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(71) Applicant: **Soilmec S.p.A.**
47522 Cesena (IT)

(72) Inventors:
- **Guerra, Ivano**
  47522 Cesena (FC) (IT)
- **Fontana, Pietro**
  47522 Cesena (FC) (IT)

(74) Representative: **Di Gennaro, Sergio**
Brazanò & Zanardo Milano S.p.A.
Corso Vittorio Emanuele II, 61
10128 Torino (IT)

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

(57) Joystick (10) for the execution of controls on operating machines equipped with a safety system, including at least one area (11), and comprising at least one sensor (13) adapted for detecting the presence of the operator's hand on such a joystick (10).
Said sensor (13) and a special enabling button (12) being electronically connected to a control device of the joystick, in which such a control device, if it receives the signal of detection of the operator's hand by the sensor (13) and the button (12) is intentionally pressed, by the operator, allows said commands to be executed and allows the pressing of the button (12) to be released, maintaining the possibility of executing such commands.

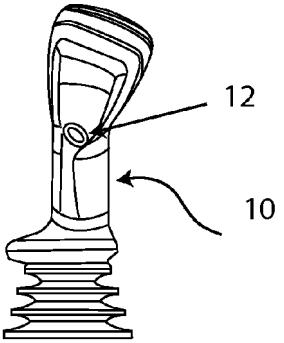

FIG. 2

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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.

[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 manoeuvres 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. Joystick (10) for the execution of controls on operating machines equipped with a safety system, including 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), said sensor (13) and a special enabling button (12) being electronically connected to a control device of the joystick, wherein such a control device, if it receives the signal of detection of the operator's hand by the sensor (13) and the button (12) is intentionally pressed, by an operator, allows said commands 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. System according to claim 1, wherein the button (12) is in a position that cannot be reached accidentally.

6. Method for activating a safety system 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 at a special enabling button (12); the process comprising the following steps in sequence:

   • activation of the system;
   • detection of the presence of the operator's hand on the area (11) of the joystick (10);
   • detection of the button (12) being pressed;
   • 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).

7. 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).

8. Activation method according to claim 5, wherein the presence of the operator's hand on the joystick is monitored by the sensor (13).

9. Activation method 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.

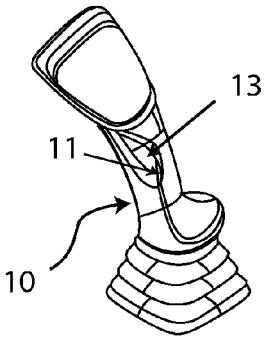

FIG. 1

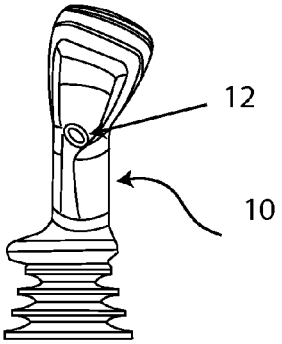

FIG. 2

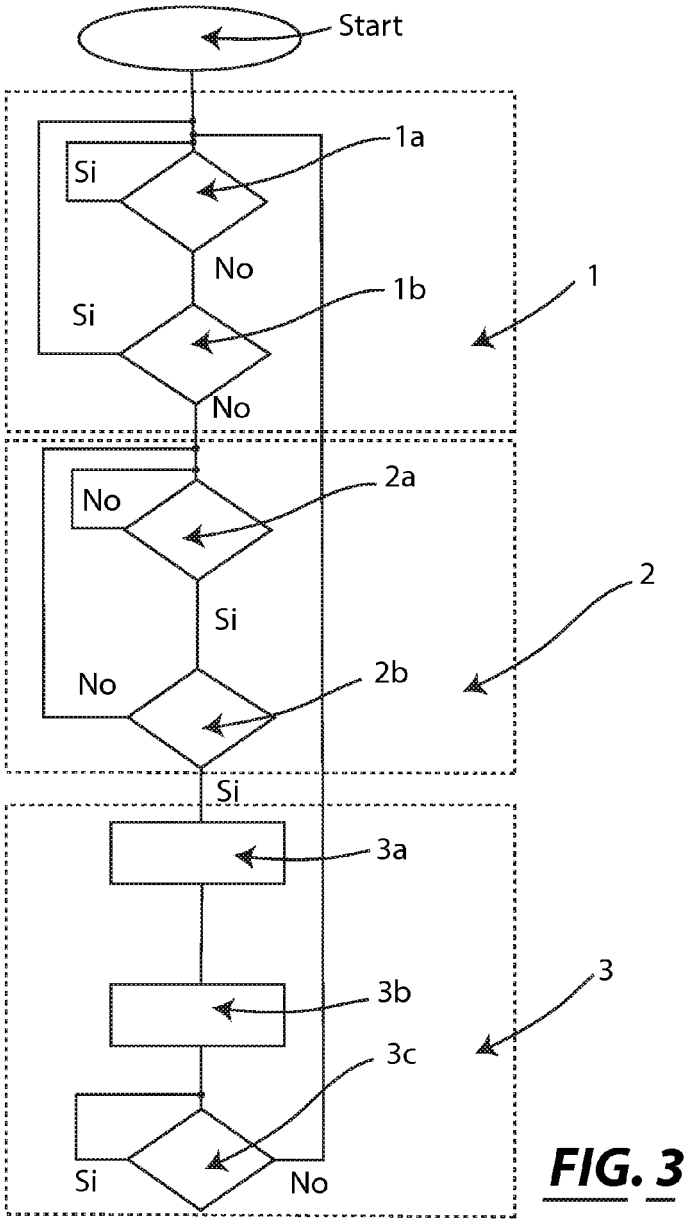

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 11 16 2778

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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	15 July 2011	Popescu, Alexandru

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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