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(54) **MAGNETIC FLOATING DEVICE AND A VEHICLE**

MAGNETISCHE SCHWEBEVORRICHTUNG UND FAHRZEUG

DISPOSITIF FLOTTANT MAGNÉTIQUE ET VÉHICULE

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(73) Proprietors:
- **AUDI AG**
  85045 Ingolstadt (DE)
- **LG Electronics Inc.**
  Youngdungpo-gu
  Seoul 150-721 (KR)

(72) Inventors:
- **RITTGER, Lena**
  85051 Ingolstadt (DE)
- **MERTENS, Joris**
  85051 Ingolstadt (DE)
- **KANG, Seung mo**
  Seocho-gu Seoul (KR)
- **PARK, Sungjun**
  Seocho-gu Seoul (KR)
- **OH, Jiwon**
  Gangseo-gu Seoul (KR)

(74) Representative: **Hofstetter, Schurack & Partner**
Patent- und Rechtsanwaltskanzlei
PartG mbB
Balanstrasse 57
81541 München (DE)

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Description

[0001] The invention is concerned with a magnetic floating device and a vehicle comprising an electronic control unit and the magnetic floating device.

[0002] In the field of consumer electronics, magnetic floating devices such as magnetic floating loudspeakers are known. Such a magnetic floating device usually comprises of a floating unit with at one floating magnet and a base unit with at least one base magnet. The floating unit is designed to float by means of an adjustment in magnetism of the at least one of base magnet of the base unit of the magnetic floating device. Such a magnetic floating devices is used due to its ergonomic benefits. Furthermore, the presence of integrated cables, which are difficult to clean and can be easily pulled accidentally, can be avoided in the case of the magnetic floating device. However, such a magnetic floating device can be used as single purpose device, such as a loud speaker or a light emitting device. Furthermore, such a magnetic floating device can be used in a stationary frame of reference such as an office table or a table in home. However, the use of such a magnetic floating device is not possible in the case of a vehicle, because due to dynamic movements of the vehicle, a reliable positioning of the floating component of the magnetic floating device is difficult.

[0003] Document KR 101829376 B1 discloses a sound output apparatus capable of adjusting the height of a floating speaker. The sound output apparatus comprises an elevating member having a magnetic force generation part generating a magnetic field for floating a flying body in the air, a transmission member which rotates along the circumference of the elevating member and moves the elevating member in a vertical direction, and a supporting member ratably supporting the transmission member. However, the sound output apparatus has a single functionality as a floating speaker and means for integrating such a sound output apparatus in a vehicle are not disclosed.

[0004] Document DE 21 2014 000 011 U1 discloses a magnetic levitation audio device comprising a magnetic levitation base capable of generating a magnetic field and a sound box levitated above the magnetic levitation base to a magnetic force. The magnetic levitation base comprises a base enclosure, an elector magnetic induction module disposed in the base enclosure. The sound box can be controlled to switch on without the need of manual operations, in order to improve the practicability of the magnetic levitation audio device. However, the magnetic levitation audio device has only one single functionality and an integration of the audio device in a vehicle is not feasible due to a lack of stabilization in the case of jerk events.

[0005] Document US 2016/0157002 A1 discloses a magnetic floating speaker including a seat having a shell and a magnetic floating controller and a lower magnet both received in the shell. A floating member floating and located above the seat has a cover, a bass unit, two full range units and an upper magnet all received in the cover. The magnetism of the upper magnet and the lower magnet is mutually exclusive. However, the magnetic floating speaker has a single functionality and means for stabilizing the magnetic floating speaker in a vehicle is not disclosed.

[0006] It is an object of the present invention to provide a magnetic floating device as a multipurpose device in a vehicle.

[0007] The object is accomplished by the subject matter of the independent claims. Advantageous developments with convenient and non-trivial further embodiments of the invention are specified in the following description, the dependent claims and the figures.

[0008] The invention provides a magnetic floating device that has two parts, a base unit and a floating unit. The magnetic floating device comprises the base unit with a magnetic floating controller and at least one base magnet. Furthermore, the base unit may comprise a shell which is designed to receive the magnetic floating controller and the at least one base magnet. The base unit of the magnetic floating device functions as a stationary part of the magnetic floating device, so that the base unit may be supported on a surface, for example, a surface of a table or a dashboard of a vehicle. Furthermore, the at least one base magnet may be an induction magnet, such that the strength and/or the polarity of the at least one base magnet is controlled or adjusted by means of the magnetic floating controller. Furthermore, the magnetic floating device comprises the floating unit with a functional component, a control circuitry and at least one floating magnet. Furthermore, the floating unit may comprise a covering unit which may be designed to receive the functional component and the at least one base magnet, wherein the functional component may be exposed to external surroundings of the floating unit. The magnetic floating controller of the base unit is designed to generate a floating state of the floating unit by means of an adjustment in magnetism of the at least one base magnet. The magnetism of the at least one base magnet and the at least one floating magnet is preferably mutually exclusive, that is the magnetism of the at least one floating magnet is not influenced by the adjustment in the magnetism of the base magnet. In the floating state, the floating unit is floating above the base unit.

[0009] According to the invention, the functional component of the floating unit comprises a display panel with a pixel matrix, wherein the control circuitry of the floating unit is designed to actuate at least one pixel element of the pixel matrix for displaying at least one graphic display object. The display panel, for example, may comprise organic light emitting diodes (OLED) and/or thin film transistors (TFT) as pixel elements. The pixel elements can be distributed over a total area of the display panel. The display panel may cover a total surface area of the functional component, which may be cylindrical in shape in case of a cylindrical shaped functional unit. In this case, the display panel may be designed to have a view of 360°, such that a plurality of graphic display objects may be displayed at various locations of the display panel. Alternatively, the display panel may cover a part of the surface area of the cylindrical shaped functional component, such that the display panel may be designed to have a view of 300° or 240° or 180° or 90° or 30°.

[0010] The control circuitry controls an actuation of the pixel elements as per a required location or position of the at least one graphic display object on the display panel. The output of the at least one graphic display object may be requested by a control signal that may be received by the control circuitry.

[0011] Furthermore, according to the invention, the control circuitry is designed to actuate at least one pixel element of the pixel matrix for displaying at least one graphic display object at a constant position relative to a reference point on the base unit. This is of advantage, because this can enable a user to view the at least one graphic display object, for example read a text, while the floating unit is moving. Despite this movement, the at least one graphic display object, e.g. the text, will remain on the same spot in space in relation to the user. In other words, when the display panel or the floating unit comprising the display panel is moved by an external force and/or due to an input signal, then the position of the displayed at least one graphic display object remains unmoved or unchanged in relation to the reference point on the base unit. Hence, the at least one graphic display object can be positioned stationary in any frame of reference. Hence, the user can perceive the at least one graphic display object in a stationary location even if there is a change of spatial orientation of the floating unit.

[0012] In order to achieve this, when the display panel is moving, the at least one graphic display object is displayed on the display panel at the constant position relative to the reference point on the base unit. This is realized by shifting the actuation of the pixel elements of the graphic display object, wherein a rate of shifting the actuation of the pixel elements is equal in magnitude and opposite in direction with respect to that of a rate of change of spatial orientation of the floating unit, wherein the change of spatial orientation of the floating unit is triggered by an external force and/or an input signal. The floating unit comprises an orientation sensing unit which is designed to identify the rate of change of spatial orientation of the floating unit and send a an orientation signal to the control circuitry. The control circuitry can then shift the actuation of the pixel elements as a function of the orientation signal, which may comprise the information regarding the magnitude and direction of the rate of shifting of the floating unit. For example, if the floating unit is rotated clockwise about its axis at a rate of X radian per second, then the orientation sensing unit sends the corresponding orientation signal to the control circuitry. The control circuitry in turn, shifts the actuation of the pixel elements of the at least one graphical display object at the rate of X radian per second anti-clockwise about the axis of the floating unit. Hence, the graphic display object remains at a stationary position with respect to a reference point on the base unit. This is of advantage, because the user can continue perceiving the at least one graphical display object on the display panel at the same place.

[0013] The orientation sensing unit is designed to detect at least part of the external force. At least a part of the external force may constitute a predefined tangential force or torque which is designed to constitute the change of spatial orientation of the floating unit in a predefined rotary motion about an axis of the floating unit. For example, a user may grab the floating unit and rotate it around a vertical axis. Furthermore, at least a part of the external force may constitute a predefined axial force which is designed to constitute the change of spatial orientation of the floating unit in a predefined translatory motion along the axis of the floating unit. For example, the user may tap or push the floating unit. The external force may be detected by means of a sensing unit, such as an accelerometer. In other words, upon an application of an external force on the floating unit which may lead to a change in spatial orientation of the floating unit, the sensing unit may identify the external force and derive the individual components of the external force, for example the tangential component and the axial component. Thus, the external force may be provided by the user, who can hold the floating unit and rotate it by a predefined rotation and/or push it towards the base unit by a predefined translation. Furthermore the external force may be due to the vibrations of the dashboard of a vehicle, when the vehicle is driven, in which case the magnetic floating device integrated to the vehicle can experience the vibrations and/or oscillating movements. Based on the respective components of the force, the respective rate of change of spatial orientation may be derived by the orientation sensing unit, such as a gyroscope and/or accelerometer. The orientation sensing unit may in turn send the orientation signal to the control circuitry. This is of advantage, because the different forms external forces leading to different forms of change of spatial orientation can be taken into account in order to ensure that the displaying of the at least one graphical object remains constant with respect to the reference point on the base unit.

