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(54) Control module

(57) A control module includes a controller and a sensor in communication with the controller. The controller is arranged in communication with a power supply for a motor. The sensor is arranged to detect the movement of an output portion of the motor, and to generate a signal indicative of movement of said motor output portion in a desired manner. The controller is configured to communicate with the sensor to detect said signal during or after the supply of power to the motor, and to generate a negative indicator if the controller fails to detect said signal from the sensor. The controller can be configured to reverse the polarity of the power supply to the motor in response to said negative indicator and/or to determine whether the motor has received an input of power during the supply of power to the motor, and to generate an alarm if no input is determined.

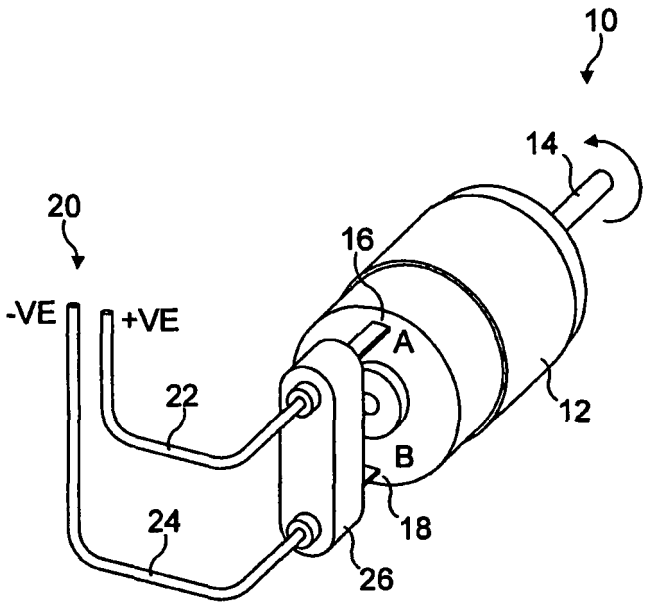

FIG. 1

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Description

[0001] The present invention relates to a control module, more particularly, but not exclusively, to a latch control module for a latch in an automotive vehicle.

[0002] It is known to provide a latch in the door of an automotive vehicle, for releasably retaining the door in a closed position. Such latches can be used to lock the door in the closed position when the car is unattended, or even if the vehicle is occupied, so as to prevent unauthorised access to the vehicle.

[0003] Typically, such latches include a drive arrangement for moving the latch between an unlocked condition and one or more locked conditions. The drive arrangement will usually incorporate at least one motor for driving a component in the latch, to cause the door to become locked or unlocked.

[0004] In conventional arrangements, the or each motor operates in response to signals from an electronic control unit (ECU) in the vehicle, wherein each motor is operatively coupled to the ECU via a wiring harness within the door.

[0005] If a motor is mounted in a latch with its terminals in an incorrect orientation for the polarity of the power supply within the wiring harness, the motor will not rotate in the desired direction, in use. In particular, the rotation of the motor may cause a component in the latch to move to an open position instead of a closed position or vice versa, thereby compromising the operative capacity of the latch.

[0006] Therefore, during current vehicle assembly operations, it is necessary to manually check the operative orientation of each motor in a door latch, thereby limiting the productivity of the assembly process.

[0007] It is an object of the invention to provide means which addresses the problem referred to above.

[0008] According to the invention there is provided a method of testing a door latch mechanism, comprising the steps of :

i) mounting a motor in a door latch, wherein said motor has a movable output portion;
ii) providing a power supply for driving the motor, in order to move said output portion of the motor;
iii) providing one or more sensors for generating a signal indicative of movement of said output portion in a desired direction;
iv) providing a controller in communication with said sensor(s) and said power supply; and
v) initiating power to the motor to move said output portion;

wherein the controller is configured to communicate with said sensor(s) to detect said signal indicative of movement of the output portion of the motor in the desired direction during or after the supply of power to the motor, and to generate a first negative indicator if the controller fails to detect a signal from the sensor(s).

[0009] The controller may be configured to determine whether the motor has received an input of power during the initiation of power to the motor, and to generate an alarm if no input is determined.

[0010] In the preferred embodiment, the controller is configured to reverse the polarity of the power supply to the motor in response to said first negative indicator.

