FORM 2

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COMPLETE SPECIFICATION

(See section 10 and rule 13)

1. Title of the Invention

A VEHICLE DOOR HANDLE ASSEMBLY WITH A HANDLE DEPLOYMENT SYSTEM

2. Applicant(s)

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3. Preamble to the description

The following specification specifically describes the invention and the manner in which it is to be performed.

FIELD

The present disclosure relates to vehicle door handle mechanisms. Particularly, the present disclosure relates to concealed door handle mechanisms for vehicles.

BACKGROUND

The background information herein below relates to the present disclosure but is not necessarily prior art.

Conventional door handles in vehicles protrude outside the body of the vehicle. The protruding door handles affect the aerodynamic performance. From the point of view of styling, the protruding door handles are not favoured. Different door handle designs and mechanisms have been envisaged to avoid the aerodynamic drag. One such mechanism has a flush door handle wherein the handle part of the mechanism is not protruding outside during the normal condition. When the key fob is operated, the door handle comes out of the door of the vehicle so that the user can pull to open the door.

However, the door handles of the prior art involve complex mechanisms and the handles is not easily operable under different circumstances.

There is, therefore, felt a need there for a simple and secured concealed door handle mechanism which alleviates the problems associated with the prior art.

OBJECTS

Some of the objects of the present disclosure, which at least one embodiment herein satisfies, are as follows:

An objective of the present invention is to provide a mechanism for electrically actuating a handle concealed inside the door of a vehicle.

Another objective of the present invention is to provide a mechanism for electrically actuating a handle concealed inside the door of a vehicle, which is simple in construction.

Yet another objective of the present invention is to provide a mechanism for electrically actuating a handle concealed inside the door of a vehicle, which is easily operable under different circumstances.

Still another objective of the present invention is to provide a mechanism for electrically actuating a handle concealed inside the door of a vehicle, which is safe for the user.

Other objects and advantages of the present disclosure will be more apparent from the following description, which is not intended to limit the scope of the present disclosure.

SUMMARY

The present disclosure envisages a vehicle door handle assembly with a handle deployment system.

The door handle assembly comprises a handle lever and a housing.

The handle lever is pivoted about a handle pivot axis between a home position and a deployed position and between the deployed position and a fully open position. The handle lever is configured to unlock of a door of the vehicle on being manually displaced from the deployed position to the fully open position. The housing is fitted in an outer panel of the door. The housing is configured to support the handle lever and to encapsulate all but one exterior surfaces of the handle lever in the closed position.

The deployment system comprises an electric motor corresponding to the handle lever, a deploying linkage disposed between the handle lever and the motor, a control unit configured to receive at least two input signals and to displace the handle lever from the home position to the deployed position on receipt of a

deployment signal and from the deployed position to the home position on receipt of a retraction signal.

In an embodiment, the deploying linkage includes a cam, a cam lever and a push lever. The cam is pivoted about a cam pivot axis. The cam lever is pivoted about the cam lever pivot axis. The push lever is configured to linearly displace on operation of the motor to displace the cam lever and thereby the cam to displace the handle lever from a home position to a deployed position or from a deployed position to a home position.

In an embodiment, the deployment system includes at least one position sensor configured to facilitate detection of the handle lever in the home position and the deployed position and generate at least one position signal. The position sensor is configured to transmit the position signal to the control unit.

In an embodiment, the deployment system includes a deployment switch and a retraction switch for the motor, wherein activation of the deployment switch triggers rotation of the motor in a first direction and activation of the retraction switch triggers rotation of the motor in a second direction.

In an embodiment, the deployment system includes a contact sensor that is communicatively coupled to the control unit. The contact sensor is configured to generate a contact signal on application of a predetermined magnitude of pressure on the handle lever and transmit the contact signal to the control unit to be registered by the control unit as the deployment signal.

In a preferred embodiment, the deployment system includes a transceiver that is communicatively coupled to the control unit. The transceiver is configured to receive a wireless signal to be registered by the control unit as the deployment signal or as the retraction signal.

Typically, the deployment system includes a key fob configured to facilitate generation of the wireless signal on being brought within a predetermined

proximity to the vehicle. Alternatively, the key fob is configured to generate the wireless signal on being brought within a predetermined proximity to the vehicle.