[0014] The magnetic floating device may comprise a shell, wherein the magnetic floating controller is designed to adjust the floating unit between the floating state and a grounded state by means of an adjustment in the magnetism of the least one base magnet. In the grounded state, the floating unit is docked in the shell of the base unit. Furthermore, the magnetic floating device comprises a signal input unit which is designed to receive an announcement signal that signals an anticipation of a jerk event. The signal input unit may be received in the shell of the base unit or in the covering component of the floating unit. Furthermore, the magnetic floating controller is designed to adjust the floating unit from the floating state to the grounded state in order to temporarily dock and/or lock the floating unit in the shell of the base unit by adjusting the magnetism of the at least one base magnet as a function of the announcement signal received by the signal input unit. In other words, when a jerk event is anticipated, the signal input unit may receive the announcement signal and may transfer or forward the announcement signal to the magnetic floating controller. This in turn may enable the magnetic floating controller to adjust the floating unit from the floating state to the grounded state.

[0015] This can be realized by means of the magnetic floating controller which can adjust the magnetism of the at least one base magnet of the base unit as per the announcement signal. Hence, during the jerk event, the floating unit can be secured, as it is docked into the shell of the base unit. Hence, a flying of the floating unit as a projectile due to the forces acting upon the jerk event on the floating unit can be avoided. For example, in the floating state, the floating unit can be floating above the base unit such that a gap is formed between the floating unit and the base unit. This can be ensured in such a manner, that the at least one floating magnet in the floating unit having a given polarity and the at least one base magnet of the base unit, which faces the floating unit, is of the same polarity (north/north or south/south). This can be ensured by means of the magnetic floating controller which in turn can adjust the strength of the magnetic field as well as the polarity of the at least one base magnet of the base unit. In this case, the magnetic floating controller may ensure a corresponding polarity of the at least one base magnet as the polarity of the at least one floating magnet facing the at least one base magnet and the strength of the at least one base magnet can be adjusted by means of the magnetic floating controller, in such a manner that the floating unit can be located at a predefined distance or gap above the base unit. The magnetic force can be balanced by the weight of the floating unit and hence, the floating state of the floating unit can be achieved. This ensures that the floating unit is floating or levitating above the base unit in a stable manner. When the jerk event is anticipated, the signal input unit may receive the announcement signal that signals the anticipation of the jerk event. Upon the receiving of the announcement signal, the signal input unit can transfer or forward the announcement signal to the magnetic floating controller. Upon receiving the announcement signal, the magnetic floating controller can adjust the magnetism of the at least one base magnet, such that the strength of the base magnet is reduced and/or the polarity of the at least one base magnet is reversed as compared to that of the at least one floating magnet facing the at least one base magnet. This in turn can ensure that the floating unit can be drawn towards the base unit. In other words, the floating unit can be adjusted to the grounded state. Hence, the magnetic floating controller ensures a temporary docking and/or locking of the floating unit in the shell of the base unit by adjusting the magnetism of the at least one base magnet as a function of the announcement signal received by the signal input unit. This is of advantage, because this ensures that before the jerk event occurs or during a jerk event the floating unit is stably secured inside the shell of the base unit, hence, an unwanted projectile-like movement or flying of the floating unit due to the forces acting on the floating unit upon the jerk event are avoided. Furthermore, in order to lock the floating unit, the magnetic floating controller may be designed to trigger a predefined rotary motion of the floating unit in the shell of the base unit by adjusting the magnetism of the at least one base magnet, wherein the covering component and the shell may constitute a bayonet mount.

[0016] The invention also comprises embodiments that provide features which afford additional technical advantages.

[0017] In one embodiment, the functional component comprises a recognition unit, which is designed to recognize a voice signal and/or a gesture. Said input signal, which may also lead to a movement of the floating unit, may comprise said voice signal and/or said gesture. The recognition unit may comprise a microphone to sense the voice signal and/or a camera to sense the gesture. The recognition unit may further comprise a processor to process the voice signal and/or the gesture and identify the respective voice signal and/or the gesture as the input signal. Upon the identification of the input signal, the processor of the recognition unit may derive a magnetism signal comprising the change and/or the rate of change of the spatial orientation of the floating unit as a function of the input signal. The recognition unit may send the magnetism signal to the magnetic floating controller, which in turn may change the spatial orientation of the floating unit by adjusting the magnetism of the at least one base magnet as a function of the magnetism signal. This is of advantage, this enables a usage of the magnetic floating device by changing the spatial orientation of the floating unit, even when a user is at a distance greater than a manually reachable distance from the magnetic floating device and/or when a manual accessibility of the magnetic floating device is not possible. For example, during an autonomous driving situation of vehicle, wherein the driver may be seated in a laid back position away from the dashboard of the vehicle where the magnetic floating device may be integrated and can still be able to access the magnetic floating device by means of the voice signal and/or the gesture.

[0018] In one embodiment, a functionality of the functional component may be accessed and/or adjusted and/or changed according to the external force and/or the input signal. For example, the functional component may constitute a functionality of a telephone and/or a loudspeaker and/or a light emitting device, such that the functionality, such as picking up a telephone call or rejecting a telephone call or adjusting the volume or adjusting a luminosity of the light emitting device, can be accessed and/or adjusted and/or changed according to the external force and/or the input signal. It is further thinkable, that by means of the external force and/or the input signal a rotatory motion of the floating unit can be triggered, when the floating unit is in the floating state. Such that a rotational speed of the rotary motion of the floating unit can be adjusted by the magnetic floating controller by adjusting the magnetism of the at least one base magnet or the plurality of magnets. This is of advantage, in case the functional component comprises a loudspeaker, in which case, the distribution of sound energy can be uniformly distributed in about 360° about an axis of rotation of the floating unit, that is, throughout the surroundings of the magnetic floating device. This can lead to a uniform audibility in all directions and an enhanced 3D-Stereo-surround-effect.

[0019] Furthermore, the functional component may comprise an interface to an external component such that a parameter value of a functionality of the external component is adjusted by means of the functional component. The functional component may therefore be a user interface for the external component. In other words, the functionality of the external component can be adjusted through the functional component, wherein the an adjustment in the functionality of the external component is enabled by a corresponding external force and/or a corresponding input signal acting on the functional component of the magnetic floating device. For example, the floating component may constitute a functionality of a remote controller of a television, by means of which various parameters of the respective television, such as the selection of channels and/or an adjustment of volume may be enabled. This is of advantage, because this enables the usage of the magnetic floating device as an interface which can be used for the accessing of other external components.

[0020] In one embodiment, the signal input unit may be designed to receive a takeoff signal that signals an end of the jerk event, wherein the magnetic floating controller is designed to adjust the floating unit from the grounded state to the floating state by adjusting the magnetism of the at least one base magnet as a function of the takeoff signal received by the signal input unit. In other words, a sensing unit or a control circuitry can detect the end of the jerk event by monitoring a particular physical property, for example, a vibration of the surface of the table, on which the base unit may be placed. Such that, if at a point of time, the vibration of the surface of the table is lower than a threshold value, then an end of the jerk event is identified by the sensing unit or the control circuitry. At this point of time, the takeoff signal can be sent to the signal input unit by the sensing unit or the control circuitry. The signal input unit can transfer or forward the received takeoff signal to the magnetic control unit, which in turn then can adjust the magnetism of the at least base magnet as a function of the takeoff signal, in order to adjust the floating unit to the floating state. This is of advantage, because this ensures the adjustment of the floating unit from the grounded state to the floating state by means of the magnetic floating controller upon the end of the jerk event. Hence, the magnetic floating controller can be used as ergonomically desired, such that the floating unit is in the floating state above the base unit.

[0021] In one embodiment, in the grounded state, the base unit is designed to electrically charge an energy storage of the floating unit by induction and/or conduction. In other words, the base unit may comprise a charging unit which is designed for a connection with an external electrical charging device such that, the base unit is provided with electrical energy which may be required for the adjustment of the magnetism of the base magnet of the base unit by the magnetic floating controller. In the grounded state, when the floating unit is docked in the shell of the base unit, then the base unit is designed to electrically charge the energy storage of the floating unit. The energy storage of the floating unit comprise a rechargeable battery which may be charged by connection and/or induction by the base unit. This is of advantage, because this can ensure the floating unit to be electrically charged during the floating state which can enable the working of the functional component of the floating unit in the grounded state as well as in the floating state. Furthermore, it is thinkable, that the base unit may comprise a wireless charging transmitter and the floating unit may comprise a wireless charging receiver. Such that, when the charging unit of the base unit is connected to the external electrical charging device, then the wireless charging transmitter can be switched on. When the floating unit is the floating state, that is a gap exists between the floating unit and the base unit, then wireless charging transmitter can transmit electrical energy to the wireless charging receiver by means of a produced magnetic field. This in turn can lead to a storage of electrical energy in the energy storage of the floating unit. Hence, the base unit can continue to supply electrical energy to the floating unit, even when the floating unit is in the floating state.

[0022] The invention further includes a vehicle comprising an electronic control unit and the inventive magnetic floating device, wherein the electronic control unit is designed to anticipate the jerk event and provide the announcement signal upon an anticipation of the jerk event to the signal input unit. This is of advantage, because this may enable an incorporation or integration of the magnetic floating device in the vehicle, for example, the magnetic floating device may be integrated in a dashboard of the vehicle. The electronic control unit enables the anticipation of the jerk event and provides the announcement signal to the signal input unit of the magnetic floating device. This in turn can transmit the announcement signal to the magnetic floating controller, which can then adjust the magnetism of the at least one base magnet in order to adjust the floating unit to the grounded state. Furthermore, the electronic control unit is designed to provide the takeoff signal signaling the end of the jerk event to the signal input unit. This in turn can transmit the takeoff signal to the magnetic floating controller, which can then adjust the magnetism of the at least one base magnet in order to adjust the floating unit to the floating state.

