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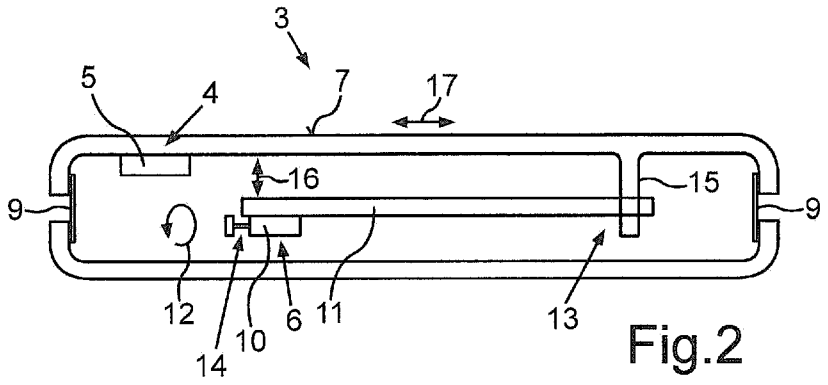


Fig.2

(57) Abstract: The invention relates to an operating device (3) for a motor vehicle (1), including an operating element (4), including a capturing device (5) for capturing an operating input performed at the operating element (4) and including a drive device (6) for outputting a haptic feedback at the operating element (4) depending on the operating input captured by the capturing device (5), wherein the drive device (6) has an actuator (10) for providing an exciting movement, wherein the drive device (6) has a lever element (11), which can be excited to a movement by the exciting movement of the actuator (10), which has a higher amplitude compared to the exciting movement, wherein the lever element (11) is adapted to transmit the movement to the operating element (4) for outputting the haptic feedback.

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OPERATING DEVICE FOR A MOTOR VEHICLE WITH A DRIVE DEVICE INCLUDING A LEVER ELEMENT

The present invention relates to an operating device for a motor vehicle including an operating element, including a capturing device for capturing an operating input performed at the operating element and including a drive device for outputting a haptic feedback at the operating element depending on the operating input captured by the capturing device, wherein the drive device has an actuator for providing an exciting movement. Moreover, the present invention relates to a motor vehicle.

Presently, the interest is in particular directed to operating devices for motor vehicles. Such operating devices are known from the prior art in different embodiments. Such operating devices usually include an operating element, which can be actuated for performing an operating action. Therein, the operation can for example be effected with at least one finger or a corresponding input device. The operating input can be captured by a corresponding capturing device. As a result of the captured operating action, a corresponding control signal can then be output, by which a functional device of the motor vehicle associated with the operating device can be controlled. Such a functional device can for example be an infotainment system, a navigation system, an air conditioning system or the like.

Moreover, operating devices are known from the prior art, which have a drive device. If a touch or actuation of the operating element is recognized by the capturing device, haptic feedback can be output by the drive device. In this manner, the operating action can be confirmed by the haptic feedback. Such a drive device can include a corresponding actuator, by which an exciting movement can be output. Therein, it is usually provided that this actuator is disposed directly at the operating element or at a storage location of the operating element. Herein, it is disadvantageous that the exciting movement provided by the actuator is directly transmitted to the operating part to be moved. Hereby, the actuator directly determines the characteristic, for example the force, acceleration and/or deflection, of the haptic feedback.

Hereto, US 8 884 884 B2 describes a device, which has a touch-sensitive surface and an actuator with an eccentric rotating mass, which is connected to the touch-sensitive

surface. Therein, the actuator is controlled such that complete rotation of the eccentric mass is prevented. In this manner, vibrations can be provided as a haptic feedback at the touch-sensitive surface.

It is the object of the present invention to demonstrate a solution, how a haptic feedback can be more efficiently provided with the aid of a drive device in an operating device of a motor vehicle.

According to the invention, this object is solved by an operating device as well as by a motor vehicle having the features according to the respective independent claims. Advantageous developments of the present invention are the subject matter of the dependent claims.