In an embodiment, the control unit includes a vehicle speed comparator that is communicatively coupled to the control unit. The vehicle speed comparator is configured to receive a vehicle speed signal from a vehicle speed sensor, to compare the speed with a predetermined threshold vehicle speed value and generate an active drive signal when the magnitude of the vehicle speed signal exceeds the threshold vehicle speed value and transmit the active drive signal to the control unit to be registered by the control unit as the deployment signal.

In an embodiment, the deployment system includes a reverse gear sensor that is communicatively coupled to the control unit. The reverse gear sensor is configured to generate a reverse gear signal on sensing selection of reverse gear ratio and to transmit the contact signal to the control unit to be registered by the control unit as the deployment signal.

In an embodiment, the deployment system includes a crash sensor communicatively coupled to the control unit. The crash sensor is configured to generate a crash detection signal in an event of a crash of the vehicle and to transmit the crash signal to the control unit to be registered by the control unit as the deployment signal.

In a preferred embodiment, the control unit includes a pulse counter that is communicatively coupled to the control unit. The pulse counter is configured to initiate counting of pulses when the handle lever is displaced to the deployed position based on the position signal and to generate a time-limit signal when the pulse count exceeds a predetermined pulse count limit while the position signal value remains unchanged, and to transmit the time-limit signal to the control unit to be registered by the control unit as the retraction signal.

In an embodiment, the contact sensor is concealed in the handle lever.

In a preferred embodiment, door handle assembly includes a resilient member configured to bias the deploying linkage to retract the handle lever to the home position.

In an embodiment, the handle lever has an outer cap and a gripper. The gripper is provided with grooves or contours. The gripper is configured to be concealed within the housing in the home position of the handle lever. The handle lever has a top surface extending from the gripper. The top surface has a profile that restricts the complete grabbing of the handle lever which protects the user's fingers from getting caught between the housing and the handle lever. The handle lever further has a crowning geometry that extends from the front end of the gripper.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWING

The door handle mechanism of the present disclosure will now be described with the help of the accompanying drawing, in which:

Figure 1a illustrates a door handle mechanism of the present disclosure with door handle in a home position;

Figure 1b illustrates a door handle mechanism of the present disclosure with door handle in a deployed position;

Figure 2 illustrates a rear view of the door handle mechanism of the present disclosure;

Figure 3 illustrates an isometric view of the door handle of the present disclosure;

Figure 4 illustrates a side view of the door handle of Figure 3;

Figure 5 illustrates a rear view of the door handle mechanism within a housing in a door panel of a vehicle;

Figure 6 illustrates a front view of the door handle mechanism within a housing in a door panel of a vehicle; and

Figure 7 illustrates a schematic circuit diagram of the door handle mechanism of the present disclosure.

LIST OF REFERENCE NUMERALS

100	door handle assembly
1	handle
2	cam
3	cam lever
4	cam pivot axis
5	cam lever pivot axis
6	pivot axis of handle
7	push lever
8	motor
8a, 8b, 8c, 8d	motors in schematic circuit diagram
9	housing
10	resilient member
11	outer cap
12	gripper
13	top surface
14	contact sensor
15	crowning geometry
16	projecting arm

20 control unit

21 feed distribution module

22 power line

23 CAN bus

24 deployment signal line

25 retraction signal line

26a, 26b, 26c, 26d deployment switches

27a, 27b, 27c, 27d retraction switches

28 distribution module

DETAILED DESCRIPTION

Embodiments, of the present disclosure, will now be described with reference to the accompanying drawing.

Embodiments are provided so as to thoroughly and fully convey the scope of the present disclosure to the person skilled in the art. Numerous details are set forth, relating to specific components, and methods, to provide a complete understanding of embodiments of the present disclosure. It will be apparent to the person skilled in the art that the details provided in the embodiments should not be construed to limit the scope of the present disclosure. In some embodiments, well-known processes, well-known apparatus structures, and well-known techniques are not described in detail.

The terminology used, in the present disclosure, is only for the purpose of explaining a particular embodiment and such terminology shall not be considered to limit the scope of the present disclosure. As used in the present disclosure, the forms “a”, “an” and “the” may be intended to include the plural forms as well, unless the context clearly suggests otherwise. The terms “comprises”,

“comprising”, “including” and “having” are open ended transitional phrases and therefore specify the presence of stated features, elements, modules, units and/or components, but do not forbid the presence or addition of one or more other features, elements, components, and/or groups thereof.