[0011] The controller is preferably configured to generate a first positive indicator if said signal indicative of movement of the output portion of the motor in the desired direction is detected from the sensor(s).

[0012] There is also provided an apparatus for carrying out the above method. There is also provided a computer program for controlling the controller of said method and/or said apparatus.

[0013] According to a further aspect of the invention, there is provided a control module comprising a controller and a sensor in communication with the controller; the controller being configured for communication with a power supply for a motor having a motor output portion which is movable upon activation from the power supply, and the sensor being configured to generate a signal indicative of movement of said motor output portion in a desired manner, wherein the controller is configured to communicate with the sensor to detect said signal during or after the supply of power to the motor, and to generate a negative indicator if the controller fails to detect said signal from the sensor.

[0014] Preferably, the controller is configured to reverse the polarity of the power supply to the motor in response to said negative indicator.

[0015] Other aspects and features of the invention will be readily apparent from the dependent claims and the following description, which is provided, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic view of a motor arrangement in accordance with a preferred embodiment of the invention;

Figure 2 is a schematic block diagram of a latch assembly incorporating the motor arrangement of Fig. 1; and

Figure 3 is a flow diagram showing the typical operation of a control module for the door latch assembly of Figure 2.

[0016] Referring to Figure 1, a motor arrangement for a vehicle door latch is indicated generally at 10. The arrangement includes an electric motor 12 having an output shaft 14, which is intended to be rotated, in use, for driving a component within the door latch, for example to lock or unlock the door latch.

[0017] The motor 12 has first and second terminals 16, 18, for electrical connection with a power supply, for rotating the output shaft 14.

[0018] The motor 12 is operatively coupled to a vehicle door wiring harness, an end portion of which is indicated generally at 20. Wiring harness 20 includes first and second wires 22, 24 which are coupled to the respective first and second terminals 14, 16 via an electrical connector 26.

[0019] In this embodiment, the motor arrangement 10 is mounted in a left hand side door in a vehicle, which requires the output shaft 14 of the motor 12 to rotate in an anticlockwise direction, in order to cause a component within the latch to move from a first locked position to an unlocked position, in order to unlatch the door.

[0020] Clearly, if the terminals 16, 18 of the motor 12 are incorrectly orientated with respect to the polarity of the power supply from the wires 22, 24, the output shaft 14 of the motor 12 will rotate in the clockwise direction, which will prevent the door from being unlatched during activation of the motor 12.

[0021] Figure 2 shows a schematic block diagram of a door latch assembly 30 into which the motor arrangement 10 from Figure 1 has been fitted. The latch 30 includes a first component 32, which is intended to pivot from a first position to a second position, in response to rotation of the output shaft of the motor arrangement 10, so as to lock the latch 30. The latch 30 also includes a sensor 34 which is arranged to detect whether the component 32 has moved to its second position.

[0022] The motor arrangement 10 and sensor 34 are both coupled to an ECU 36 in the vehicle, via a wire harness indicated at 38.

[0023] During a typical assembly process for a vehicle, the motor 12 is mounted in the door latch 30, before being electrically connected to the wire harness 38. With the door latch 30 mounted in a respective door, the door is closed in such a manner as to bring the latch 30 into a locked condition. In the locked condition, the first component 32 is arranged in a first position, such that, under rotation of the output shaft 14 of the motor 12 in the correct rotary direction, the component 32 will be caused to move to a second position, whereby the latch 30 assumes an unlocked condition.

[0024] It should be noted that the ECU 36 in Figure 2 includes a control module 40, operation of which is controlled by a computer program. A typical operation of the control module 40 in combination with the motor arrangement 10 will now be described with reference to Figures 2 and 3.

[0025] With the latch 30 in a known locked condition, the control module 40 is programmed to enter a 'first check' mode. In this mode, the module 40 communicates with the ECU 36, so as to initiate a supply of power to the motor 12, via the wire harness 38, in order to rotate the output shaft 14 of the motor 12 in a first direction.

[0026] The control module 40 is programmed to recognise that the component 32 in the door latch 30 should be moved from the first position to the second position, in response to this first actuation of the motor 12. In particular, the control module 40 is programmed to anticipate that the sensor 34 will detect the movement of the latch component 32 from the first position to the second position, in response to this actuation of the motor 12.

