(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 719 866 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.11.2006 Bulletin 2006/45

(21) Application number: **06112363.4**

(22) Date of filing: **07.04.2006**

(51) Int Cl.:
E05F 15/00 *(2006.01)* ***E05F 15/12*** *(2006.01)*
E05F 15/20 *(2006.01)*

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **14.04.2005 IT MI20050640**

(71) Applicant: **Fin-Men S.p.A.**
31030 Dosson di Casier (Treviso) (IT)

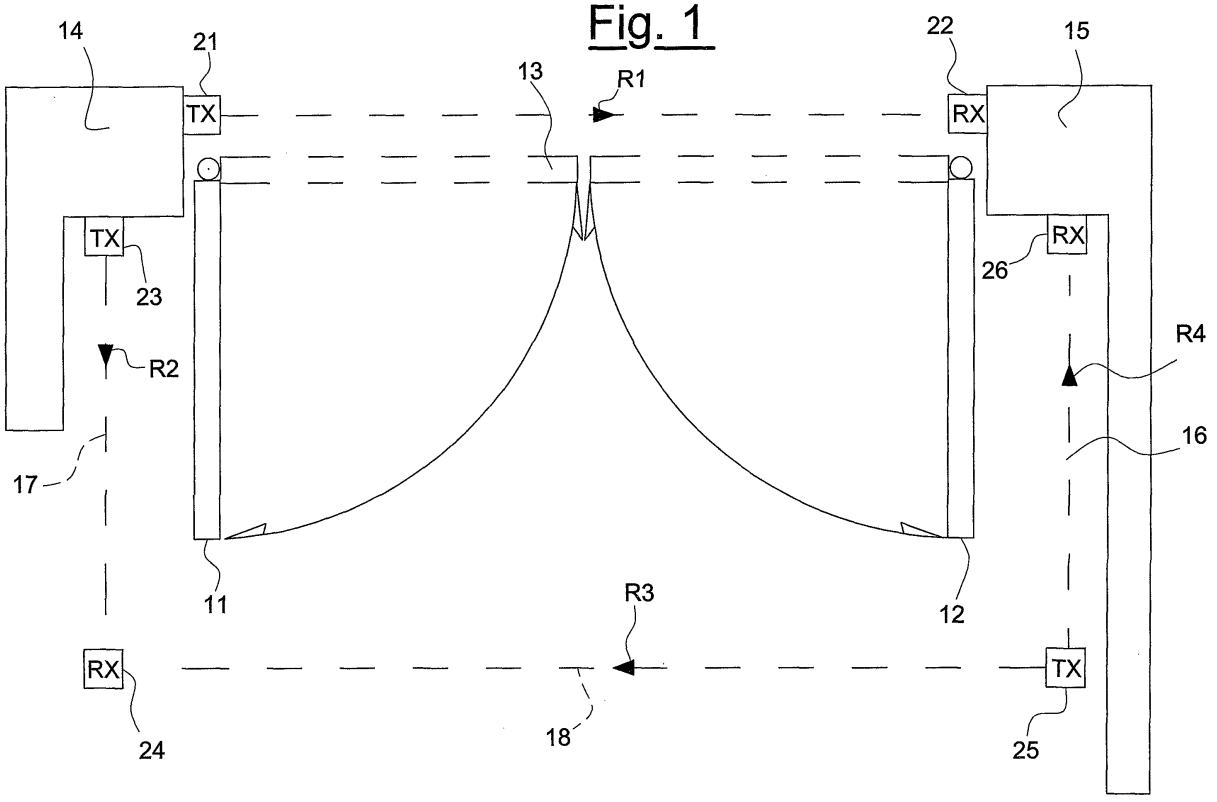
(72) Inventor: **Michielan, Gianni**
31021, Campocroce di Mogliano (Treviso) (IT)

(74) Representative: **Coppo, Alessandro et al**
Ing. Barzanò & Zanardo Milano S.p.A.,
Via Borgonuovo, 10
20121 Milano (IT)

(54) Safety system for automatic gate

(57) Safety protection system for an automatic gate, said gate comprising at least one mobile wing (11, 12) adapted to cover an access passage (13) defined at its ends by fixed elements (14, 15) of said gate. The system presents a plurality of infrared transmitters and receivers whose transmitted and received rays define a protected area corresponding to the dimensions of the operational surface of the gate; the interruption of one of said rays, generates a state of alarm.

