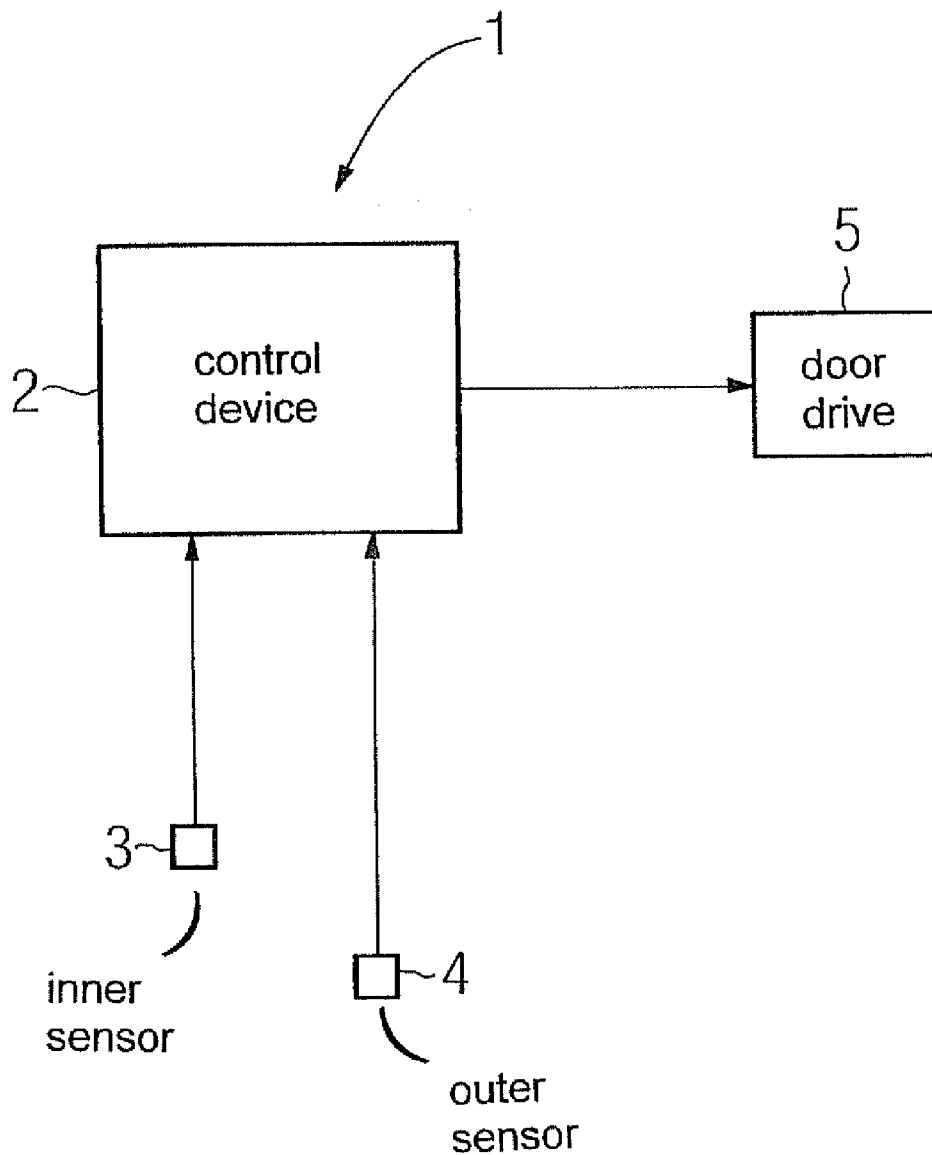


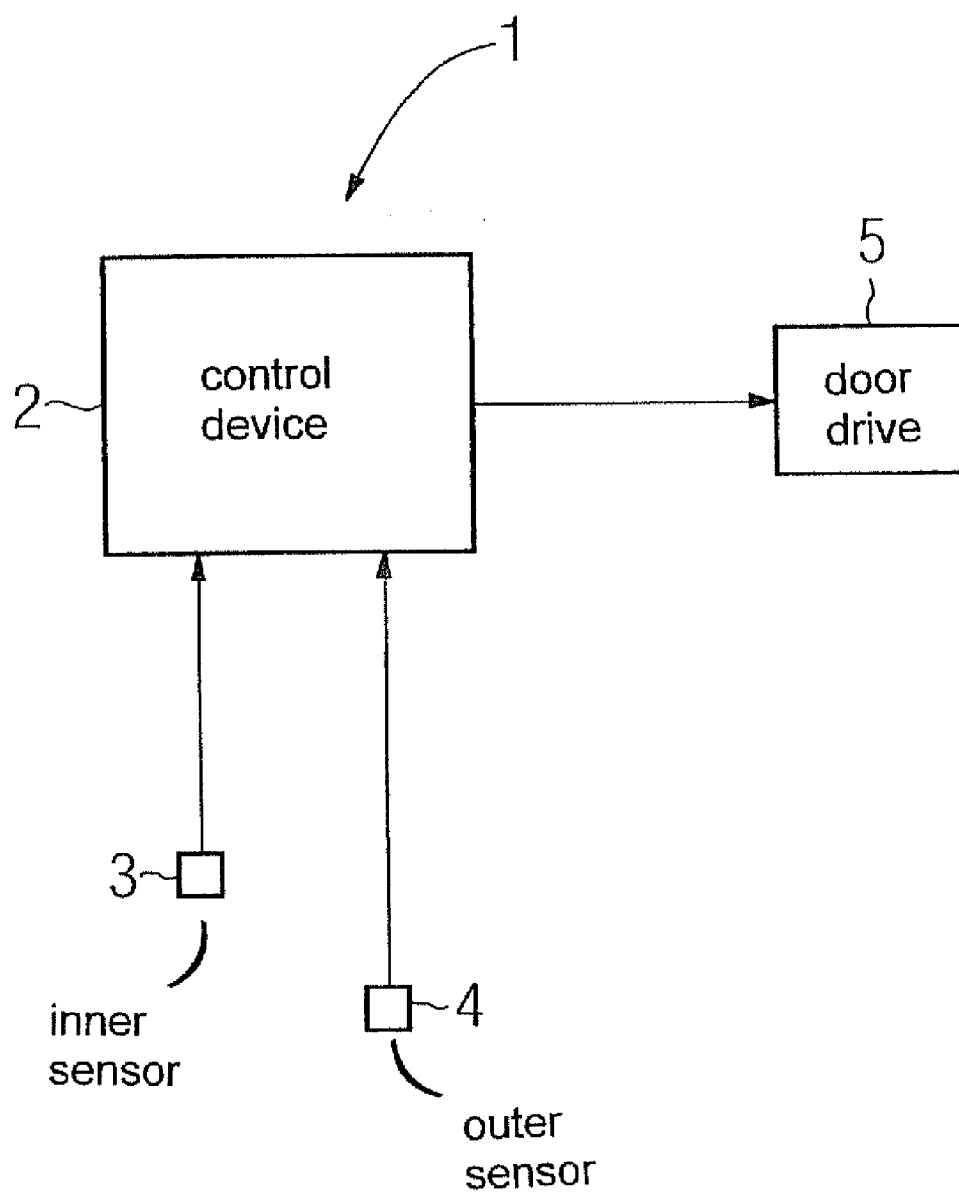


US 20120060720A1

(19) **United States**(12) **Patent Application Publication**
Ebert et al.(10) **Pub. No.: US 2012/0060720 A1**(43) **Pub. Date: Mar. 15, 2012**(54) **RAIL VEHICLE WITH TRAPPING
PROTECTION APPARATUS**(52) **U.S. Cl. 105/329.1**(76) **Inventors:** **Matthias Ebert**, Königs-
Wusterhausen (DE); **Björn**
Heinrichs, Willich (DE)(21) **Appl. No.: 12/879,383**(22) **Filed: Sep. 10, 2010****Publication Classification**(51) **Int. Cl.**
B61D 19/02 (2006.01)
B61D 1/00 (2006.01)(57) **ABSTRACT**

A rail vehicle with a contactlessly operating trapping protection apparatus in a door area is provided. The trapping protection apparatus has an inner and an outer contactless sensor, each sensor detecting obstructions in the door area. Further, a control device for controlling a door movement of a door of the rail vehicle is provided. The control device is configured such that, when only the inner sensor is interrupted, the door is moved further in the closing direction while, when the outer sensor is interrupted, a closing movement of the door is stopped.





RAIL VEHICLE WITH TRAPPING PROTECTION APPARATUS

FIELD OF INVENTION

[0001] The invention relates to a rail vehicle with a contactlessly operating trapping protection apparatus in the door area.

SUMMARY OF INVENTION

[0002] A trapping protection apparatus such as this typically makes use of a contactlessly operating sensor, such as a light grid, whose output signal leads to a door which is currently in the course of a closing movement being reversed, or the closing process not being started or being delayed. The resultant reversal movement is normally carried out completely, that is to say, after the obstruction has been removed, the door closing process must be carried out again from the start.

[0003] The operation of such trapping protection apparatuses has the disadvantage that reversal movements that occur are frequently assessed as being unnecessary when, for example, simply a random interruption of the light grid by movement by one of the passengers in the vicinity of the door leads to complete reversal of the closing movement.

[0004] The reversal and closing movement that is required again results in a longer stopping duration, that is to say this results in more time being lost at train or tram stops.

[0005] An object of the claimed invention is to provide a rail vehicle of the type mentioned initially where reversal movements of the door occur less frequently.

[0006] This object is achieved in that the trapping protection apparatus has an inner and an outer contactless sensor, in each case for detecting an obstruction in the door area, and has a control device for controlling a door movement when an obstruction occurs, wherein the control device is designed such that, when only the inner sensor is interrupted, the door is moved further in the closing direction while, when the outer sensor is interrupted, a closing movement of the door is stopped.