According to an embodiment, an operating device for a motor vehicle includes an operating element. Moreover, the operating device preferably includes a capturing device for capturing an operating input performed at the operating element. Furthermore, the operating device in particular includes a drive device for outputting a haptic feedback at the operating element depending on the operating input captured by the capturing device, wherein the drive device has an actuator for providing an exciting movement. Moreover, the drive device preferably has a lever element, which can be excited to a movement by the exciting movement of the actuator, which has a higher amplitude compared to the exciting movement. Furthermore, the lever element is preferably adapted to transmit the movement to the operating element for outputting the haptic feedback.

An operating device according to the invention for a motor vehicle includes an operating element. Furthermore, the operating device includes a capturing device for capturing an operating input performed at the operating element. Moreover, the operating device includes a drive device for outputting a haptic feedback at the operating element depending on the operating input captured by the capturing device, wherein the drive device has an actuator for providing an exciting movement. Furthermore, the drive device has a lever element, which can be excited to a movement by the exciting movement of the actuator, which has a higher amplitude compared to the exciting movement. In addition, the lever element is adapted to transmit the movement to the operating element for outputting the haptic feedback.

The operating device can be disposed in an interior of the motor vehicle, for example in the center console or the dashboard. The operating device includes the operating

element, which can for example be operated by the driver of the motor vehicle or a further occupant of the motor vehicle. For performing the operating action, in which the operating element is operated, the occupant of the motor vehicle can for example press on or touch the operating element with at least one finger or a corresponding input device. With the aid of the capturing device of the operating device, this touch or the operating action can be captured. The capturing device can for example have a touch-sensitive sensor, by which a touch of an operating surface of the operating element can be recognized. The capturing device can also be adapted to recognize an approach of the at least one finger or the input device to the operating element. In addition, the position, in which the operating element is touched, can be captured with the aid of the capturing device. Depending on the operating action captured by the capturing device, a corresponding control signal can then be output and be transmitted to the drive device.

The drive device includes an actuator, by which the exciting movement can be generated. The exciting movement can for example be a mechanical oscillation. A stroke or a pulse can also be provided by the actuator as the exciting movement. According to the invention, it is now provided that the drive device has a lever element, which is preferably connected to the actuator and to the operating element. Therein, the lever element is formed such that it can be excited to a movement by the exciting movement of the actuator. The movement of the lever element can for example be a mechanical oscillation. Therein, the lever element is formed such that the movement, to which the lever element is excited by the actuator, has a higher amplitude compared to the exciting movement, which is provided by the actuator. In other words, the exciting movement of the actuator is enhanced by the lever element. For example, the lever element can be excited to mechanical oscillations with the aid of the actuator, which have a higher amplitude compared to oscillations that the actuator outputs as the exciting movement. By the configuration of the lever element, the enhancement of the exciting movement can then be determined. The enhancement can for example be adapted by the geometric configuration, the material, the mechanical characteristics and/or the oscillation behavior of the lever element. The movement, which the lever element performs as a result of the excitation by the actuator, is transmitted to the operating element. In this manner, the operating element is then also moved and thus the haptic feedback is output. By the lever element, the forces of the exciting movement of the actuator, the deflection of the actuator in the exciting movement as well as accelerations and/or speeds in the exciting movement of the actuator can then be correspondingly adapted to the operating element. Thus, the haptic feedback or the active haptic can be adapted in efficient manner.

Preferably, the lever element has at least a clamping area, at which the lever element is clamped, and the actuator is connected to the lever element in a fixing position, wherein the lever element can be excited to mechanical oscillations by the exciting movement provided by the actuator as the movement. Thus, the exciting movement of the actuator can be used to mechanically oscillate the lever element or the free end of the lever element. Therein, it is preferably provided that a resonant frequency of the lever element can be excited by the exciting movement of the actuator. For example, the actuator can perform an oscillation with the resonant frequency of the lever element as the exciting movement. Thus, it can be achieved in simple manner that the lever element performs an oscillation with a higher amplitude than the oscillation of the exciting movement. This movement of the lever element can then be transmitted to the operating element and thus the haptic feedback can be output.

In an embodiment, the lever element is clamped at a fist clamping area and the fixing position is arranged at a free end opposing the first clamping area of the lever element. In other words, thus, the lever element is preferably one-sided clamped. In particular, the lever element has a considerably larger spatial extension in longitudinal direction from the clamping area to the free end than in transverse or vertical direction. Thus, the lever element is preferably formed elongated. Therein, the lever element is clamped or spatially fixedly disposed on a first side or in the first clamping area. The second end of the lever element or the free end can freely oscillate. Therein, the actuator is disposed in an area of the free end of the lever element.

