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(54) Safety device of pneumatic sensing edge type for motorized doors

(57) A safety device of pneumatic sensing edge type for motorized doors, comprising:
- a tubular pneumatic sensing edge (4) provided at one end with a transmitting unit (12) and at the other end with a receiving unit (14) facing said transmitting unit,
- a first radio receiver/transmitter (9) associated with a control unit (8) for said motorized door (2),
- a second radio receiver/transmitter (30,32) mounted on

said motorized door (2) and associated with said transmitting unit (12) and with said receiving unit (14), and tuned to said first radio receiver/transmitter (9),

characterised by further comprising, activated by the signal for controlling motorization of said door (2), means (18) for connecting power to said transmitting unit (12) and to said receiving unit (14).

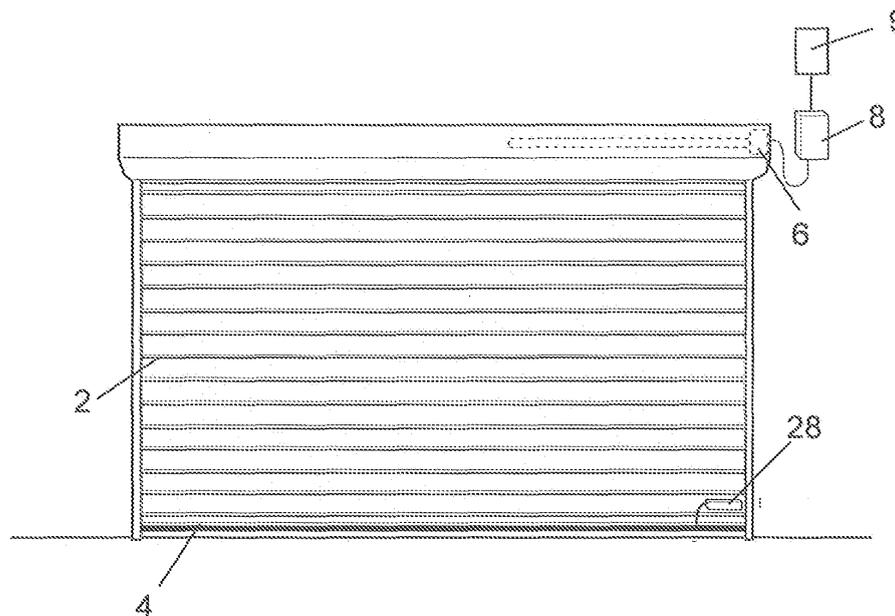


FIG. 1

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Description

[0001] The present invention relates to a safety device of pneumatic sensing edge type for motorized doors.

[0002] Motorized doors are known in the form of sectional doors, sliding doors, sliding gates etc., and generally doors which move along a controlled gap. The movement is generally provided by an electromechanical actuator controlled by a control unit via traditional limit switches.

[0003] Current regulations require that when the edge of the door strikes against an obstacle occasional present within the gap with which the door is associated, the control system senses the presence of the obstacle and immediately halts the door, preferably with rapid temporary reversal of its movement.

[0004] This is currently achieved by a safety device, commonly known as a "pneumatic sensing edge" consisting essentially of a deformable tubular profile, generally of rubber, which is applied along the door edge and, if an obstacle is present, strikes it first, and deforms to generate in some manner a signal corresponding to this deformation.

[0005] Various types of pneumatic sensing edges exist, of which the so-called active pneumatic sensing edges are much used, they consisting of a hollow tubular rubber tube carrying at one end a transmitting unit (IR, laser, ultrasound, etc.) and at its other end a receiving unit. Under normal operating conditions the radiation generated by the transmitting unit strikes the receiving unit to confirm that the equipment is operating normally. However if during door movement the pneumatic sensing edge strikes an obstacle, it undergoes deformation by being squeezed and interrupts the radiation, which can no longer reach the receding unit. This senses the situation and sends a corresponding signal to the control unit, which then causes the actuator to stop and undergo a rapid temporary movement reversal to withdraw the door from the obstacle by an amount sufficient to prevent the door from pressing against it, and to enable it to be removed.

[0006] This signal generated by the receiving unit is transmitted to the control unit via cable which, as the door is in movement while the control unit is fixed, has to be flexible and extensible to ensure the connections for any position of the door and under any condition of movement.

[0007] To dispense with this cable connection, it has already been proposed to associate with the receiving unit and with the control unit two radio receiver/transmitters, which in this manner simplify the installation of the assembly by eliminating the connection cable between the door and the control unit and eliminating any constraint in positioning the control unit.

[0008] However the elimination of this connection cable has made it impossible to power the equipment associated with the pneumatic sensing edge by mains electricity, so that it has to be powered by battery, which how-

ever rapidly discharges due to the constant powering of this equipment, and has to be frequently replaced.