[0007] In this case, use is made of the fact that the selected arrangement of an inner and an outer contactless sensor allows conclusions to be drawn about a movement direction of a passenger who is currently entering or leaving the rail vehicle. For example, when only the inner sensor is interrupted while no interruption is found in the outer sensor, it is considered to be unnecessary to reverse the door. This door can instead be moved further in the closing direction, in which case, if required, the movement can be carried out at a slower closing rate than in the case of the standard closing movement.

[0008] The control device is preferably designed such that, when the inner sensor emits a signal first, followed by the outer sensor, the closing movement of the door is interrupted.

[0009] The described situation occurs, for example, when a passenger is leaving the rail vehicle through the door. In situations such as this, a closing movement of the door must be stopped.

[0010] It may be advantageous for the control device to be designed such that, in situations in which a closing movement of the door is stopped, the door is then reversed. This is possibly dependent on the extent to which the closing movement has already been carried out.

[0011] This decision process is carried out by the control device (door controller) itself. The result is dependent on the door enable signal and the vehicle speed.

[0012] The contactlessly operating sensor referred to here provides the door controller with signals which are used as the basis to control the door drive.

[0013] After the door has been stopped, the reversal can take place by only a defined amount which, for example, allows a single person to enter or leave the rail vehicle, allows the door to be opened completely, or only stops the door movement.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] One exemplary embodiment of the invention will be explained in more detail in the following text with reference to the drawing. The single FIGURE shows a schematic view of a trapping protection apparatus for the door area of a rail vehicle.

DETAILED DESCRIPTION OF INVENTION

[0015] As is illustrated in the FIGURE, a trapping protection apparatus 1 comprises a control device 2 which is in each case connected for signaling purposes to an inner sensor 3 and to an outer sensor 4. By way of example, the two sensors 3, 4 may be in the form of light grids which run substantially parallel to one another in the door area.

[0016] The sensors 3, 4 each signal to the control device 2 the detection of an obstruction in their sensor area, either of a person entering or leaving the rail vehicle or of an object moving into the detection area. On the basis of the signals received from the sensors 3, 4, the control device 2 produces control signals for a door drive 5, which controls a movement of one door of the rail vehicle, in particular also its closing and reversal movement.

[0017] The operation of the door drive 5 by the control device 2 now depends on the signals generated by the sensors 3, 4. In this case, a distinction is drawn between the following situations:

[0018] a) Only the inner sensor 3 signals the presence of an obstruction: in this situation, it can be assumed that a person who is already in the rail vehicle has inadvertently caused initiation of the inner sensor 3, but does not wish to leave the rail vehicle. In a situation such as this, it is possible to move the door further in the closing direction, possibly at a reduced closing rate. The door drive 5 is operated appropriately by the control device 2.

[0019] b) The outer sensor 4 indicates the presence of an obstruction: in this situation, there is no distinction between whether the outer sensor is signaling the presence of an obstruction exclusively or after response by the inner sensor 3. In both situations, the closing movement of the door is stopped.

[0020] If required, the door can be reversed by a certain, defined amount or else completely by suitable operation of the door drive 5 by the control device 2 after the door drive has been stopped. The type of reaction of the door to a signal from the trapping protection apparatus, such as stopping, partial or complete reversal, is defined on the basis of the requirements of an operator of the rail vehicle and the infrastructure, as well as the vehicle state at the time of the signal, which is characterized, for example, by door signals, the vehicle speed, etc. at that time. The type of reaction can be configured separately for each vehicle type. For example, in the case of a suburban

railway where trains arrive at short intervals at a station it is possible not to completely reverse the door but either to stop it or to reverse it by a small amount, in order to allow people who have been trapped to be freed.

1.-5. (canceled)

6. A rail vehicle, comprising:

a contactlessly operating trapping protection apparatus located in a door area of the rail vehicle, wherein the trapping protection apparatus includes:

an inner contactless sensor,

an outer contactless sensor, both sensors detecting obstructions in the door area,

a control device for controlling a door movement when an obstruction occurs, wherein the control device is configured such that, when only the inner sensor is interrupted, the door is moved further in a closing direction while, when the outer sensor is interrupted, a closing movement of the door is stopped.

7. The rail vehicle as claimed in claim 6, wherein the control device is configured such that the closing movement

of the door is stopped when first the inner sensor is interrupted, followed by the outer sensor.

8. The rail vehicle as claimed in claim 6, wherein the control device is configured such that the door is reversed after the closing movement of the door has stopped.

9. The rail vehicle as claimed in claim 7, wherein the control device is configured such that the door is reversed after the closing movement of the door has stopped.

10. The rail vehicle as claimed in claim 8, wherein the control device is configured such that a reversal of the door takes place by a defined amount.

11. The rail vehicle as claimed in claim 8, wherein the control device is configured such that the door is reversed completely.

12. The rail vehicle as claimed in claim 9, wherein the control device is configured such that a reversal of the door takes place by a defined amount.

13. The rail vehicle as claimed in claim 9, wherein the control device is configured such that the door is reversed completely.

* * * * *