The terms first, second, third, etc., should not be construed to limit the scope of the present disclosure as the aforementioned terms may be only used to distinguish one element, component or section from another component or section. Terms such as first, second, third etc., when used herein do not imply a specific sequence or order unless clearly suggested by the present disclosure.

A vehicle door handle mechanism with a concealed handle is required which is simple in construction, which is easy and safe to operate and which is easily operable under different conditions.

The present disclosure envisages a vehicle door handle assembly 100 for electrically deploying a handle lever 1 concealed inside the door of a vehicle. The assembly 100 with a handle deployment system 200 of the present disclosure is explained here forth with the help of Figures 1-7.

The door handle assembly 100 comprises a handle lever 1 and a housing 9. The housing 9 is fitted in an outer panel of a door of the vehicle. In the deployed position, the handle lever 1 is accessible to a user who is outside the vehicle for handling and thus unlocking the door. The handle lever 1 is pivoted about a handle pivot axis 6 between a home position and a deployed position and between the deployed position and a fully open position. The handle lever 1 is configured to unlock of a door of the vehicle on being manually displaced from the deployed position to the fully open position. The housing 9 is configured to support the handle lever 1 and to encapsulate all but one exterior surfaces of the handle lever 1 in the closed position, to provide a concealed door handle configuration.

In a preferred embodiment, the handle lever 1 has an outer cap 11 and a gripper 12. The outer cap 11 has a substantially planar shape. The housing 9 encapsulates,

in the home position of the handle lever 1, the gripper 12 while exposing the outer cap 11. The gripper 12 is provided with grooves or contours to enhance quality of grip. The handle lever 1 has a top surface 13 extending from the gripper 12. The gripper 12 is provided with texture or grain for anti-slip. The top surface 13 has a profile that restricts the complete grabbing of the handle lever 1 and protects the user's fingers from getting caught between the housing 9 and the handle lever 1. When the handle lever 1 is in the deployed position, the top surface 13 from the gripper 12 is partially enclosed between the gripper 12 and the housing 9. The handle lever 1 has a crowning geometry 15 that extends from the front end of the gripper 12 to protect any loose items from getting caught within the housing 9. In an embodiment, a projecting arm 16 from the handle lever 1 is provided in the vicinity of the handle pivot axis 6 to be extending in the operative inward direction of the assembly 100. The projecting arm 16 is engaged with the cam 2.

The deployment system 200 comprises an electric motor 8 for every handle lever 1, deploying linkage disposed between the handle lever 1 and the corresponding motor 8, a control unit 20 configured to receive at least two input signals and to displace the handle lever 1 from the home position to the deployed position on receipt of a deployment signal and from the deployed position to the home position on receipt of a retraction signal.

In an embodiment, the deploying linkage includes a cam 2, a cam lever 3 and a push lever 7. The cam 2 is engaged with the handle lever 1 on one end and the cam lever 3 on the other end. The push lever 7 is engaged with the cam lever 3 on one end and a shaft of the motor 8 on the other end. The cam 2 is pivoted about a cam pivot axis 4. The cam lever 3 is pivoted about the cam lever pivot axis 5. The push lever 7 is configured to linearly displace on operation of the motor 8 to displace the cam lever 3 and thereby the cam 2 to displace the handle lever 1 from a home position to a deployed position or vice versa. In a preferred embodiment, the deploying linkage includes a resilient member configured to bias the deploying linkage to retract the handle lever 1 towards the home position. In an embodiment, the resilient member 10 is a torsion spring. The motor 8 supplies

torque in a direction of deployment of the handle lever 1 against the biasing torque of the torsion spring. A battery is provided for supplying electrical power to the motor 8.

In a preferred embodiment, the deployment system 200 of the present disclosure includes at least one position sensor, a deployment switch and a retraction switch for the motor 8, a contact sensor 14, a transceiver, a vehicle speed comparator, a reverse gear sensor and a pulse counter, all communicatively coupled to the control unit. The deployment system 200 also includes a hand-held key fob for wireless communication with the control unit through the transceiver.