According to a further embodiment, the operating device includes a housing element, the lever element is connected to the housing element in the first clamping area and the lever element is connected to the operating element in an intermediate area between the clamping area and the free end. Therein, the operating element can be supported movably to the housing element. In particular, the housing element is on a side of the operating element facing away from the operator. Therein, the lever element can be clamped at the housing element. In the intermediate area between the clamping area, in which the lever element is connected to the housing element, and the free end, at which the actuator is disposed, the lever element can for example be connected to the operating element via a corresponding retaining element. Thus, by the choice of the intermediate area or the arrangement of the retaining element of the operating element at the lever element, the amplitude of the oscillation can be determined, which is transmitted from the lever element to the operating element.

According to a further embodiment, the lever element is clamped at a first clamping area and a second clamping area opposing the first clamping area and the fixing position is arranged at a center area of the lever element. The lever element can comprise a fist end, which is associated with the fist clamping area, and a second end, which is associated with the second clamping area. The actuator can then be connected centrally to the lever element. In this way, the operating element can be equally excited to vibrations.

In an embodiment, the lever element is connected to the operating element in the at least one clamping area. In other words, the fixed end of the one-sided clamped lever element is disposed at the operating element. If the lever is clamped on both sides, the two opposite ends of the lever element may be arranged on the operating element. Hereto, the operating element can have a retaining element on a rear side facing away from the operating surface, at which the retaining element is retained. Thus, direct mechanical coupling between the lever element and the operating element can be provided. Thus, the exciting movement of the actuator can be enhanced by the excitation of the lever element and the haptic feedback can be output at the operating element.

In a further embodiment, the operating element is movably supported at the housing element along a predetermined direction of movement by means of at least one spring element. As already explained, the operating device can have the housing element, at which the operating element is movably supported. Thus, the operating element can be moved relative to the housing element. Therein, it is in particular provided that the operating element is retained at the housing element by at least one, in particular by multiple, spring elements. Therein, the spring elements are in particular formed such that they allow a movement of the operating element relative to the housing element along a predetermined direction of movement. The spring elements can for example be leaf springs, the main extension direction of which is arranged perpendicularly to an operating surface of the operating element. Thus, a direction of movement of the operating element can for example be allowed, which extends perpendicularly to the operating surface.

According to a further embodiment, the actuator is fixed to the lever element in a fixing position by means of a fixing element, wherein the fixing position of the actuator at the lever element is variable. In other words, the fixing position, in which the actuator is disposed at the lever element, is variable. In particular if the lever element is formed as a one-sided clamped lever, the oscillation frequency and/or the oscillation amplitude, with which the lever element performs the movement, can be adapted by the fixing position.

This allows adaptation of the active haptic to the operating element or to the used actuator in simple manner.

In a further configuration, the capturing device is to capture an input position of the operating action performed at the operating element, and a control device of the operating device is adapted to adapt an amplitude and/or a signal form of a control signal for controlling the actuator depending on the input position. By the capturing device, it can be determined, at which location or position the operating element is touched. Depending on the captured input position, the actuator can now be controlled. For example, corresponding control signals for the actuator depending on the input position can be registered in a corresponding look-up table. Therein, the respective control signals can be determined depending on an oscillation behavior of the operating element. Therein, it can also be taken into account, at which location the operating element is connected to the lever element. In particular, the control signal is adapted such that the haptic feedback is identically sensed by the operator in each input position of the operating element. For example, the control signal is adapted such that the same oscillation amplitude and/or the same pulse are output as the haptic feedback in each of the input positions. The control signal can in particular be an electrical voltage or an electrical current. For adapting the control signal, the electrical voltage and/or the electrical current intensity can be adapted. The duration of control and/or the signal form can also be adapted. Thus, it can be achieved that the same haptic feedback is output for a user independently of the position, in which he touches the operating element.