[0027] After a set time period, the control module 40 is programmed to enter a 'second check' mode, wherein the module 40 checks whether the ECU 36 has received a signal from the sensor 34 indicative of the desired movement of the latch component 32, i.e. to detect whether the latch 30 has assumed an unlocked condition.

[0028] If the control module 40 detects that no such signal has been received within the predetermined time period, the control module 40 is programmed to enter a 'fault finding' mode, to determine whether the motor 12 has been incorrectly orientated in the door latch 30, or whether there has been a more significant fault in the assembly process.

[0029] As a first step in the 'fault finding' mode, the control module causes the ECU 36 to reverse the polarity of the power supply to the motor 12. For example, if the wire harness 38 was previously configured as a positive-negative power supply across the respective wires 22, 24, the polarity is reversed so that the harness 38 is effectively supplying power to the motor 12 in a negative-positive sense.

[0030] After the polarity of the power supply has been reversed, the control module 40 re-enters the 'first check' mode, in order to initiate power to the motor 12, to move the latch component 32. This is then followed by a further 'second check' mode, to await a signal from the sensor 34.

[0031] If the control module 40 detects that a signal is received by the ECU 36 in the further second check mode, then the control module 40 ends its programme and the vehicle is allowed to move on to the next stage in the assembly process.

[0032] If, on the other hand, the control module 40 identifies that sensor 34 has not detected movement of the latch component 32 during the further second check mode, the control module 40 generates an alarm signal, to indicate that closer inspection is required, for example manual inspection.

[0033] It should be understood that the control module 40 and ECU 36 may be connected to any number of motors in any given latch, and may be connected to a plurality of given latches on a vehicle. The controller 40 can be configured for testing each motor, simultaneously, or sequentially, as required. A separate sensor can be provided for each motor, for detecting the operative movement thereof, for example to monitor motors used for general lock/unlock operations, as well as superlock, power release, power cinch and child safety operations within one or more latches.

[0034] It will be appreciated that the invention is of particular benefit in reducing the number of manual checks that would otherwise be required when initially fitting a latch to a vehicle door during the first assembly of the vehicle.

[0035] The control module may include a memory,

which is programmed to store the operative orientation of each motor in a given latch, as determined by the above described method. This is of advantage if the ECU is reset after the initial assembly of the vehicle. In particular, by remembering the operative orientation of the motor, the control module can ensure that the polarity of the power supply to the motor is correct, upon re-setting of the ECU.

[0036] The module is also capable of detecting whether there has been a fundamental problem with the motor. For example, the control module can be configured to detect whether the motor is initiated to rotate at all during the first check mode, by monitoring the current flow during the initiation of power to the motor.

[0037] The module is advantageous, not only in that it can be used to detect whether a motor in a vehicle door latch is operating in a desired direction, it can also be instrumental in detecting whether there has been another failure in the vehicle door latch, such as a failure or anomaly within the motor or the remainder of the latch, for example the failure of an associated sensor or movable latch component.

Claims

1. A method of testing a door latch mechanism, comprising the steps of :

i) mounting a motor in a door latch, wherein said motor has a movable output portion;
ii) providing a power supply for driving the motor, in order to move said output portion of the motor;
iii) providing one or more sensors for generating a signal indicative of movement of said output portion in a desired direction;
iv) providing a controller in communication with said sensor(s) and said power supply;
v) initiating power to the motor to move said output portion; and
vi) the controller being configured to communicate with said sensor(s) to detect said signal indicative of movement of the output portion of the motor in the desired direction during or after the supply of power to the motor, and to generate a first negative indicator if the controller fails to detect a signal from the sensor(s),

wherein the controller is configured to reverse the polarity of the power supply to the motor in response to said first negative indicator.

2. A method according to claim 1, wherein, after the polarity of the power supply has been reversed, the controller is configured to re-communicate with said sensor(s) to detect a signal indicative of movement of the output portion of the motor in the desired direction, and to generate a second negative indicator if the controller again fails to detect a signal from the sensor(s).

3. A method according to claim 2, wherein an alarm is generated in response to said second negative indicator.

4. A method according to any of claims 1 to 3, wherein the controller is configured to generate a first positive indicator if said signal indicative of movement of the output portion of the motor in the desired direction is detected from the sensor(s).