The position sensor is configured to facilitate detection of the handle lever 1 in the home position and the deployed position and to generate at least one position signal. The position sensor is configured to transmit the position signal to the control unit 20. The position signal is further configured to be transmitted in the form of audio or visual means in the vehicle infotainment system.

Activation of the deployment switch triggers rotation of the motor 8 in a first direction and activation of the retraction switch triggers rotation of the motor 8 in a second direction.

The contact sensor 14 is configured to generate a contact signal on application of a predetermined magnitude of pressure on the handle lever 1 and to transmit the contact signal to the control unit 20 to be registered by the control unit 20 as the deployment signal.

The transceiver is configured to receive a wireless signal to be registered by the control unit 20 as the deployment signal or as the retraction signal.

The key fob is configured to facilitate generation of a wireless signal on being brought within a predetermined proximity to the vehicle or to generate the wireless signal on being brought within a predetermined proximity to the vehicle. When the key fob enters the predetermined proximity radius, the wireless signal received from the key fob is registered as a deployment signal, and when the key

fob exits the predetermined proximity radius, the wireless signal received from the key fob is registered as a retraction signal. Alternatively, the key fob is provided with a button, on pressing of which the key fob generates a wireless signal and the control unit 20 registers the wireless signal thus received as a deployment signal or as a retraction signal alternately.

The vehicle speed comparator is communicatively coupled to the control unit 20. The vehicle speed comparator is configured to receive a vehicle speed signal from a vehicle speed sensor, to compare the speed with a predetermined threshold vehicle speed value and generate an active drive signal when the magnitude of the vehicle speed signal exceeds the threshold vehicle speed value and to transmit the active drive signal to the control unit 20 to be registered by the control unit 20 as the deployment signal. In an embodiment, the predetermined threshold vehicle speed value is 5km/hr.

The reverse gear sensor is configured to generate a reverse gear signal on sensing selection of reverse gear ratio and transmit the contact signal to the control unit 20 to be registered by the control unit 20 as the deployment signal.

The crash sensor is configured to generate a crash detection signal in an event of a crash of the vehicle and transmit the crash signal to the control unit 20 to be registered by the control unit 20 as the deployment signal.

The pulse counter that is configured to initiate counting of pulses when the handle lever 1 is displaced to the deployed position based on the position signal and to generate a time-limit signal when the pulse count exceeds a predetermined pulse count limit while the position signal value remains unchanged, and to transmit the time-limit signal to the control unit 20 to be registered by the control unit 20 as the retraction signal.

According to another aspect of the present disclosure, during battery change or power-on-reset, the handle lever 1 shall not be retracted or deployed.

In an embodiment, the contact sensor 14 is concealed in the handle lever 1.

According to yet another aspect of the present disclosure, the assembly 100 can be configured to mechanically deploy the handle lever 1 during emergency and key cylinder which is equipped inside the handle housing can be made accessible to unlock the door to further provide access to release the handle lever 1 to a fully open position thus allowing the user to manually release the door.

In an embodiment, an overheating protection system is equipped in the electric motor 8.

In an embodiment, as illustrated in Figure 7, the handle deployment system 200 includes a distribution module 28. The distribution module 28 receives, from the control unit 20, power through a power line 22 and door unlock instructions 23 through a CAN bus 23. The door unlock instructions include addresses of doors from among the plurality of doors to be opened. Accordingly, the distribution module 28 selectively distributes the received power to the deployment switches 26a, 26b, 26c, 26d and the retraction switches 27a, 27b, 27c, 27d.

The foregoing description of the embodiments has been provided for purposes of illustration and not intended to limit the scope of the present disclosure. Individual components of a particular embodiment are generally not limited to that particular embodiment, but, are interchangeable. Such variations are not to be regarded as a departure from the present disclosure, and all such modifications are considered to be within the scope of the present disclosure.

TECHNICAL ADVANCEMENTS AND ECONOMIC SIGNIFICANCE

The present disclosure described herein above has several technical advantages including, but not limited to, the realization of a mechanism for electrically actuating a handle concealed inside the door of a vehicle which is:

- simple in construction;
- easily operable under different circumstances;
- safe for the user; and

- equipped with a handle with a profile which avoids the hooking of the finger rings.

The embodiments herein and the various features and advantageous details thereof are explained with reference to the non-limiting embodiments in the following description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein.