Fig. 1



EP 1 719 866 A2

Description

[0001] The present invention relates to a safety protection system for automatic gates.

[0002] The gate on which the system according to the present invention can be applied, may be a swing gate, and more generally, the system according to the present invention can be applied to barriers wherein access is provided by opening and closing at least one wing, automatically moved in an angular direction in relation to the corresponding direction of the barrier.

[0003] Automatic gates giving access to private areas are normally activated by users from a fixed point, by means of a push-button or key for the opening-closure action, or by means of a remote control device that transmits an impulse via radio to an electronic unit which activates the gate movement in the desired direction.

[0004] Moreover, generally in the case of remote control transmission via radio, once the gate has been opened, the subsequential closing action of the gate occurs through a new command transmitted by the user, or it automatically occurs after a predetermined time lapse.

[0005] However these types of sliding gates can provoke serious safety problems for the user due to the fact that because of the intrinsic configuration of the structures, they normally comprise moving parts which have sharp corners that can result as very dangerous for the user's safety.

[0006] In fact, since these gates are activated through remote control from a fixed point, in certain cases the structure motion cannot be interrupted automatically at the moment when collision may occur with potential users or other objects against protruding portions of the aforesaid structure, and in particular against the primary edge, except by manually shutting off the power to the system or by inverting the structure travel movement in moments following those of strict necessity.

[0007] As a result, the inevitable consequences are easy to imagine, and sometimes these can even become dramatic because there exists no possibility for rapid intervention.

[0008] In order to brake, interrupt or invert the travel of a moving automatic gate in the case of imminent danger, without the need for manual intervention, safety protection systems for sliding gates have been employed that are substantially based on the use of protection ribs.

[0009] Such ribs are placed at the most dangerous corners, and are made from a pliant material and by means of a pressure switch for example, they transmit an electric signal to an electronic transmitter contact each time the pressure varies inside the ribs, as for example, in the case of accidental contact or impact provoked by vehicles during transit.

[0010] In fact when the vehicle hits the rib, the electronic transmitter immediately sends an impulse to a receiver, that can be activated through radio contact, located in the vicinity of a fixed point, and which immediately interrupts the electrical power supply to the system; consequently, if the gate is in motion, it is immediately blocked or inverts its movement in the position it has reached.

[0011] As an alternative to pneumatic type ribs, there are other types, again made from pliant materials, which contain a fine steel cable stretched inside the rib, which intervenes for example on the electrical power supply to the system.

[0012] In this way, any kind of accidental contact or impact against the rib provokes immediate gate blockage in the position reached during the moment of the contact.

[0013] In the case of automatic sliding gates, through the application of a specifically shaped aluminium profile, the protection rib is mounted on the front surface of the gate panel in its travelling direction.

[0014] The transmission of the signal generated by the protection rib to a gate control unit is sent via radio, or via the cable from the panel to the fixed part of the gate, through flexible electric cables or sliding saddles on the gate.

[0015] The Applicant has noted that each known method for signal transmission of the rib presents problems of reliability. For example, the interruption signal transmitted via radio from the ribs to the gate control unit can be affected by disturbances, and therefore it can occur that the signal is not received or recognised by the unit. An interruption signal transmitted via cable implies the need for cable connection between a fixed part and a mobile part of the gate with the ensuing possibility of rupture and/or damage over a period of time, thus provoking an increase in system production and maintenance costs.

[0016] The Applicant has envisaged a simple and reliable way to send such signal transmission of the rib, through the presence of at least one infrared ray signal along a path, which defines a determined area around the gate. In particular, said "protected" area has a substantially quadrangular shape and comprises the barred barrier of the gate, two straight lines substantially orthogonal to the barrier, and external to the wings of the gate, and a straight line opposite and substantially parallel to the barrier, which closes the protected area.

[0017] Any form of violation within the protected area will provoke the arrest or inversion of the movement of the mobile wings of the gate. Moreover, an intervention signal generated by the protective ribs placed on the gate wings, caused for example, by the impact of the rib itself against some obstacle, will deactivate an infrared transmitter and generate the simultaneous arrest of the mobile wings.