[0023] In one embodiment, the electronic control unit may be designed to anticipate the jerk event on the basis of a digital map and/or a sensor which may be designed to monitor the vehicle environment. In other words, the electronic control unit may anticipate the jerk event on the basis of the digital map, for example, the digital map may comprise of information of the path of travel of the vehicle which may be obtained by a navigation system, such that different road hindrances or speed bumps or sharp corners on the path of the travel may be available to the electronic control unit through the digital map. This can enable the anticipation of the jerk event, for example, the jerk event may result due to the application of breaks in order to deaccelerate the vehicle in front of a road bump or while turning the vehicle at sharp corners of a road during the travel. Such a jerk event can be predetermined and the respective announcement signal can be send to the signal input unit of the magnetic floating device. Furthermore, the sensor, such as at least one camera and/or at least one light detection and ranging sensor (LIDAR) can monitor the vehicle environment so that a presence of different road hindrances or speed bumps or sharp corners on the path of the travel can be detected and the corresponding jerk event can be anticipated. As a result, the announcement signal may be sent to the signal input unit of the magnetic floating device. The signal input unit may transfer or forward the announcement signal to the magnetic floating controller, which may enable the adjustment of the floating unit to the grounded state. Hence, a security or safety of the magnetic floating device as well as the different parts in the interior of the vehicle and the passengers inside of the vehicle can be ensured.

[0024] In one embodiment, the functional component may comprise a user interface to an infotainment system and/or a comfort functionality of the vehicle as a respective external component, as has already been described. This is of advantage, because various functionalities of the infotainment system and/or the comfort functionality, such as an air conditioning of the vehicle interior, can be regulated or adjusted by means of the floating component of the magnetic floating device.

[0025] The invention also comprises embodiments of the inventive vehicle that comprise features that correspond to features as they have already been described in connection with the embodiments of the magnetic floating device. For this reason, the corresponding features of the embodiments of the inventive vehicle are not described here again.

[0026] The inventive vehicle is preferably designed as motor vehicle, in particular as a passenger vehicle or a truck, or as a bus.

[0027] The invention also comprises the combinations of the features of the different embodiments.

[0028] In the following an exemplary implementation of the invention is described. The figures show:

- Fig. 1 a schematic illustration of an embodiment of a magnetic floating device in a floating state;
- Fig. 2 a schematic illustration of the magnetic floating device with a sensing unit;
- Fig. 3 a schematic illustration of an embodiment of a magnetic floating device in the floating state;
- Fig. 4 a schematic illustration of an embodiment of a magnetic floating device in the floating state;
- Fig. 5 a schematic illustration of an embodiment of a magnetic floating device in the floating state;
- Fig. 6 a schematic illustration of an embodiment of a vehicle with the magnetic floating device in the floating state;
- Fig. 7 a schematic illustration of an embodiment of a vehicle with the magnetic floating device in a grounded state; and
- Fig. 8 a schematic illustration of an embodiment of a vehicle with the magnetic floating device in the floating state.

[0029] The embodiment explained in the following is a preferred embodiment of the invention. However, in the embodiment, the described components of the embodiment each represent individual features of the invention which are to be considered independently of each other and which each develop the invention also independently of each other and thereby are also to be regarded as a component of the invention in individual manner or in another than the shown combination. Furthermore, the described embodiment can also be supplemented by further features of the invention already described.

[0030] In the figures identical reference signs indicate elements that provide the same function.

[0031] Fig. 1 shows a schematic illustration of an embodiment of a magnetic floating device 10 which may comprise a base unit 11 and a floating unit 12. The base unit 11 may comprise a shell 13, a magnetic floating controller 14 and a base magnet 15. The magnetic floating controller 14 and the base magnet 15 may be received in the shell 13. Furthermore, the base unit 11 may comprise a charging unit 16. The base magnet 15 may be an induction magnet, wherein the strength and/or polarity of the base magnet 15 may be controlled by means of the magnetic floating controller 14. For example, the magnetic floating controller 14 may control the strength and/or polarity of the base magnet 15 by controlling the direction of electricity or current through an induction coil 17, which may be looping around the base magnet 15. The magnetic floating controller 14 may receive electrical energy directly from an external electrical charging device 18 or via the charging unit 16, for example, by means of a wire 19. The charging unit 16 may be electrically charged by means of the external electrical charging device 18 through a wire 20. Furthermore, the base unit 11 may include a top shell 21 and a bottom shell (not shown in the figures), wherein the bottom shell may be connected or integrated to a surface 22, such as a surface of a table or a dashboard 23 of a vehicle 24, as is shown in detail in Fig. 6 and will be explained further down. The top shell 21 may comprise a hole 25 which can enclose a volume 26.

[0032] The floating unit 12 may comprise a covering component 27, a functional component 28, a control circuitry 30 and a floating magnet 31, wherein the control circuitry 30 and the floating magnet 31 may be received in the covering component 27. The magnetic floating controller 14 may be designed to generate a floating state S1 by means of an adjustment in magnetism of the base magnet 15. In the floating state S1, the floating unit 12 may be floating above the base unit 11. As shown in Fig. 1, the floating unit 12 may have a first spatial orientation Q1, which may be depicted by a gap with a first normal distance D1 between a lower surface 36 of the floating unit 12 and top shell 21 of the base unit 11.

[0033] The functional component 28 may be integrated to the covering component 27 and build a part of a surface area of the covering component 27 as surrounded by dotted lines 29, 29'. The functional component 28 may comprise a display panel 32 with a pixel matrix. The control circuitry 30 may be designed to actuate at least one pixel element of the pixel matrix for displaying at least one graphic display object 33. As shown in Fig. 1, the functional component 28 may constitute a functionality of a telephone as depicted by a symbol 35, which may represent an incoming telephone call, whereas "ABC" may represent the name of a caller, as displayed by the display panel 32. A user (not shown in the figures) may be able to access the functional component 28, in this case to use the telephone by triggering a change of spatial orientation Q1, Q2 of the floating unit 12 by an external force F and/or an input signal I, as shown in Fig. 3. As shown in Fig. 1, the external force F can be provided by the user by folding the floating unit 12 by means of his hand 37 and pushing the floating unit 12 towards the base unit 11 along an axis 38 of the floating unit 12. This enables the change in the spatial orientation Q1, Q2 of the floating unit 12 from the first spatial orientation Q1 to a second spatial orientation Q2, as shown in Fig. 2, which may be depicted by a gap with a second normal distance D2 between the lower surface 36 of the floating unit 12 and top shell 21 of the base unit 11. The pushing of the floating unit 12 may be depicted by an arrow 39 and may trigger a rejection of the telephone call, as shown by a symbol 40 of the graphic display object 33, whereas "ABC" may represent the name of the caller. Furthermore, a rotation of the floating unit 12, as depicted by an arrow 41, by the user may trigger a receiving of the telephone call. Hence, at least a part of the external force F may constitute a predefined axial force which may be designed to constitute the change of spatial orientation Q1, Q2 of the floating unit 12 in a predefined translator motion along the axis 38 of the floating unit 12. In other words, the floating unit 12 is shifted from the first normal distance D1 to the second normal distance D2. Hence, the functionality of the functional component 28 may be adjusted, in this case the taking or rejecting the telephone call, according to the external force F and/or the input signal I.

[0034] As shown in Fig. 1 and Fig. 2, the control circuitry 30 may be designed to actuate at least one pixel element of the pixel matrix for displaying the at least one graphic display object 33 at a constant position P relative to a reference point 34 on the base unit 11. The constant position P of the graphic display object 33 relative to the reference point 34 can be depicted by means of a normal distance D0 between the position of the display of the graphic display object 33 on the display panel 32 and the reference point 34. The display of the graphic display object 33 at the constant position P can be realized by shifting the actuation of pixel elements of the graphic display object 33, wherein a rate of shifting the actuation of the pixel elements is equal in magnitude and opposite in direction with respect to that of a rate of change of spatial orientation Q1, Q2 of the floating unit 12, wherein the change of spatial orientation Q1, Q2 of the floating unit 12 can be triggered by the external force F and/or the input signal I. The floating unit 12 may comprise an orientation sensing unit 55 which may be designed to identify the rate of change of spatial orientation Q1, Q2 of the floating unit 12 and send an orientation signal 56 to the control circuitry 30, as shown by an arrow 57. The control circuitry 30 can then shift the actuation of the pixel elements as a function of the orientation signal 56, which may comprise the information regarding the magnitude and direction of the rate of shifting of the floating unit 12.

[0035] Furthermore, at least a part of the external force F may constitute a predefined tangential force which may be designed to constitute the change in the spatial orientation Q1, Q2 in a predefined rotary motion about the axis 38 of the floating unit 12.

[0036] The external force F may be detected by means of a sensing unit 43, which may be comprised by the floating unit 12, for example the sensing unit may comprise an accelerometer, as shown in Fig. 5. The sensing unit 43 may estimate the different components of the external force F, such as an axial force in the downward direction, that is a pushing force in downward direction, as shown by the arrow 39; an axial force in the upward direction, that is a pushing force in upward direction, as shown by an arrow 45; a tangential force in a clockwise direction about the axis 38, as shown by the arrow 41; and a tangential force in an anti-clockwise direction about the axis 38, as shown by an arrow 44. Furthermore, the sensing unit 43 may send a force signal 46 to the control circuitry 30, so that the control circuitry 30 may enable a display of the graphic display object 33 displaying the individual estimated components of the external force F on the display panel 32, as shown by image arrows 39', 41', 44' and 45' corresponding to the arrows 39, 41, 44 and 45 respectively, whereas a symbol 43' may denote the accelerometer of the sensing unit 43.