In a further configuration, the control device is adapted to control the actuator for damping the movement of the lever element. For example, the control device can first control the actuator in order that it outputs the exciting movement. When the lever element is then excited to the movement or to the oscillations, the actuator can be controlled such that the movement of the lever element is damped, after a predetermined temporal duration. For example, the actuator can be excited with an oscillation in opposite phase to the oscillation of the lever element. This allows adaptation of the haptic feedback with the aid of active damping.

Preferably, the operating device has at least one damping element for damping the movement of the lever element and/or the operating element. The at least one damping element can for example be an element of an elastomer, a foam material or the like. This element can be disposed at the lever element and/or the operating element. The at least one damping element can also be formed by corresponding ribs, which the lever element

and/or the operating element has. The at least one damping element can also form a part of the spring element, by which the operating element is disposed at the housing element. In this manner, passive damping of the oscillation of the operating element and/or the lever element can be allowed.

In an embodiment, the lever element is beam-shaped, cylindrically or hollow-cylindrically formed. For example, the lever element can be formed rod-shaped or beam-shaped. Therein, the lever element can have a square cross-sectional area. It can also be provided that the lever element has a rectangular cross-sectional area. By the configuration of the cross-section, the oscillation behavior of the lever element can be correspondingly adapted. Furthermore, it can be provided that the lever element is cylindrically or hollow-cylindrically formed. It can also be provided that the lever element has a stepped outer diameter or that the outer diameter of the lever element tapers. For example, the diameter can be larger in the area of the free end of the lever element than in an area of the clamping area. Thus, higher mass is provided in the area of the free end, which can be moved by the exciting movement of the actuator. Overall, the geometric configuration of the lever element can be adapted to the used actuator, the used operating element and the haptic feedback, which is to be output.

In a further embodiment, the lever element has a recess and the actuator is disposed in the recess at least in certain areas. If the lever element is for example hollow-cylindrically formed, the actuator can be disposed in the interior of the lever element. Thus, the drive device can be provided in particularly installation space saving manner.

Preferably, the actuator is formed as a drive with an eccentric rotating mass, as an electromagnetic actuator or as a piezoelectric actuator. Basically, different types of actuators can be used for the operating device. The actuator can for example be a drive with eccentric rotating mass or an unbalance motor. The actuator can also be formed as an electromagnetic actuator or as a Lorentz force actuator. Further, the actuator can be formed as a piezoelectric actuator.

In a further embodiment, the operating element includes a touch-sensitive screen or a touch-sensitive operating surface. In other words, the operating element can include a touch screen or be formed as a touch screen. The operating element can also include a touchpad or be formed as a touch screen. In a touch-sensitive screen or a touch-sensitive surface, the position of a touch can be captured in the operating action. It can also be

provided that a force, with which the operating action is exerted on the operating element, is captured with the aid of the capturing device.

In an alternative embodiment, the operating element is a part of a switch or a button or a keypad. The operating element can for example be associated with a switch, a button or a keypad, which is disposed in the area of the dashboard of the motor vehicle. It can also be provided that the operating element is a part of a touch-sensitive keypad or a touch-sensitive surface. With the aid of the operating device, different functional devices of the motor vehicle, such as for example an air conditioning system, an entertainment system, an illumination device or the like, can then be controlled.

A motor vehicle according to the invention includes an operating device according to the invention. The motor vehicle is in particular formed as a passenger car. The preferred embodiments presented with respect to the operating device according to the invention and the advantages thereof correspondingly apply to the motor vehicle according to the invention.

Further features of the invention are apparent from the claims, the figures and the description of figures. The features and feature combinations mentioned above in the description as well as the features and feature combinations mentioned below in the description of figures and/or shown in the figures alone are usable not only in the respectively specified combination, but also in other combinations or alone without departing from the scope of the invention. Thus, implementations are also to be considered as encompassed and disclosed by the invention, which are not explicitly shown in the figures and explained, but arise from and can be generated by separated feature combinations from the explained implementations. Implementations and feature combinations are also to be considered as disclosed, which thus do not have all of the features of an originally formulated independent claim. Moreover, implementations and feature combinations are to be considered as disclosed, in particular by the implementations set out above, which extend beyond or deviate from the feature combinations set out in the relations of the claims.

Now, the invention is explained in more detail based on preferred embodiments as well as with reference to the attached drawings.