The foregoing description of the specific embodiments so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit and scope of the embodiments as described herein.

The use of the expression “at least” or “at least one” suggests the use of one or more elements or ingredients or quantities, as the use may be in the embodiment of the disclosure to achieve one or more of the desired objects or results.

While considerable emphasis has been placed herein on the components and component parts of the preferred embodiments, it will be appreciated that many embodiments can be made and that many changes can be made in the preferred embodiments without departing from the principles of the disclosure. These and other changes in the preferred embodiment as well as other embodiments of the disclosure will be apparent to those skilled in the art from the disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter is to be interpreted merely as illustrative of the disclosure and not as a limitation

WE CLAIM:

1. A vehicle door handle assembly (100) with a handle deployment system (200), said door handle assembly (100) comprising:

- a handle lever (1) pivoted about a handle pivot axis (6) between a home position and a deployed position and between said deployed position and a fully open position, said handle lever (1) configured to unlock a door of said vehicle on being manually displaced from said deployed position to said fully open position;

- a housing (9) fitted in an outer panel of said door, said housing (9) configured to support said handle lever (1) and to encapsulate all but one exterior surfaces of said handle lever (1) in said closed position;

said deployment system (200) comprising:

- an electric motor (8) corresponding to said handle lever (1);

- a deploying linkage (2,3,7) disposed between said handle lever (1) and said motor (8); and

- a control unit (20) configured to receive at least two input signals and to displace said handle lever (1) from said home position to said deployed position on receipt of a deployment signal and from said deployed position to said home position on receipt of a retraction signal.

2. The door handle assembly (100) as claimed in claim 1, wherein said deploying linkage includes a cam (2), a cam lever (3) and a push lever (7), said cam (2) being pivoted about a cam pivot axis (4), said cam lever (3) being pivoted about said cam lever pivot axis (5), said push lever (7) configured to linearly displace on operation of said motor (8) to displace said cam lever (3) and thereby said cam (2) to displace said handle lever (1) from a home position to a deployed position or from a deployed position to a home position.

3. The door handle assembly (100) as claimed in claim 1, wherein said deployment system (200) includes a deployment switch and a retraction switch for said motor (8), wherein activation of said deployment switch triggers rotation of said motor (8) in a first direction and activation of said retraction switch triggers rotation of said motor (8) in a second direction.

4. The door handle assembly (100) as claimed in claim 1, wherein said deployment system (200) includes at least one position sensor configured to facilitate detection of said handle lever (1) in said home position and said deployed position and generate at least one position signal, said position sensor configured to transmit said position signal to said control unit (20).

5. The door handle assembly (100) as claimed in claim 4, wherein said deployment system (200) includes a contact sensor (14) that is communicatively coupled to said control unit (20), said contact sensor (14) configured to generate a contact signal on application of a predetermined magnitude of pressure on said handle lever (1) and transmit said contact signal to said control unit (20) to be registered by said control unit (20) as said deployment signal.

6. The door handle assembly (100) as claimed in claim 4, wherein said deployment system (200) includes a transceiver that is communicatively coupled to said control unit (20), said transceiver configured to receive a wireless signal to be registered by said control unit (20) as said deployment signal or as said retraction signal.

7. The door handle assembly (100) as claimed in claim 6, wherein said deployment system (200) includes a key fob configured to facilitate generation of said wireless signal on being brought within a predetermined proximity to said vehicle.

8. The door handle assembly (100) as claimed in claim 6, wherein said deployment system (200) includes a key fob configured to generate said

wireless signal on being brought within a predetermined proximity to said vehicle.

9. The door handle assembly (100) as claimed in claim 4, wherein said control unit (20) includes a vehicle speed comparator that is communicatively coupled to said control unit (20), said vehicle speed comparator being configured to receive a vehicle speed signal from a vehicle speed sensor, compare said speed with a predetermined threshold vehicle speed value and generate an active drive signal when the magnitude of said vehicle speed signal exceeds said threshold vehicle speed value and transmit said active drive signal to said control unit (20) to be registered by said control unit (20) as said deployment signal.

10. The door handle assembly (100) as claimed in claim 4, wherein said deployment system (200) includes a reverse gear sensor that is communicatively coupled to said control unit (20), said reverse gear sensor (??) configured to generate a reverse gear signal on sensing selection of reverse gear ratio and transmit said contact signal to said control unit (20) to be registered by said control unit (20) as said deployment signal.