[0037] As shown in Fig. 3, the input signal I may comprise a voice signal (not shown in the figures) and/or a gesture G which may be recognized by means of a recognition unit 48. The recognition unit 48 may comprise a microphone (not shown in the figures) to sense the voice signal and/or a camera 49 to sense the gesture G. The recognition unit 48 may further comprise a processor 50 to process the voice signal and/or the gesture G and identify the respective voice signal and/or the gesture G as the input signal I. Upon the identification of the input signal I, the processor 50 of the recognition unit 48 may derive a magnetism signal 51 comprising the change and/or the rate of change of the spatial orientation Q1, Q2 of the floating unit 12 as a function of the input signal I. The recognition unit 48 may send the magnetism signal 51 to the magnetic floating controller 14, for example wirelessly along a path 52, as shown by an arrow 53. The magnetic floating controller 14 may in turn change the spatial orientation Q1, Q2 of the floating unit 12 by adjusting the magnetism of the base magnet 15 as a function of the magnetism signal 51. Hence, the changing the spatial orientation Q1, Q2 of the floating unit 12 may be enabled by means of the voice signal and/or gesture G in a similar manner as shown in Fig. 1 and Fig. 2, in which case the change in the spatial orientation Q1, Q2 had been triggered by the external force F. Furthermore, the control circuitry 30 may display the graphic display object 33 depicting the input signal I by means of a symbol 54 on the display panel 32.

[0038] The functionality of the functional component 28 may be changed according the external force F and/or the input signal I. For example, the functionality of the functional component 28 may be change from that of a telephone, as shown in Fig. 1 and Fig. 2, to that of a loud speaker, as shown in Fig. 4. In this case, the graphic display object 33 may represent a volume symbol 47, wherein a number "23" may represent a parameter value of the degree of loudness of the loud speaker which can be adjusted by means of the external force F and/or the input signal I.

[0039] Fig. 6 shows a schematic illustration of an embodiment of the magnetic floating device 10 which can be integrated in the vehicle 24, wherein the vehicle 24 may be a personal vehicle which may be either driven manually or maybe a self-driving vehicle. Furthermore, the vehicle 24 may be a semiautonomous vehicle. In the Fig. 5, a part of an interior room 58 of the vehicle 24 is depicted from a perspective view of the user, who can be the driver (not shown in the figures) of the vehicle 24. Furthermore, a steering wheel 59, which can be used to manoeuver the vehicle 24, and the dashboard 23 of the vehicle 24 are depicted. The vehicle 24 may comprise a wind screen 60 and an electronic control unit 61.

[0040] The magnetic floating device 10 may comprise the base unit 11 and a floating unit 12, wherein the base unit 11 may comprise a signal input unit 62. The bottom shell (not shown in the figures) of the base unit 11 may be connected of integrated to the dashboard 23. The floating unit 12 may comprise an energy storage 63 which may be received in the covering component 27. The magnetic floating controller 14 is designed to adjust the floating unit 12 between the floating state S1 and a grounded state S2 by means of an adjustment in magnetism of the base magnet 15. In the grounded state S2, the floating unit 12 may be docked in the shell 13 of the base unit 11, as shown in Fig. 7. Furthermore, the signal input unit 62 of the magnetic floating device 10 may be designed to receive an announcement signal 64 that signals an anticipation of a jerk event. The jerk event may be due a deceleration of the vehicle 24 due to an application of breaks of the vehicle 24, when the vehicle 24 nears a road bump or due to turning of the vehicle 24 at corners of the path of the travel.

[0041] The electronic control unit 61 may be designed to anticipate the jerk event and provide the announcement signal 64 upon an anticipation of the jerk event to the signal input unit 62 along a path 65, as shown by an arrow 66. Upon receiving the announcement signal 64, the signal input unit 62 can transmit or forward the announcement signal 64 to the magnetic floating contrailer 14 along a path 67, as shown by an arrow 68. Upon receiving the announcement signal 64, the magnetic floating controller 14 may adjust the direction of electricity or current through the induction coil 17 of the base magnet 15, such that the strength and/or the polarity of the base magnet 15 can be adjusted, such that the floating unit 12 is adjusted from the floating state S1 to the grounded state S2. Hence, magnetic floating controller 14 may be designed to adjust the floating unit 12 from the floating state S1 to the grounded state S2 in order to temporarily dock and/or lock the floating unit 12 in the shell 13 of the base unit 11 by adjusting the magnetism of the at least one base magnet 15 as a function of the announcement signal 64 received by the signal input unit 62. In floating state S1, the floating unit 12 may be floating above the base unit 11 with the gap with the first normal distance D1 between the lower surface 36 of the floating unit 12 and top shell 21.

[0042] The signal input unit 62 may be designed to receive a takeoff signal 69 that signals an end of the jerk event. The electronic control unit 61 may be designed identify the end of the jerk event and send the takeoff signal 69 to the signal input unit 62 along the path 65, as shown by the arrow 66. The electronic control unit 61 may be designed to anticipate the jerk event on the basis of a digital map 70 and/or a sensor 71 which is designed to monitor the vehicle environment. Furthermore, the announcement signal 64 may be provided by the user in the vehicle 24 by means of a voice signal and/or a gesture G.

[0043] The signal input unit 62 may transmit or forward the takeoff signal 69 to the magnetic floating controller 14 along the path 67, as shown by the arrow 68. The magnetic floating controller 14 is designed to adjust the floating unit 12 from the grounded state S2 to the floating state S1 by adjusting the magnetism of the base magnet 15 as function of the takeoff signal 69 received by the signal input unit 62. In other words, the magnetic floating controller 14 may control the flow of electricity or current in the induction coil 17 looping across the base magnet 15 in such a manner, that the strength and/or polarity of the base magnet 15 are adjusted, in order to repel or move the floating unit 12 back to the floating state S1. Furthermore, the gap may be increased or decreased by adjusting the magnetism of the base magnet 15 by the magnetic floating controller 14. Furthermore, in the grounded state S2, the base unit 11 may be designed to electrically charge the energy storage 63 of the floating unit 12 by induction and/or conduction.

[0044] Furthermore, the functional component 28 may comprise an interface, especially a user interface to an external component 72, 73, such as an infotainment system 72 and/or a comfort functionality 73 of the vehicle. such that a parameter value of a functionality of the external component 72, 73 is adjusted by means of the functional component 28.

[0045] Fig. 8 depicts that the magnetic floating device 10 may display the graphic display object 33 depicting a lock symbol 74 when the vehicle 24 has been parked. The lock symbol 74 of the graphic display object 33 may be displayed by the display panel 32 towards the outside environment of the vehicle 24, such that a person or a plurality of persons outside the vehicle 24 can view that the vehicle 24 has been locked by means of the displayed lock symbol 74.

[0046] Overall, the examples show how the magnetic floating device 10 can be used as a multipurpose electronic device which can be integrated in the vehicle 24 in an efficient manner, as it is provided by the invention.

Claims

1. Magnetic floating device (10) comprising:

- a base unit (11) with a magnetic floating controller (14) and at least one base magnet (15); and
- a floating unit (12) with a functional component (28), a control circuitry (30) and at least one floating magnet (31), wherein the magnetic floating controller (14) is designed to generate a floating state (S1) by means of an adjustment in magnetism of the at least one base magnet (15), wherein in the floating state (S1), the floating unit (12) is floating above the base unit (11), and
- an orientation sensing unit (43) which is designed to identify a rate of change of spatial orientation (Q1, Q2) of the floating unit (12) that is triggered by an external force (F) and/or an input signal (I);

characterized in that

the functional component (28) comprises a display panel (32) with a pixel matrix, wherein the control circuitry (30) is designed to actuate at least one pixel element of the pixel matrix for displaying at least one graphic display object (33) at a constant position (P) relative to a reference point (34) on the base unit (11), whereby the control circuitry is designed to shift the actuation of pixel elements at a rate that is equal in magnitude and opposite in direction with respect to that of a rate of change of said spatial orientation (Q1, Q2) of the floating unit (12); and wherein the orientation sensing unit (43) is designed to detect:

- at least a part of the external force (F) that constitutes a predefined tangential force which is designed to constitute the change of spatial orientation (Q1, Q2) of the floating unit (12) in a predefined rotary motion about an axis (38) of the floating unit (12); and/or
- at least a part of the external force (F) constitutes a predefined axial force which is designed to constitute the change of spatial orientation (Q1, Q2) of the floating unit (12) in a predefined translatory motion along the axis (38) of the floating unit (12);

wherein:

- the base unit (11) comprises a shell (13), wherein the magnetic floating controller (14) is designed to adjust the floating unit (12) between the floating state (S1) and a grounded state (S2) by means of an adjustment in the magnetism of the at least one base magnet (15), wherein in the grounded state (S2), the floating unit (12) is docked in the shell (13) of the base unit (11);
- the magnetic floating device (10) comprises a signal input unit (62) which is designed to receive an announcement signal (64) that signals an anticipation of a jerk event; and
- the magnetic floating controller (14) is designed to adjust the floating unit (12) from the floating state (S1) to the grounded state (s2) in order to temporarily dock and/or lock the floating unit (12) in the shell (13) of the base unit (11) by adjusting the magnetism of the at least one base magnet (15) as a function of the announcement signal (64) received by the signal input unit (62).

2. Magnetic floating device (10) according to any of the preceding claims, wherein the functional component (28) comprises a recognition unit (48), which is designed to recognize a voice signal and/or a gesture (G), the input signal (I) comprising said voice signal and/or said gesture (G).

3. Magnetic floating device (10) according to any of the preceding claims, wherein a functionality of the functional component (28) is accessed and/or adjusted and/or changed according to the external force (F) and/or the input signal (I), and/or wherein the functional component (28) comprises an interface to an external component (72, 73) and whereby the functional component (28) is designed to adjust a parameter value of a functionality of the external component (72, 73).