5. A method according to claim 4, wherein the controller is configured to store the polarity of the power supply to the motor, upon receiving said signal from the sensor(s).

6. A method according to any preceding claim, wherein the controller is configured to determine whether the motor has received an input of power during the initiation of power to the motor, and to generate an alarm if no input is determined.

7. A method according to any preceding claim, comprising the steps of providing a plurality of said motors in the door latch, each motor having an output portion and a power supply for driving said output portion, wherein one or more sensors is provided in communication with each motor for generating a signal indicative of movement of the output portion of each motor in a desired direction, and wherein the controller is arranged in operative communication with each sensor for testing each motor.

8. A method according to claim 7, wherein the controller is configured to test the motors sequentially, one after another.

9. A method according to claim 7, wherein the controller is configured to test at least two motors concurrently.

10. A method according to any preceding claim, comprising the steps of providing a plurality of said door latches, each including at least one motor having an associated power supply for driving an output portion of the motor and an associated sensor for generating a signal indicative of movement of the output portion of the or each motor in a desired direction, and arranging the controller in operative communication with each sensor for testing each motor.

11. A control module comprising:

a controller, and
a sensor in communication with the controller;
the controller being configured for communication with a power supply for a motor having a

motor output portion which is movable upon activation from the power supply, and the sensor being configured to generate a signal indicative of movement of said motor output portion in a desired manner,

wherein the controller is configured to communicate with the sensor to detect said signal during or after the supply of power to the motor, and to generate a negative indicator if the controller fails to detect said signal from the sensor.

12. A control module according to claim 11, wherein the controller is configured to reverse the polarity of the power supply to the motor in response to said negative indicator.

13. A control module according to claim 11 or 12, wherein the controller is configured to determine whether the motor has received an input of power during the supply of power to the motor, and to generate an alarm if no input is determined.