There show:

Fig. 1 a motor vehicle according to an embodiment of the present invention, which has an operating device;

Fig. 2 a schematic representation of the operating device according to a first embodiment in a sectioned side view;

Fig. 3 a schematic representation of the operating device according to a further embodiment in a sectioned side view;

Fig. 4 a drive device of the operating device according to a first embodiment;

Fig. 5-7 different cross-sectional areas of a lever element of the drive device;

Fig. 8 a drive device according to a further embodiment;

Fig. 9 a drive device according to a further embodiment;

Fig. 10 an operating device according to a further embodiment in a perspective view;

Fig. 11 the operating device according to Fig. 10 in a sectioned side view;

Fig. 12 an operating device according to a further embodiment in a perspective view; and

Fig. 13 an operating device according to a further embodiment in a perspective view.

In the figures, identical and functionally identical elements are provided with the same reference characters.

Fig. 1 shows a motor vehicle 1 according to an embodiment of the present invention in a plan view. Presently, the motor vehicle 1 is formed as a passenger car. The motor vehicle 1 includes an interior 2, in which an operating device 3 is disposed. The operating device 3, which presently is schematically illustrated, includes an operating element 4, which can be operated by an occupant of the motor vehicle 1. Therein, the operating device 3 can be

disposed in the interior 2 of the motor vehicle 1 such that the operating element 4 faces the occupant of the motor vehicle 1.

By the operating device 3, an operating action in the form of the actuation of the operating element 4 can be captured. For this purpose, the operating device 3 has a capturing device 5, which can for example include a touch-sensitive sensor. For example, touch of the operating element 4 with at least one finger or a corresponding input device can be captured by this capturing device 5. Moreover, the position of the touch on the operating element 4 can be recognized by the capturing device 5. Further, the operating device 3 includes a drive device 6, by means of which the operating element 4 can be moved for outputting a haptic feedback to the occupant. If the operating action or the touch of the operating element 4 is recognized by the capturing device, a corresponding control signal can be output to the drive device 6. As a result of the control signal, the drive device 6 can then move the operating element 4.

Fig. 2 shows an operating device 3 according to a first embodiment in a sectioned side view. There, the operating surface 4 is apparent, which has an operating surface 7, which can be operated by the vehicle occupant. The operating surface 4 can for example be a part of a switch, a button or a keypad. It can also be provided that the operating element 4 is formed as a touch-sensitive screen. In addition, the capturing device 5 for capturing the operating action is schematically illustrated. The operating device 3 further includes a housing element 8, at which the operating element 4 is resiliently or movably supported with the aid of corresponding spring elements 9.

The drive device 6 includes an actuator 10, which can be controlled depending on the operating action captured by the capturing device 5. The operating device 3 can for example have a control device not illustrated here, which is connected to the capturing device 5 and to the actuator 10. If the operating action is captured by the capturing device 5, the control device can control the actuator 10 such that it performs an exciting movement. The actuator 10 can for example be a piezoelectric actuator, an electromagnetic actuator or the like. Presently, the actuator 10 is formed as a drive with eccentric rotating mass. By this actuator 10, a rotating movement can be generated as the exciting movement. This is schematically illustrated by the arrow 12.

The drive device 6 further includes a lever element 11, which presently is substantially beam-shaped formed. The lever element 11 has a clamping area 13, at which the lever element 11 is clamped. Moreover, the lever element 11 has a free end 14, at which the

actuator 10 is disposed. Presently, the lever element 11 is connected to a retaining element 15 of the operating element 4 in the clamping area 13. If the exciting movement is provided by the actuator 10, the lever element 11 coupled to the actuator 10 is excited to a movement and in particular to a mechanical oscillation. This is presently illustrated by the arrow 16. Therein, it is in particular provided that a resonant frequency of the lever element 11 is excited by the exciting movement of the actuator 10. Presently, the lever element 11 is excited to an oscillation at the free end 14, the amplitude of which is larger than an amplitude of the exciting movement of the actuator 10. Thus, the exciting movement or the oscillation of the actuator 10 can be enhanced by the lever element 11. This enhanced movement can then be transmitted to the operating element 4 and there be output as a haptic feedback.