[0018] One aspect of the present invention concerns a safety protection system for an automatic gate, said gate comprising at least one mobile wing adapted to cover an access passage defined at each end by fixed elements of said gate, characterised in that it comprises a plurality of infrared ray transmitters and receivers, whose transmitted and received rays define a protected area

corresponding to the dimensions of the operational surface of the gate, the interruption of one of said rays thus provoking a state of alarm.

[0019] The characteristics and advantages of the safety protection system for automatic gates according to the present invention will be made clearer from the following description, provided as an example but by no means limiting, with reference to the appended schematic drawings wherein:

- figure 1 is a schematic view seen from above, of an automatic swing gate with two mobile wings, associated with the safety protection system according to the present invention.

[0020] With reference to the aforesaid figure, the automatic gate illustrated comprises a pair of mobile wings 11 and 12, shown in the figure with a rectangular form as an example, and which cover an access passage or barrier 13. Such access passage is defined at its ends by fixed parts of said gate comprising a pair of columns 14 and 15, positioned at opposite ends of said passage or barrier.

[0021] In an equivalent manner the present invention is also applicable to access passages covered by a single swinging wing.

[0022] The wings perform a swivel action and are each hinged to one of said columns; they are preferably each moved by a motor, such as an electric motor, for example.

[0023] In one embodiment of the invention the wings are equipped with a protective rib made of rubber or in any case of some pliant material, the rib substantially having a triangular prismatic shape, and being attached to a front wall of said wing.

[0024] For the purpose of the present invention, the protective rib can be made according to different equivalent technologies, wherein, as a result of pressure exerted against the pliant material of said rib, a signal is generated, or an electric signal is interrupted in order to communicate the impact of the rib against some obstacle, and that the wing movement must be arrested.

[0025] The gate is driven by said motors which are controlled by an electronic control unit located in proximity to the fixed elements of the gate, for example.

[0026] The safety protection system according to the present invention defines a protected area, which, if violated, will provoke the arrest and/or the inversion of the movement of the mobile parts, such as the gate wings for example.

[0027] Said protected area concurs with the dimensions of the operational surface of the gate when open or closed, and has a substantially quadrangular form, whose perimeter is defined by the aforesaid barred gate barrier 13, two sides 16 and 17, substantially orthogonal to the external barrier of the gate wings, and an opposite side 18, substantially parallel to the barrier which closes the protected area.

[0028] Infrared ray transmitters or receivers are positioned at the intersection of said sides; the transmitters and receivers are positioned in a manner so that the infrared rays transmitted by the transmitters substantially travel along the perimeter of the protected area until they reach the position of the corresponding receiver.

[0029] With reference to the example illustrated in figure 1 in particular, the system comprises a first transmitter 21, associated with one of the two columns on which one wing is hinged, and a first receiver 22 associated with the opposite column so that a first infrared ray R1 substantially travels along the barrier 13. A second transmitter 23, associated with the same column containing the first transmitter 21, sends a second infrared ray R2 in a direction substantially corresponding to said side 17 towards a second receiver 24, located at the intersection with the opposite side 18. A third transmitter 25 sends a third infrared ray R3 of said second receiver, which, for this purpose is able to receive at least two rays from different directions, for example, orthogonal to each other. Moreover, said third transmitter 25 is able to send a fourth ray R4 in the direction of a third receiver 26 associated with column 15; for this purpose, the third transmitter 25 is able to send at least two rays simultaneously in different directions from each other, orthogonal, for example.

[0030] According to the present invention a state of alarm can be generated by the interruption of one of said rays, for example, in the case where this is provoked by an intrusion inside the protected area. Moreover, in the case where the gate is equipped with protective ribs, the state of alarm will identify a condition wherein an impact has occurred against an obstacle of the wing during its travel course, or it is able to identify an operating fault of the rib, serious enough to warrant the interruption of the total gate function.

[0031] Infrared ray transmitters are activated by a pilot system circuit, connected to the said electronic control unit of the gate (not shown in the figure) comprising a microprocessor that activates or deactivates the transmitter in question; the power supply for circuits and transmitters is preferably furnished by a long-life battery.