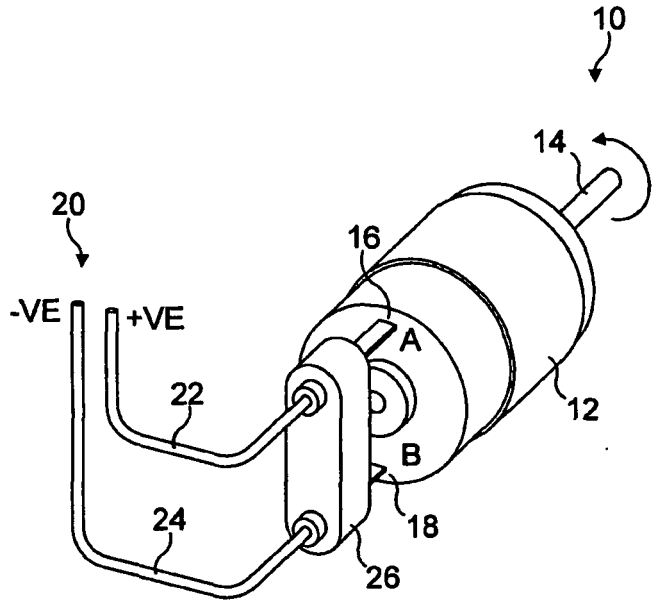

FIG. 1

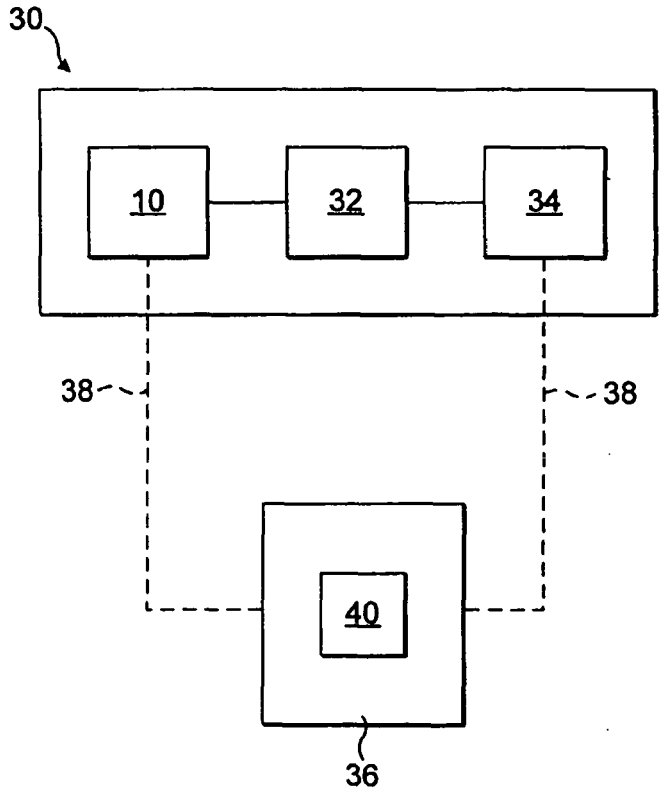

FIG. 2

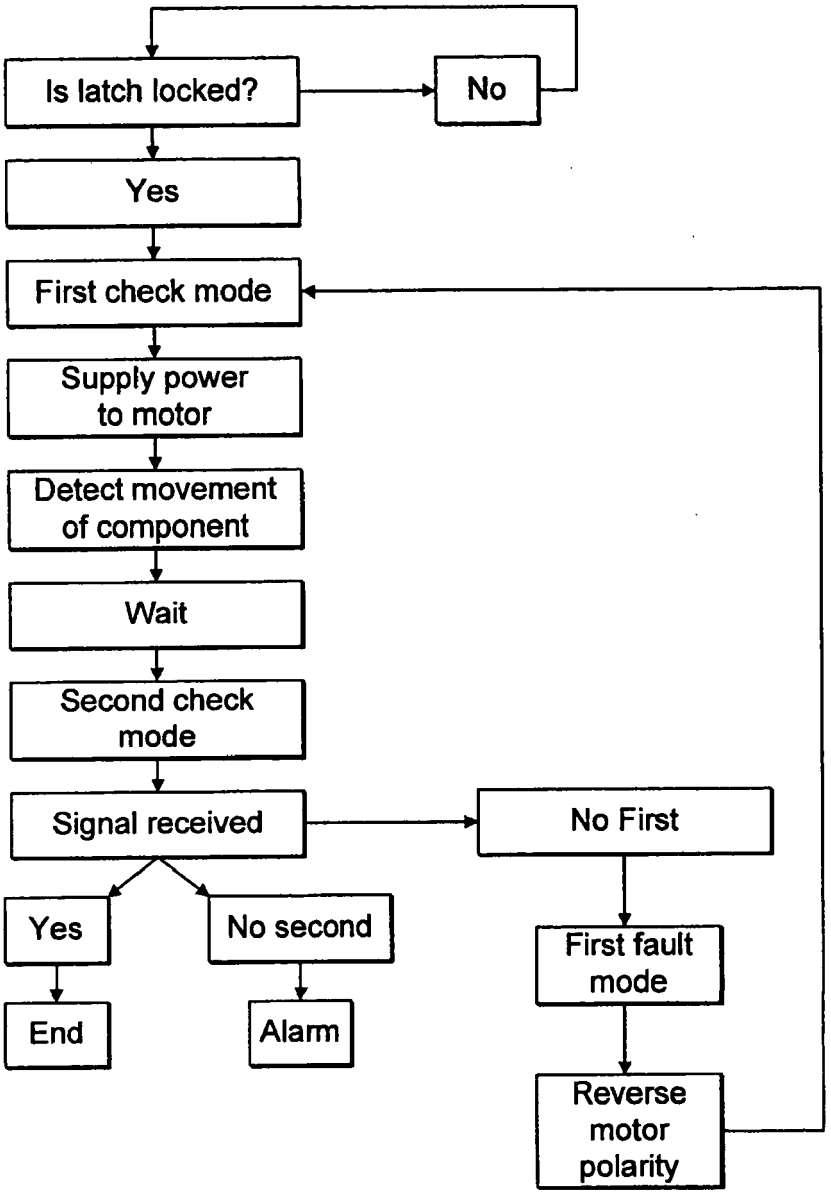
Is latch locked?
No
Yes
First check mode
Supply power to motor
Detect movement of component
Wait
Second check mode
Signal received
No First
Yes
No second
First fault mode
End
Alarm
Reverse motor polarity

FIG. 3