Presently, the spring elements 9 are formed as leaf springs, wherein respective main extension directions of the spring elements 9 extend perpendicularly to the operating surface 7 of the operating element 4. By the configuration of the spring elements 9, a direction of movement 17 of the operating element 4 can be preset. Presently, a direction of movement parallel to the operating surface 7 and perpendicular to the main extension direction of the spring elements 9 is allowed.

Fig. 3 shows an operating device 3 according to a further embodiment in a sectioned side view. Therein, the lever element 11 is connected to the housing element 8 in the clamping area 13. Here too, the actuator 10 is located at the opposing free end 14. In an intermediate area 18 between the clamping area 13 and the free end 14, the lever element 11 is connected to the retaining element 15 of the operating element 4. Thus, the movement or oscillation of the lever element 11 can be transmitted to the operating element 4 and be output there as the haptic feedback.

Fig. 4 shows a schematic representation of the drive device 6 according to a further embodiment. Therein, the actuator 10 is disposed at the free end 13 of the lever element 11 with a schematically illustrated fixing element 19. The fixing element 19 can for example be a corresponding clamp. Basically, it is provided that a fixing position, in which the actuator 10 is disposed at the lever element 11, is adjustable. Presently, this is illustrated by the arrow 20. By the fixing position, an oscillation frequency and/or an amplitude of the oscillation of the lever element can be adapted.

Fig. 5 to 7 show different cross-sectional areas for the lever element 11. Therein, Fig. 5 shows a lever element 11 with a rectangular cross-sectional area. Therein, the spatial

extension of the lever element 11 is smaller along a first direction y than along a second direction z. By the geometric configuration of the lever element 11, a preferred oscillation direction along the first direction y can be favored. Compared hereto, Fig. 6 shows a lever element 11 with a rectangular cross-section, wherein an extension of the lever element 11 along the first direction y is larger than along the second direction z. This favors an oscillation of the lever element 11 along the second direction z. Fig. 7 shows a lever element 11 with a round cross-sectional area. In this implementation, the lever element 11 can equally oscillate in all directions y, z.

Fig. 8 shows a drive device 6 according to a further embodiment. Herein, the lever element 11 has a larger outer diameter at the free end 14 than in the clamping area 13. Thereby, the lever element 11 has a larger mass in the area of the free end 14, which can be moved or accelerated by the actuator 10. Thus, compared to a lever element 11 formed cylindrically, higher enhancement of the movement can be achieved.

Fig. 9 shows a drive device 6 according to a further embodiment. Herein, the lever element 11 is hollow-cylindrically formed and has a recess 21. In this recess 21, the actuator 10 is disposed. In this configuration too, the fixing position of the actuator 10 is variable.

Fig. 10 shows the operating device 3 according to a further embodiment in a perspective view. Fig. 11 shows an associated sectioned side view. Therein, the operating element 4 is apparent, which presently is constituted by a touch-sensitive screen. The actuator 10 is connected to the lever element 11 by the fixing element 19 in the form of a clamp at the free end 14. The lever element 11 is connected to the operating surface 4 via the retaining element 15. Here too, the spring elements 9 are formed as leaf springs and allow movement of the operating surface 4 along the direction of movement 17.

Fig. 11 shows the operating device 3 according to further embodiment in a perspective view. Here, the lever element 11 is connected to the operating element4 at a first clamping area 13 and a second clamping area 13'. The first clamping area 13 is associated with a first end of the lever element 11 and the second clamping area 13' is associated with a second end opposing the first end of the lever element 11. The actuator 10 is located in a central area 22 of the lever element 11. The lever element 11 is hollow-cylindrically formed and has a recess 21, in which the actuator 10 is arranged. Fig. 12 shows the operating device 3 according to another embodiment. This operating device 3 differs from the operating device 3 according to Fig. 12 in that the actuator 10 is

connected to the lever element 11 via a coupling element 23.