4. Magnetic floating device (10) according to any of the preceding claims, wherein the signal input unit (62) is designed to receive a takeoff signal (69) that signals an end of the jerk event, wherein the magnetic floating controller (14) is designed to adjust the floating unit (12) from the grounded state (S2) to the floating state (S1) by adjusting the magnetism of the at least one base magnet (15) as a function of the takeoff signal (69) received by the signal input unit (62).

5. Magnetic floating device (10) according to any of the preceding claims, wherein in the grounded state (S2), the base unit (11) is designed to electrically charge an energy storage (63) of the floating unit (12) by induction and/or conduction.

6. Vehicle (24) comprising an electronic control unit (61) and a magnetic floating device (14) according to any of the preceding claims, wherein the electronic control unit (61) is designed:

- to anticipate a jerk event and provide an announcement signal (64) upon an anticipation of the jerk event to a signal input unit (62); and
- to provide a takeoff signal (69) signaling the end of the jerk event to the signal input unit (62).

7. Vehicle (24) according to claim 6, wherein the electronic control unit (61) is designed to anticipate the jerk event on the basis of a digital map (70) and/or a sensor (71) which is designed to monitor the vehicle environment.

8. Vehicle (24) according to claims 6 or 7, wherein the floating component (12) is a user interface to an infotainment system (72) and/or a comfort functionality (73) of the vehicle (24).

Patentansprüche

1. Magnetschwebevorrichtung (10), die umfasst:

- eine Basiseinheit (11) mit einer Magnetschwebesteuereinheit (14) und mindestens einem Basismagneten (15); und
- eine Schwebeeinheit (12) mit einer Funktionskomponente (28), einem Steuerschaltkreis (30) und mindestens einem Schwebemagneten (31), wobei die Magnetschwebesteuereinheit (14) dazu ausgelegt ist, einen Schwebezustand (S1) mittels einer Einstellung des Magnetismus des mindestens einen Basismagneten (15) zu erzeugen, wobei die Schwebeeinheit (12) im Schwebezustand (S1) über der Basiseinheit (11) schwebt, und
- eine Orientierungserfassungseinheit (43), die dazu ausgelegt ist, eine Änderungsrate einer räumlichen Orientierung (Q1, Q2) der Schwebeeinheit (12) zu identifizieren, die durch eine externe Kraft (F) und/oder ein Eingangssignal (I) ausgelöst wird;

dadurch gekennzeichnet, dass

- die Funktionskomponente (28) ein Anzeigefeld (32) mit einer Pixelmatrix umfasst, wobei der Steuerschaltkreis (30) dazu ausgelegt ist, mindestens ein Pixelelement der Pixelmatrix zum Anzeigen mindestens eines graphischen Anzeigeobjekts (33) in einer konstanten Position (P) relativ zu einem Referenzpunkt (34) an der Basiseinheit (11) zu betätigen, wobei der Steuerschaltkreis dazu ausgelegt ist, die Betätigung von Pixelelementen mit einer Rate zu verschieben, die mit Bezug auf jene einer Änderungsrate der räumlichen Orientierung (Q1, Q2) der Schwebeeinheit (12) im Betrag gleich und in der Richtung entgegengesetzt ist;

und wobei die Orientierungserfassungseinheit (43) dazu ausgelegt ist, zu detektieren:

- zumindest einen Teil der externen Kraft (F), die eine vordefinierte Tangentialkraft bildet, die dazu ausgelegt ist, die Änderung der räumlichen Orientierung (Q1, Q2) der Schwebeeinheit (12) in einer vordefinierten Drehbewegung um eine Achse (38) der Schwebeeinheit (12) zu bilden; und/oder
- zumindest ein Teil der externen Kraft (F) eine vordefinierte Axialkraft bildet, die dazu ausgelegt ist, die Änderung der räumlichen Orientierung (Q1, Q2) der Schwebeeinheit (12) in einer vordefinierten Translationsbewegung entlang der Achse (38) der Schwebeeinheit (12) zu bilden;

wobei:

- die Basiseinheit (11) eine Hülle (13) umfasst, wobei die Magnetschwebesteuereinheit (14) dazu ausgelegt ist, die Schwebeeinheit (12) zwischen dem Schwebezustand (S1) und einem fixierten Zustand (S2) mittels einer Einstellung des Magnetismus des mindestens einen Basismagneten (15) einzustellen, wobei die Schwebeeinheit (12) im fixierten Zustand (S2) in der Hülle (13) der Basiseinheit (11) verankert ist;
- die Magnetschwebevorrichtung (10) eine Signaleingabeeinheit (62) umfasst, die dazu ausgelegt ist, ein Ankündigungssignal (64) zu empfangen, das ein Vorhersehen eines Ruckereignisses signalisiert; und
- die Magnetschwebesteuereinheit (14) dazu ausgelegt ist, die Schwebeeinheit (12) vom Schwebezustand (S1) in den fixierten Zustand (S2) einzustellen, um die Schwebeeinheit (12) vorübergehend in der Hülle (13) der Basiseinheit (11) zu verankern und/oder zu verriegeln, durch Einstellen des Magnetismus des mindestens einen Basismagneten (15) als Funktion des Ankündigungssignals (64), das durch die Signaleingabeeinheit (62) empfangen wird.

2. Magnetschwebevorrichtung (10) nach einem der vorangehenden Ansprüche, wobei die Funktionskomponente (28) eine Erkennungseinheit (48) umfasst, die dazu ausgelegt ist, ein Sprachsignal und/oder eine Geste (G) zu erkennen, wobei das Eingangssignal (I) das Sprachsignal und/oder die Geste (G) umfasst.

3. Magnetschwebevorrichtung (10) nach einem der vorangehenden Ansprüche, wobei gemäß der externen Kraft (F) und/oder dem Eingangssignal (I) auf eine Funktionalität der Funktionskomponente (28) zugegriffen wird und/oder diese eingestellt und/oder geändert wird, und/oder wobei die Funktionskomponente (28) eine Schnittstelle zu einer externen Komponente (72, 73) umfasst, und wobei die Funktionskomponente (28) dazu ausgelegt ist, einen Parameterwert einer Funktionalität der externen Komponente (72, 73) einzustellen.

4. Magnetschwebevorrichtung (10) nach einem der vorangehenden Ansprüche, wobei die Signaleingabeeinheit (62) dazu ausgelegt ist, ein Abhebesignal (69) zu empfangen, das ein Ende des Ruckereignisses signalisiert, wobei die Magnetschwebesteuereinheit (14) dazu ausgelegt ist, die Schwebeeinheit (12) durch Einstellen des Magnetismus des mindestens einen Basismagneten (15) als Funktion des durch die Signaleingabeeinheit (62) empfangenen Abhebesignals (69) vom fixierten Zustand (S2) in den Schwebezustand (S1) einzustellen.

5. Magnetschwebevorrichtung (10) nach einem der vorangehenden Ansprüche, wobei die Basiseinheit (11) im fixierten Zustand (S2) dazu ausgelegt ist, einen Energiespeicher (63) der Schwebeeinheit (12) durch Induktion und/oder Leitung elektrisch aufzuladen.

6. Fahrzeug (24) mit einem elektronischen Steuergerät (61) und einer Magnetschwebevorrichtung (14) nach einem der vorangehenden Ansprüche, wobei das elektronische Steuergerät (61) dazu ausgelegt ist:

- ein Ruckereignis vorherzusehen und ein Ankündigungssignal (64) bei einem Vorhersehen des Ruckereignisses zu einer Signaleingabeeinheit (62) zu liefern; und
- ein Abhebesignal (69), das das Ende des Ruckereignisses signalisiert, zur Signaleingabeeinheit (62) zu liefern.

7. Fahrzeug (24) nach Anspruch 6, wobei das elektronische Steuergerät (61) dazu ausgelegt ist, das Ruckereignis auf der Basis einer digitalen Karte (70) und/oder eines Sensors (71), der dazu ausgelegt ist, die Fahrzeugumgebung zu überwachen, vorherzusehen.

8. Fahrzeug (24) nach den Ansprüchen 6 oder 7, wobei die Schwebekomponente (12) eine Benutzerschnittstelle zu einem Infotainmentsystem (72) und/oder einer Komfortfunktionalität (73) des Fahrzeugs (24) ist.

Revendications

1. Dispositif magnétique flottant (10) comportant :

- une unité de base (11) avec une commande de flottement magnétique (14) et au moins un aimant de base (15) ; et
- une unité flottante (12) avec un composant fonctionnel (28), des circuits de commande (30) et au moins un aimant flottant (31), dans lequel la commande de flottement magnétique (14) est conçue pour générer un état flottant (S1) au moyen d'un réglage de magnétisme du au moins un aimant de base (15), l'unité flottante (12), à l'état flottant (S1), flottant au-dessus de l'unité de base (11), et
- une unité de détection d'orientation (43) qui est conçue pour identifier une vitesse de changement d'orientation spatiale (Q1, Q2) de l'unité flottante (12) qui est déclenché par une force externe (F) et/ou un signal d'entrée (I) ;

caractérisé en ce que
le composant fonctionnel (28) comporte un

panneau d'affichage (32) avec une matrice de pixels, les circuits de commande (30) étant conçus pour actionner au moins un pixel élémentaire de la matrice de pixels pour afficher au moins un objet d'affichage graphique (33) à une position (P) constante par rapport à un point de référence (34) sur l'unité de base (11), en sorte que les circuits de commande sont conçus pour décaler l'actionnement de pixels élémentaires à une vitesse qui est égale en grandeur et opposée en direction par rapport à celle d'une vitesse de changement de ladite orientation spatiale (Q1, Q2) de l'unité flottante (12) ; et l'unité de détection d'orientation (43) étant conçue pour détecter :

- au moins une partie de la force externe (F) qui constitue une force tangentielle prédéfinie qui est conçue pour constituer le changement d'orientation spatiale (Q1, Q2) de l'unité flottante (12) pendant un mouvement de rotation prédéfini autour d'un axe (38) de l'unité flottante (12) ; et/ou
- au moins une partie de la force externe (F) qui constitue une force axiale prédéfinie qui est conçue pour constituer le changement d'orientation spatiale (Q1, Q2) de l'unité flottante (12) pendant un mouvement de translation prédéfini autour de l'axe (38) de l'unité flottante (12) ;
- l'unité de base (11) comportant une coque (13), la commande de flottement magnétique (14) étant conçue pour régler l'unité flottante (12) entre l'état flottant (S1) et un état posé (S2) au moyen d'un réglage du magnétisme du au moins un aimant de base (15), l'unité flottante (12), à l'état posé (S2), étant accueillie dans la coque (13) de l'unité de base (11) ;
- le dispositif magnétique flottant (10) comportant une unité d'entrée de signal (62) qui est conçue pour recevoir un signal d'annonce (64) qui signale une anticipation d'un événement de secousse ; et
- la commande de flottement magnétique (14) étant conçue pour régler l'unité flottante (12) de l'état flottant (S1) à l'état posé (S2) afin d'accueillir temporairement et/ou de bloquer l'unité flottante (12) dans la coque (13) de l'unité de base (11) en réglant le magnétisme du au moins un aimant de base (15) en fonction du signal d'annonce (64) reçu par l'unité d'entrée de signal (62)..