[0009] This problem is solved according to the invention by a safety device of pneumatic sensing edge type for motorized doors as described in claim 1.

[0010] The present invention is further clarified hereinafter with reference to the accompanying drawings, in which:

- 10 Figure 1 is a front schematic view of a sectional door provided with the safety device according to the invention,
 Figure 2 is a partly sectional and partly interrupted detailed view of the pneumatic sensing edge, and
 15 Figure 3 shows a block diagram of the that part of the device mounted on said motorized door.

[0011] As can be seen from the figures, the device of the invention is applied to a motorized door, for example a sectional door 2 provided on its free edge with a traditional pneumatic sensing edge 4.

[0012] A gearmotor 6 is associated with the sectional door 2 for its opening and closure movements, this gearmotor being connected to a control unit 8, with which a first receiver/transmitter 9 is associated.

[0013] The pneumatic sensing edge 4 consists of a hollow tubular element 10 carrying at one end an IR transmitter 12 and at its opposite end an IR receiver 14 able to receiver the IR beam emitted by the IT transmitter 12, provided that the 10 has not been deformed by squeezing, in which case it interrupts the beam and prevents it from reaching the IR receiver 14.

[0014] Both the IR transmitter 12 and the IR receiver 14 are powered by a battery 16 via a switch 18 controlled by a second radio receiver/transmitter 30, 32 able to act as an ON/OFF switch for the feed to the pneumatic sensing edge and to power the pneumatic sensing edge at a constant voltage which if necessary is greater than the voltage of the battery 16. The second radio receiver/transmitter 30, 32 comprises a receiving unit 30 and a transmitting unit 32, and is tuned to the first radio receiver/transmitter 9 associated with the control unit 8.

[0015] The assembly mounted on the sectional door 2 and comprising the IT transmitter 12, the IR receiver 14, the second radiofrequency receiver/transmitter 30, 32, the battery 16 and the switch 18, also comprises a microcontroller 26, which controls correct operation of the equipment, indicated overall by the reference numeral 28.

[0016] The microcontroller 26 controls the switch 18 connected between the battery 16 and the two IR devices 12 and 14 connected to the inputs 22 and 20.

[0017] In operation, under normal conditions the command for opening and closing the sectional door 2 is received by the control unit 8, for example by means of a manual command or a radio-transmitted command. The control unit, by means of the first receiver/transmitter 9

with which it is provided, sends a corresponding command for activating the normally unpowered equipment 28 mounted on the door 2.

[0018] On receiving this command the IR transmitter 12 and IR receiver 14 are powered, then if the pneumatic sensing edge 4 is not deformed and the IR beam emitted by the transmitter 12 reaches the receiver 14, this latter causes the transmitting unit 32 of the second receiver/transmitter to send a corresponding signal of correct operation to the first receiver/transmitter 9 associated with the control unit 8, which then causes the gearmotor 6 to move the door 2.

[0019] In the absence of obstacles, this movement terminates in complete opening or complete closure of the door; if however an obstacle is present against which the pneumatic sensing edge 4 strikes, its deformation causes interruption of the IR beam, with consequent intervention of the IR receiver 14, causing the transmitting unit 32 of the second receiver/transmitter to send a corresponding signal to the first receiver/transmitter 9 associated with the control unit 8. This then causes stoppage of the door 2 and possibly a short reversal movement.

[0020] Essentially, the device of the invention intervenes to power the IR transmitter 12 and IR receiver 14, associated with the pneumatic sensing edge 4, only during the movement periods of the door 2, i.e. only during those periods in which control by the pneumatic sensing edge 4 is required. At the same time the receiving unit 30 of the second receiver/transmitter activates the switch 18 to enable the battery 16 to power the IR transmitter 12 and IR receiver 14 connected to the inputs 22 and 20.

[0021] It follows that the electrical energy consumed from the battery installed in the door 2 is extremely low and even enables a normal battery to be used, the charge of which can last for a considerable time.

[0022] As an alternative to a non-rechargeable battery, a rechargeable battery can be used, charged for example by a photovoltaic panel.

Claims

1. A safety device of pneumatic sensing edge type for motorized doors, comprising:

- a tubular pneumatic sensing edge (4) provided at one end with a transmitting unit (12) and at the other end with a receiving unit (14) facing said transmitting unit,
- a first radio receiver/transmitter (9) associated with a control unit (8) for said motorized door (2),
- a second radio receiver/transmitter (30, 32) mounted on said motorized door (2) and associated with said transmitting unit (12) and with said receiving unit, and tuned to said first radio receiver/transmitter,

characterised by further comprising, activated by

the signal for controlling motorization of said door (2), means (18) for connecting power to said transmitting unit (12) and to said receiving unit (14).

