und die Hand immer noch am Joystick (10) anliegt und der Knopf (12) durch den Bediener gedrückt wird, so erlaubt sie das Ausführen von Befehlen zum Ausführen von Steuerungen an der Arbeitsmaschine, und erlaubt das Loslassen des Knopfes (12), wobei die Möglichkeit des Ausführens solcher Befehle beibehalten bleibt.

2. System nach Anspruch 1, wobei der spezielle Aktivierungsknopf (12) an dem Joystick (10) positioniert ist.

3. System nach Anspruch 1, wobei die Steuerungsvorrichtung im Voraus überprüft, dass der Sensor (13) und der Knopf (12) nicht in einer aktivierten oder gedrückten Position blockiert sind.

4. System nach Anspruch 1, wobei der Sensor (13) vom kapazitiven Typ ist.

5. Verfahren zum Aktivieren des Joysticks eines Sicherheitssystems nach einem oder mehreren der Ansprüche 1 bis 4 oder 9, wobei das Verfahren auf

einen Joystick (10) zum Ausführen von Steuerungen an Arbeitsmaschinen angewendet wird, der mindestens einen Bereich (11) umfasst, der wiederum mindestens einen Sensor (13) zum Detektieren der Präsenz der Hand des Bedieners an einem solchen Joystick (10) umfasst, und einen speziellen Aktivierungsknopf (12) umfasst, der an einer Position angeordnet ist, die nicht versehentlich erreicht werden kann, wobei der Prozess der Reihe nach die folgenden Schritte umfasst:

- Aktivieren des Systems;
 - Überprüfen, ob der Sensor und der Knopf nicht manipuliert oder dauerhaft in der aktiven Position blockiert wurden,
 - Detektion der Präsenz der Hand des Bedieners an dem Bereich (11) des Joysticks (10);
 - Detektieren des Drückens des Knopfes (12) durch den Bediener, dessen Hand immer noch an dem Joystick (10) anliegt;
 - Aktivieren von Vorrichtungen, die das Ausführen der Befehle an den Arbeitsmaschinen erlauben;
 - Loslassen des speziellen Aktivierungsknopfes (12) ;
 - Beibehalten der Erlaubnis zur Ausführung der Befehle, solange die Hand des Bedieners als an dem Bereich (11) des Joysticks (10) anliegend detektiert wird.
6. Verfahren zum Aktivieren des Sicherheitssystems nach Anspruch 5, wobei vor dem Schritt des Detektierens der Präsenz der Hand des Bedieners an dem Bereich (11) des Joysticks ein Antimanipulationskontrollschritt ausgeführt wird, der die folgenden Schritte umfasst:
- Überprüfen des Zustandes des Knopfes (12);
 - Detektieren der Präsenz eines leitfähigen Körpers nahe am Sensor (13).
7. Verfahren zum Aktivieren nach Anspruch 5, wobei die Präsenz der Hand des Bedieners an dem Joystick durch den Sensor (13) überwacht wird.
8. Verfahren zum Aktivieren nach Anspruch 5 oder 6, wobei die Übergänge zwischen den verschiedenen Schritten und der Überwachung des Knopfes und/oder des Sensors durch die Steuerungsvorrichtung ausgeführt und verwaltet werden.
9. System nach Anspruch 1, wobei der Knopf (12) in einer Vertiefung oder Aussparung des Joysticks angeordnet ist, oder wobei der Knopf (12) alternativ an einer Position angeordnet ist, für deren Erreichen eine ungewöhnliche und umständliche absichtliche Drehung der Hand erforderlich ist.

Revendications

1. Système pour l'exécution de commandes sur des machines en fonctionnement munies d'un système de sécurité, le système comprenant un joystick (10) qui inclut au moins une zone (11), la zone (11) comprenant au moins un capteur (13) permettant de détecter la présence de la main de l'opérateur sur ledit joystick (10), le système comprenant en outre un bouton spécial d'activation (12) agencé dans une position qui ne peut pas être atteinte par accident, et un dispositif de contrôle, ledit capteur (13) et ledit bouton spécial d'activation (12) étant connectés électroniquement au dispositif de commande du joystick, dans lequel le dispositif de commande, pendant l'utilisation, vérifie d'abord que le capteur et le bouton n'ont pas été trafiqués, ou bloqués de manière permanente en position active et s'il reçoit le signal de détection de la main de l'opérateur par le capteur (13) et puis, alors que la main est toujours présente, en place sur le joystick (10), un opérateur appuie sur le bouton, il permet que les instructions pour l'exécution des commandes sur la machine en fonctionnement soient mises en oeuvre et autorise le relâchement de la pression sur le bouton, en conservant la possibilité d'exécuter lesdites instructions.
2. Système selon la revendication 1, dans lequel le bouton spécial d'activation (12) est placé sur le joystick (10).
3. Système selon la revendication 1, dans lequel le dispositif de commande vérifie à l'avance que le capteur (13) et le bouton (12) ne sont pas bloqués en position activée/enfoncée.
4. Système selon la revendication 1, dans lequel le capteur (13) est du type capacitif.
5. Procédé d'actionnement d'un joystick d'un système de sécurité selon l'une ou plusieurs des revendications 1 à 4 ou 9, le procédé appliqué à un joystick (10) pour l'exécution de commandes sur les machines en fonctionnement, comprenant au moins une zone (11), à son tour comprenant au moins un capteur (13) permettant de détecter la présence de la main de l'opérateur sur ce joystick (10), et un bouton d'activation spécial (12) agencé dans une position qui ne peut pas être atteinte par accident ; le procédé comprenant les étapes suivantes, successivement :
 - activation du système ;
 - vérification que le capteur et le bouton n'ont pas été trafiqués, ou bloqués de manière permanente en position active,
 - détection de la présence de la main de l'opérateur sur la zone (11) du joystick (10) ;