2. Dispositif magnétique flottant (10) selon l'une quelconque des revendications précédentes, dans lequel le composant fonctionnel (28) comporte une unité de reconnaissance (48), qui est conçue pour reconnaître un signal vocal et/ou un geste (G), le signal d'entrée (I) comportant ledit signal vocal et/ou ledit geste (G).

3. Dispositif magnétique flottant (10) selon l'une quelconque des revendications précédentes, dans lequel une fonctionnalité du composant fonctionnel (28) fait l'objet d'un accès et/ou est réglée et/ou changée en fonction de la force externe (F) et/ou du signal d'entrée (I), et/ou dans lequel le composant fonctionnel (28) comporte une interface vers un composant externe (72, 73) et en sorte que le composant fonctionnel (28) est conçu pour régler une valeur de paramètre d'une fonctionnalité du composant externe (72, 73).

4. Dispositif magnétique flottant (10) selon l'une quelconque des revendications précédentes, dans lequel l'unité d'entrée de signal (62) est conçue pour recevoir un signal de décollage (69) qui signale une fin de l'événement de secousse, la commande de flottement magnétique (14) étant conçue pour régler l'unité flottante (12) de l'état posé (S2) à l'état flottant (S1) en réglant le magnétisme du au moins un aimant de base (15) en fonction du signal de décollage (69) reçu par l'unité d'entrée de signal (62).

5. Dispositif magnétique flottant (10) selon l'une quelconque des revendications précédentes, dans lequel à l'état posé (S2), l'unité de base (11) est conçue pour charger électriquement un dispositif de stockage d'énergie (63) de l'unité flottante (12) par induction et/ou conduction.

6. Véhicule (24) comportant une unité de commande électronique (61) et un dispositif magnétique flottant (14) selon l'une quelconque des revendications précédentes, dans lequel l'unité de commande électronique (61) est conçue pour :

- anticiper un événement de secousse et fournir un signal d'annonce (64) lors d'une anticipation de l'événement de secousse à une unité d'entrée de signal (62) ; et
- fournir un signal de décollage (69) signalant la fin de l'événement de secousse à l'unité d'entrée de signal (62).

7. Véhicule (24) selon la revendication 6, dans lequel l'unité de commande électronique (61) est conçue pour anticiper l'événement de secousse sur la base d'une carte numérique (70) et/ou d'un capteur (71) qui est conçu pour surveiller l'environnement de véhicule.

8. Véhicule (24) selon les revendications 6 ou 7, dans lequel le composant flottant (12) est une interface d'utilisateur vers un système d'infodivertissement (72) et/ou une fonctionnalité de confort (73) du véhicule (24).

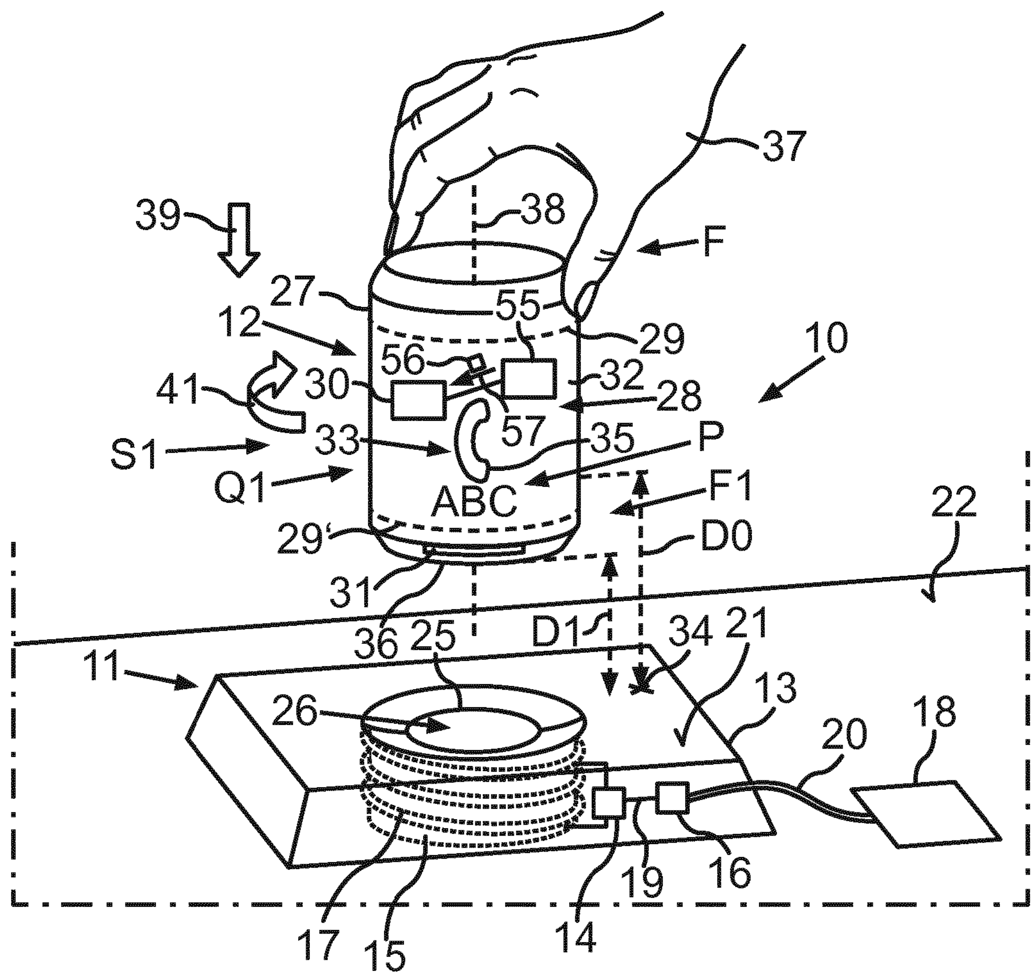
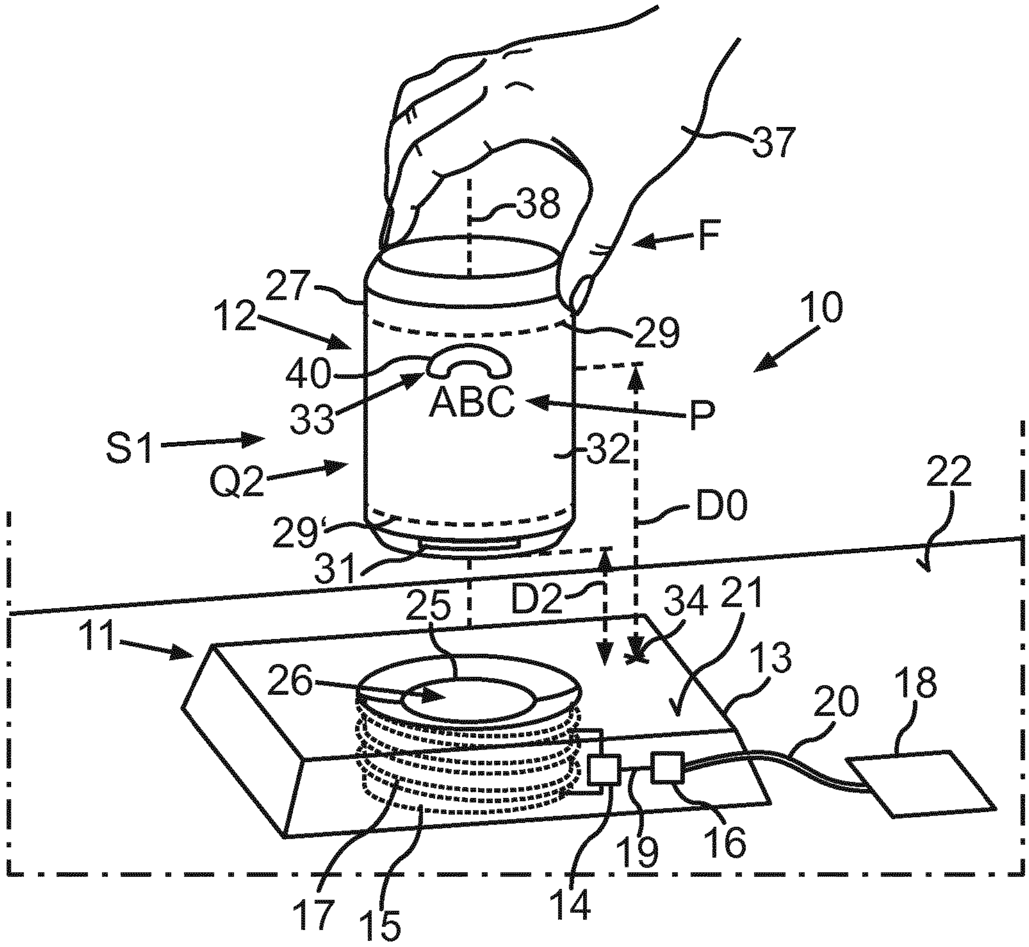