2. A device as claimed in claim 1, **characterised in that** said transmitting unit (12) and said receiving unit (14) associated with said pneumatic sensing edge (4) are of infrared type.
3. A device as claimed in claim 1, **characterised in that** said transmitting unit (12) and said receiving unit (14) associated with said pneumatic sensing edge (4) are of laser type.
4. A device as claimed in claim 1, **characterised in that** said transmitting unit (12) and said receiving unit (14) associated with said pneumatic sensing edge (4) are of ultrasonic type.
5. A device as claimed in claim 1, **characterised in that** said connection means (18) consist of an ON/OFF switch.
6. A device as claimed in claim 1, **characterised in that** the power for said transmitting unit (12) and for said receiving unit (14) is provided by a battery.
7. A device as claimed in claim 5, **characterised by** comprising an electronic circuit for raising the battery voltage to the value required for powering said transmitter (12) and said receiver (14).
8. A device as claimed in claim 6, **characterised in that** the battery (16) is of rechargeable type.
9. A device as claimed in claim 8, **characterised in that** a photovoltaic panel is associated with the rechargeable battery.

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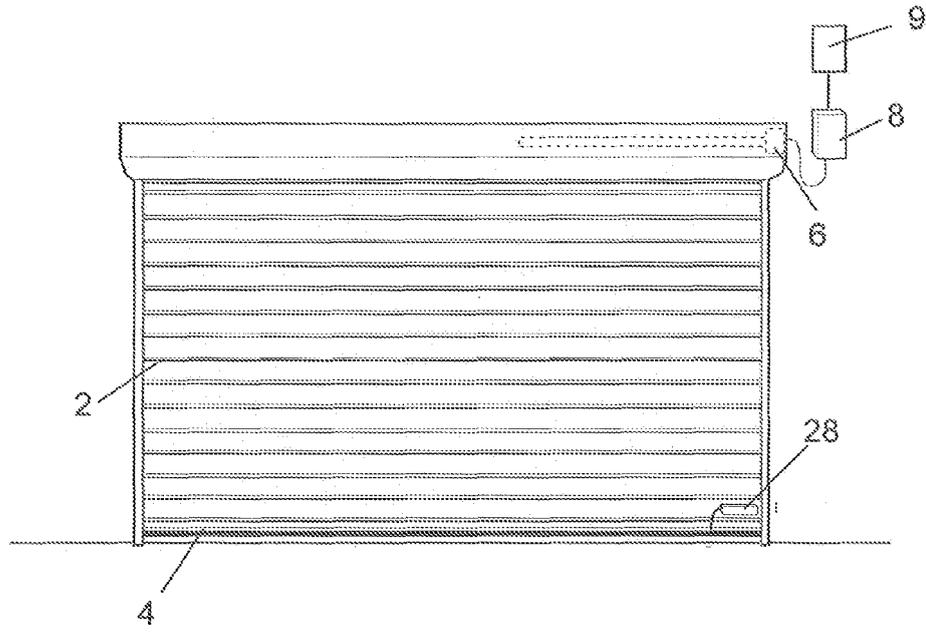


FIG. 1

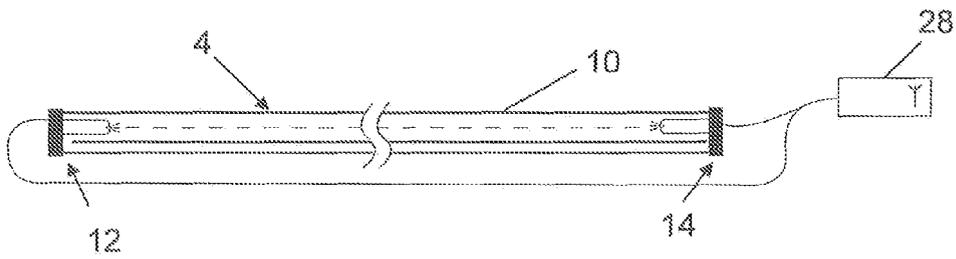


FIG. 2

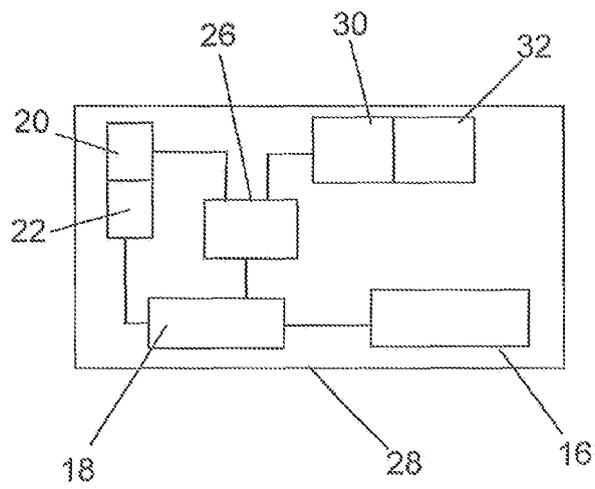


FIG. 3