[0032] Moreover, said receivers are connected to a decoding circuit connected to the electronic control unit of the gate.

[0033] Said pilot system circuit is adapted to maintain the transmitter active during normal gate function, through the transmission of a predetermined infrared signal, that identifies a state of alarm when interrupted.

[0034] The decoding circuit identifies the state of alarm following the lack of infrared signal reception and sends a block and/or inversion signal to the gate control unit, which arrests the motor, and therefore also the travel movement of the gate.

[0035] This very simple system reduces the risk of safety protection system operational failure to a minimum. For example, in the case where the pilot system circuit or the infrared ray transmitter fail to operate correctly for any reason, the gate is arrested. In a similar way, the gate will also be arrested in cases where the

signal from the protection rib cannot be transmitted correctly, or where an obstacle is interposed between the infrared transmitter or the infrared receiver.

[0036] Furthermore, the transmitter power is preferably supplied by a battery which must be replaced regularly; for this purpose, the system according to the present invention comprises a battery charging signal circuit, which includes a battery charge signal led located in proximity to the receiver, for example.

[0037] For this purpose, the transmitter pilot system circuit codes the infrared signal by entering data concerning the status of the corresponding battery in its system. The decoding circuit can decode this data contained in the infrared signal and activate said battery status signal led.

[0038] In particular, the pilot system circuit can code the infrared signal by entering regular impulses at a predetermined distance from one another. In the case were the battery begins to run down, the pilot system circuit can intensify or space out the frequency of said impulses. In this manner, the decoding circuit on the receiver can activate the pilot led according to the frequency variation of the impulses. Suitable system adjustment setting can regulate the switch-on of the low battery led sufficiently in advance in relation to the actual low battery condition (for example, two to three months beforehand).

[0039] Preferably said signal led should be located on the receiver, since it can be conveniently powered by the electronic gate control unit, so that the electronic circuits contained in the pilot system circuit that controls the transmitter are reduced to a minimum.

[0040] Alternatively, said led can be mounted directly on the transmitter. In any case, the infrared signal indicates the correct operating condition of the gate, so failure to receive said signal will provoke the arrest of the travel action of the mobile wing of the gate.

Claims

1. Safety protection system for an automatic gate, said gate comprising at least one mobile wing (11, 12) adapted to cover an access passage (13) defined at its ends by fixed elements (14, 15) of said gate, **characterised in that** it comprises
   a plurality of infrared ray transmitters and receivers whose transmitted and received rays define a protected area corresponding to the dimensions of the operational surface of the gate, the interruption of one of said rays, generating a state of alarm.

2. System according to claim 1 wherein said protected area has a substantially quadrangular shape, whose perimeter is defined by the aforesaid barred gate barrier (13), two sides (16, 17) substantially orthogonal to the barrier external to the gate wings, and an opposite side (18) substantially parallel to the barrier, thus closing the protected area.

3. System according to claim 1 wherein said state of alarm provokes the arrest and/or inversion of the travel movement of said at least one wing of said gate.

4. System according to claim 2 wherein said transmitters and receivers are associated with the intersections of said sides that define the protected area.

5. System according to claim 3, comprising a first transmitter (21) associated with one of the two columns or fixed elements (14, 15) and a first receiver (22) associated with the opposite column so that a first infrared ray (R1) substantially travels along barrier 13, a second transmitter (23) associated with the same column in which the first transmitter (21) is present, which sends a second infrared ray (R2) in a direction that substantially corresponds with said side (17) towards a second receiver (24) located at the intersection with the opposite side (18), a third transmitter (25) that sends a third infrared ray (R3) of said second receiver, said third transmitter being adapted to send a fourth ray (R4) in the direction of a third receiver (26) associated with column (15).

6. System according to claim 5 wherein said second receiver is able to receive at least two rays from directions orthogonal to one another, and said third transmitter is able to send at least two rays simultaneously in directions orthogonal to one another.

7. System according to claim 1 wherein the infrared ray transmitters are activated by a pilot system circuit connected to an electronic gate control unit, comprising a microprocessor which activates or deactivates the transmitters.

8. System according to claim 1 wherein said receivers are connected to a decoding circuit connected to said electronic gate control circuit.

Fig. 1