37
38
F
39
27
55
12
29
10
56
30
32
41
28
57
33
35
P
S1
Q1
ABC
F1
22
29'
D0
31
36
25
D1
34
21
11
13
26
20
18
16
19
14
17
15

Fig.1


37
38
F
27
12
29
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40
33
ABC
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S1
32
Q2
22
D0
29'
31
D2
34
21
25
11
13
26
20
18
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15
14

Fig.2

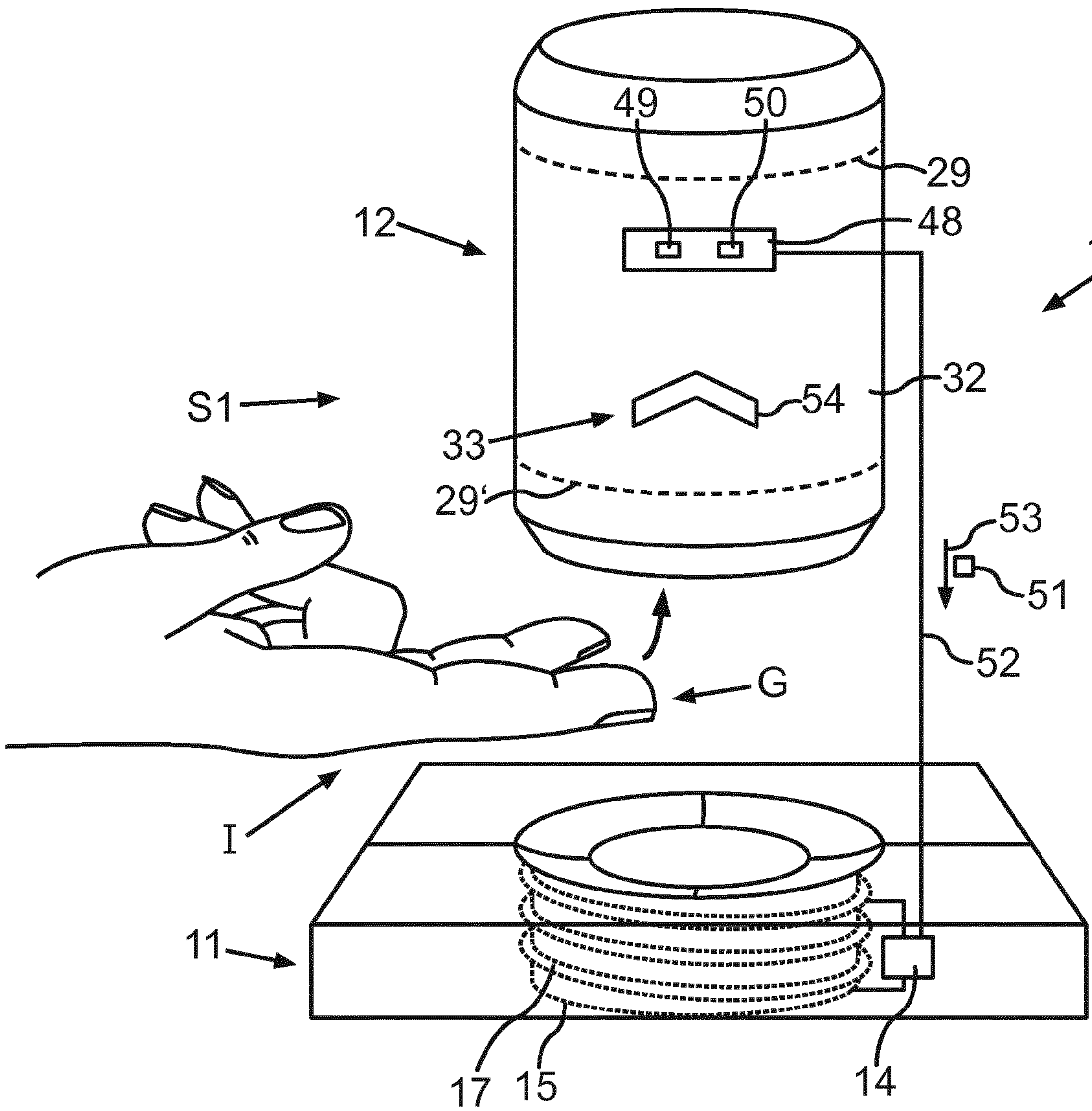


Fig.3

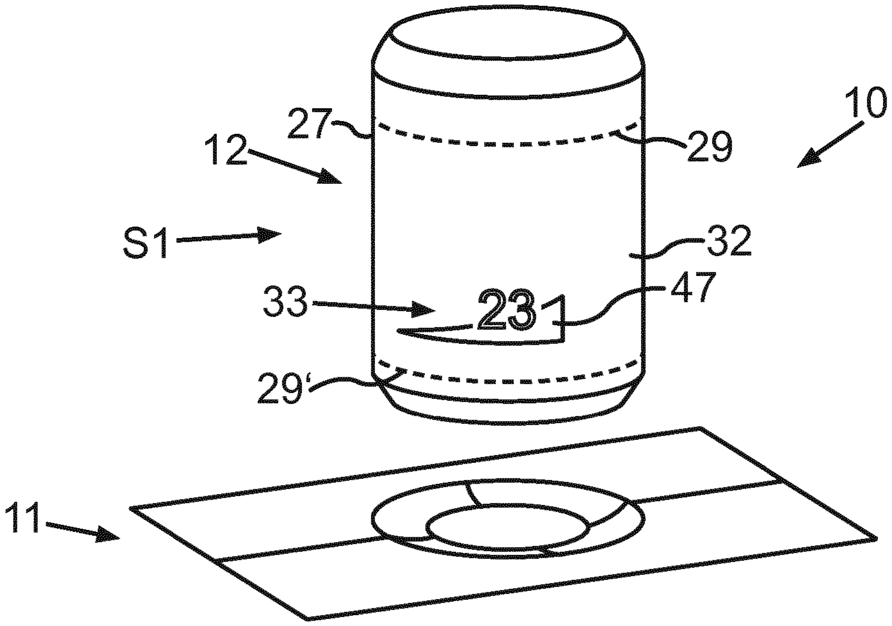

10
27
29
12
S1
32
33
23
47
29‘
11

Fig.4

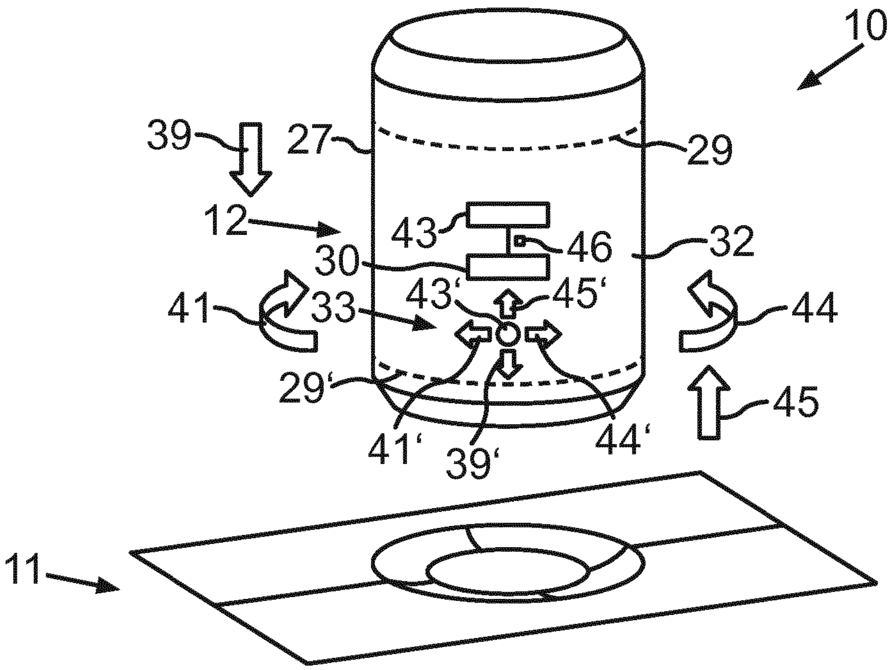
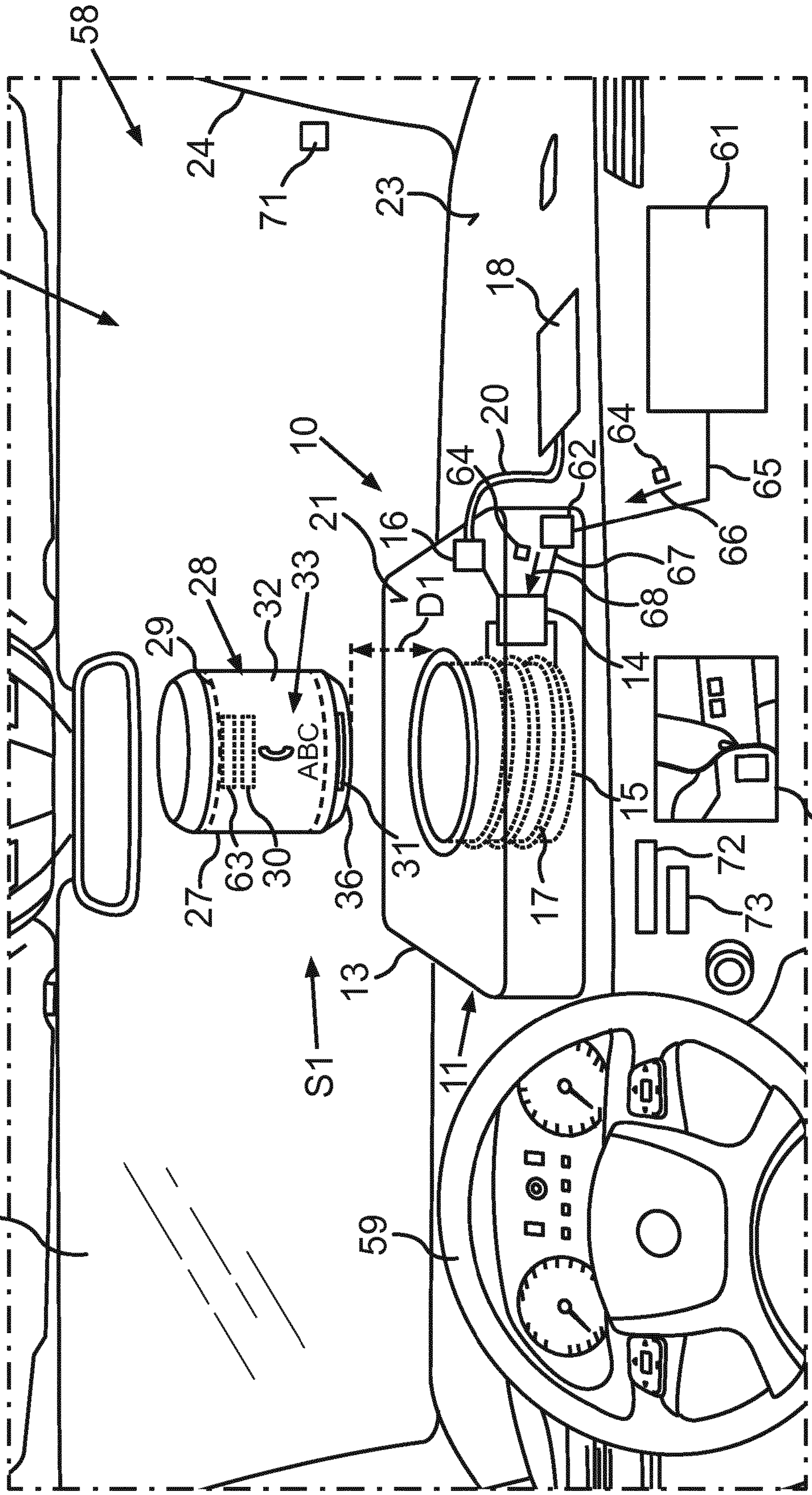