11. The door handle assembly (100) as claimed in claim 4, wherein said deployment system (200) includes a crash sensor communicatively coupled to said control unit (20), said crash sensor configured to generate a crash detection signal in an event of a crash of said vehicle and transmit said crash signal to said control unit (20) to be registered by said control unit (20) as said deployment signal.

12. The door handle assembly (100) as claimed in claim 4, wherein said control unit (20) includes a pulse counter that is communicatively coupled to said control unit (20), said pulse counter being configured to initiate counting of pulses when said handle lever (1) is displaced to said deployed position based on said position signal and generate a time-limit signal when the pulse count exceeds a predetermined pulse count limit while the position signal

value remains unchanged, and transmit said time-limit signal to said control unit (20) to be registered by said control unit (20) as said retraction signal.

13. The door handle assembly (100) as claimed in claim 4, wherein said contact sensor (14) is concealed in said handle lever (1).

14. The door handle assembly (100) as claimed in claim 4, wherein said door handle assembly (100) includes a resilient member (10) configured to bias said deploying linkage to retract said handle lever (1) to said home position.

15. The door handle assembly (100) as claimed in claim 1, wherein said handle lever (1) has an outer cap (11) and a gripper (12), said gripper (12) being provided with grooves or contours and configured to be concealed within said housing (9) in said home position of said handle lever (1).

16. The door handle assembly (100) as claimed in claim 15, wherein said handle lever (1) has a top surface (13) extending from the gripper (12), said top surface (13) has a profile that restricts the complete grabbing of said handle lever (1) and protects the user's fingers from getting caught between said housing (9) and said handle lever (1).

17. The door handle assembly (100) as claimed in claim 15, wherein said handle lever (1) has a crowning geometry (15) that extends from the front end of said gripper (12).

Dated this 3rd Day of August, 2020

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ABSTRACT

A VEHICLE DOOR HANDLE ASSEMBLY WITH A HANDLE DEPLOYMENT SYSTEM

The present invention relates to concealed door handles for vehicles and envisages a vehicle door handle assembly (100) with a deployment system (200). The door handle assembly (100) comprises a pivoted and concealed handle lever (1) and a housing (9) that is fitted in an outer panel of a door. The deployment system (200) comprises an electric motor (8) for every handle lever (1), a deploying linkage (2, 3, 7) disposed between the handle lever (1) and the corresponding motor (8), and a control unit (20) configured to receive deployment and retraction signals and to displace the handle lever (1) from the home position to the deployed position on receipt of a deployment signal and from the deployed position to the home position on receipt of a retraction signal. The assembly (100) with the system (200) is simple in construction and easy and safe to operate under different conditions.

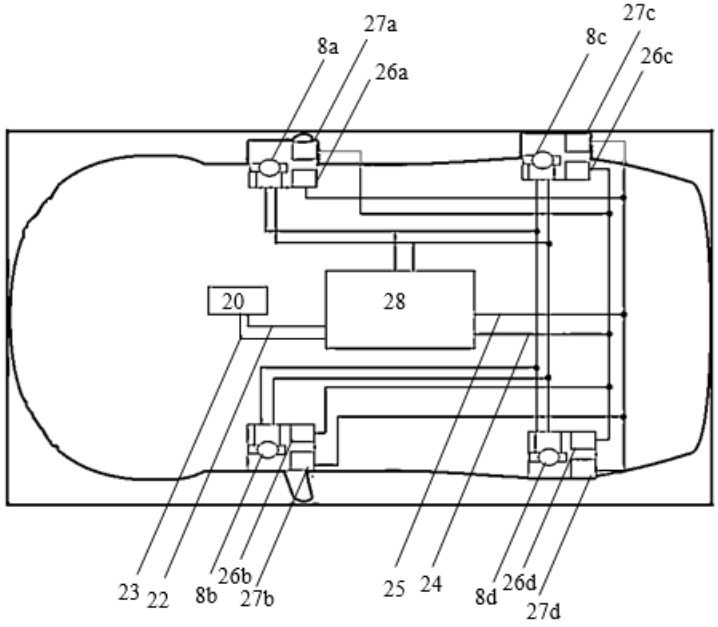

FIGURE 7