- détection de l'appui sur le bouton (12) par l'opérateur dont la main est toujours présente, en position sur le joystick (10) ;
 - activation des dispositifs qui autorisent l'exécution desdites instructions sur ces machines en fonctionnement ; 5
 - relâchement du bouton d'activation spécial (12) ;
 - maintien de l'autorisation d'exécuter lesdites instructions tant que la main de l'opérateur est détectée comme étant présente sur ladite zone (11) du joystick (10) . 10
6. Procédé d'actionnement du système de sécurité selon la revendication 5, dans lequel avant l'étape de détection de la présence de la main de l'opérateur sur la zone (11) du joystick, il existe une étape de contrôle anti-altération comprenant les étapes suivantes : 15
- vérification de l'état du bouton (12) ;
 - détection de la présence d'un corps conducteur à proximité du capteur (13). 20
7. Procédé d'actionnement selon la revendication 5, dans lequel la présence de la main de l'opérateur sur le joystick est surveillée par le capteur (13). 25
8. Procédé d'actionnement selon la revendication 5 ou 6, dans lequel des passages entre les différentes étapes et la surveillance du bouton et/ou du capteur sont effectués et gérés par le dispositif de commande. 30
9. Système selon la revendication 1, dans lequel le bouton (12) est agencé dans une dépression ou un creux du joystick, ou, selon une autre solution, le bouton (12) est agencé dans une position qui nécessite une rotation intentionnelle inhabituelle et délicate de la main pour l'actionner. 35
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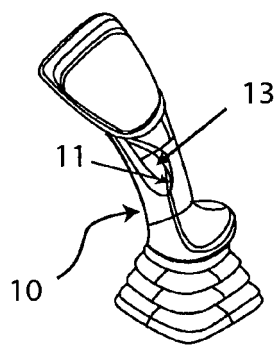


FIG. 1

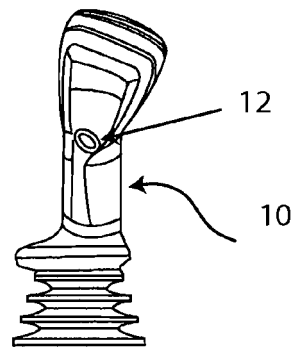
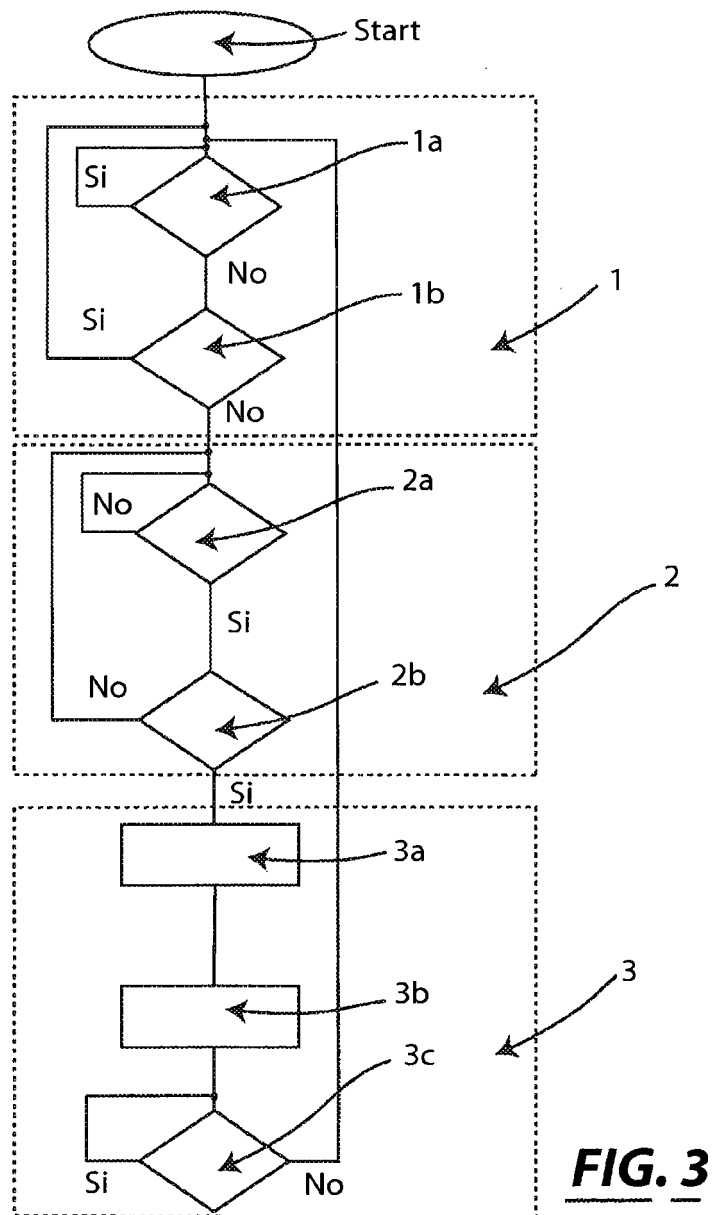


FIG. 2



REFERENCES CITED IN THE DESCRIPTION

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