10
39
27
29
12
43
46
32
30
41
43‘
45‘
44
33
29‘
45
41‘
39‘
44‘
11

Fig.5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29
D1
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73
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S1
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59

Fig.6

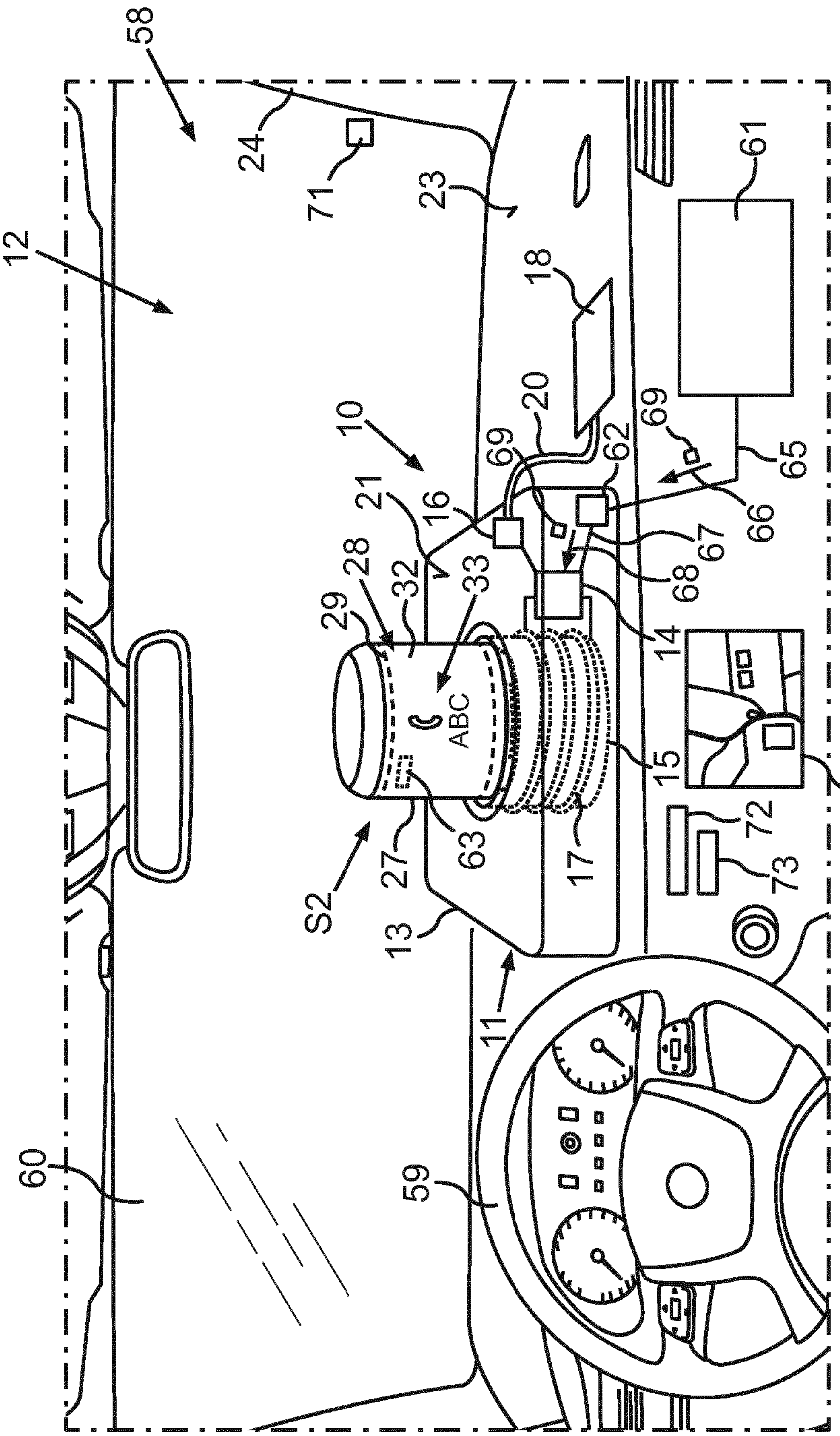
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Fig.7

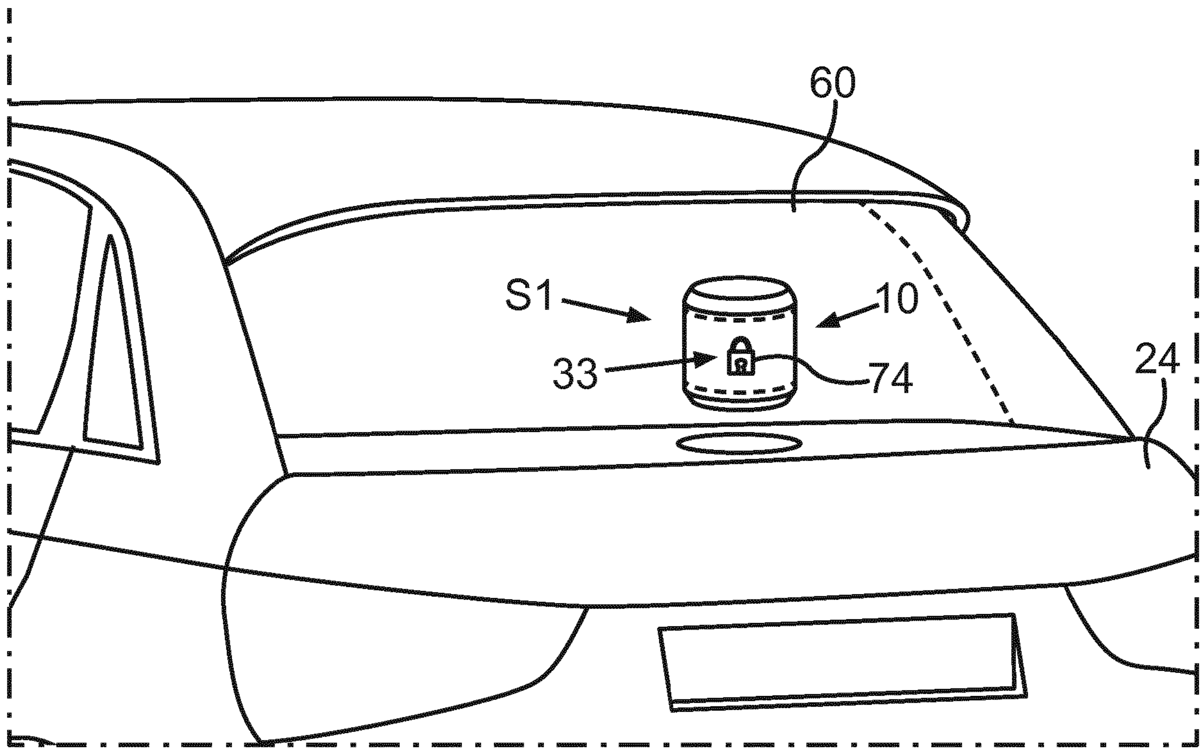

Fig.8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- DE 212014000011 U1 **[0004]**
- US 20160157002 A1 **[0005]**