By the shape and/or the material of the lever element 11, the oscillation behavior of the lever element 11 can be adapted. Further, it can be influenced, how the exciting movement provided by the actuator 10 is enhanced by the lever element 11. Moreover, the oscillation behavior of the operating element 4 can be influenced by the position of the actuator 10, the configuration of the spring elements 9, the length of the lever element 11, the shaping of the lever element 11 or the like. Thus, the haptic feedback can be adapted selected according to operating element 4. It can also be provided that the haptic feedback is adapted depending on in which input position the operating element 4 or the operating surface 7 is touched. Therein, the control signal, by which the actuator 10 is controlled, can be adapted depending on the input position. For example, by a temporal duration of the control and a signal form of the control signal, the haptic feedback can be influenced. With the aid of the control of the actuator 10, an active damping of the oscillation of the lever element 11 and/or the operating element 4 can also be allowed. For example, active damping can be performed by controlling the actuator 10. In particular, the haptic feedback can be provided such that it is identically sensed by the operator in each input position.

Claims

1. Operating device (3) for a motor vehicle (1), including an operating element (4), including a capturing device (5) for capturing an operating input performed at the operating element (4) and including a drive device (6) for outputting a haptic feedback at the operating element (4) depending on the operating input captured by the capturing device (5), wherein the drive device (6) has an actuator (10) for providing an exciting movement,
characterized in that
the drive device (6) has a lever element (11), which can be excited to a movement by the exciting movement of the actuator (10), which has a higher amplitude compared to the exciting movement, wherein the lever element (11) is adapted to transmit the movement to the operating element (4) for outputting the haptic feedback.

2. Operating device (3) according to claim 1,
characterized in that
the lever element (11) has at least one clamping area (13, 13'), in which the lever element (11) is clamped, and the actuator (10) is connected to the lever element (11) in a fixing position, wherein the lever element (11) can be excited to mechanical oscillations by the exciting movement provided by the actuator (10) as the movement.

3. Operating device (3) according to claim 2,
characterized in that
the lever element (11) is clamped at a fist clamping area (13) and the fixing position is arranged at a free end (14) opposing the first clamping area (13) of the lever element (11).

4. Operating device (3) according to claim 3,
characterized in that
the operating device (3) includes a housing element (8), the lever element (11) is

connected to the housing element (8) in the first clamping area (13) and the lever element (11) is connected to the operating element (4) in an intermediate area (18) between the clamping area (13) and the free end (14).

5. Operating device (3) according to claim 2,
characterized in that
the lever element (11) is clamped at a first clamping area (13) and a second clamping area (13') opposing the first clamping area (13) and the fixing position is arranged at a center area (22) of the lever element (11).

6. Operating device (3) according to claim 2 or 3,
characterized in that
the lever element (11) is connected to the operating element (4) in the at least one clamping area (13, 13').

7. Operating device (3) according to any one of the preceding claims,
characterized in that
the operating element (4) is movably supported at the housing element (8) along a predetermined direction of movement (17) by means of at least one spring element (9).

8. Operating device (3) according to any one of the preceding claims,
characterized in that
the actuator (10) is fixed to the lever element (11) in a fixing position by means of a fixing element (19), wherein the fixing position of the actuator (10) at the lever element (11) is variable.

9. Operating device (3) according to any one of the preceding claims,
characterized in that
the capturing device (5) is adapted to capture an input position of the operating action performed at the operating element (4), and a control device of the operating device (3) is adapted to adapt an amplitude and/or a signal form of a control signal for controlling the actuator (10) depending on the input position.

10. Operating device (3) according to claim 9,
characterized in that

the control device is adapted to control the actuator (10) for damping the movement of the lever element (11) and/or the operating element (4).

11. Operating device (3) according to any one of the preceding claims, characterized in that
the operating device (3) has at least one damping element for damping the movement of the lever element (11) and/or the operating element (4).

12. Operating device (3) according to any one of the preceding claims, characterized in that
the lever element (11) is beam-shaped, cylindrically or hollow-cylindrically formed.

13. Operating device (3) according to any one of the preceding claims, characterized in that
the lever element (11) has a recess (21) and the actuator (10) is disposed in the recess (21) at least in certain areas.

14. Operating device (3) according to any one of the preceding claims, characterized in that
the actuator (10) is formed as a drive with an eccentric rotating mass, as an electromagnetic actuator or as a piezoelectric actuator.

15. Motor vehicle (1) with an operating device (3) according to any one of the preceding claims.

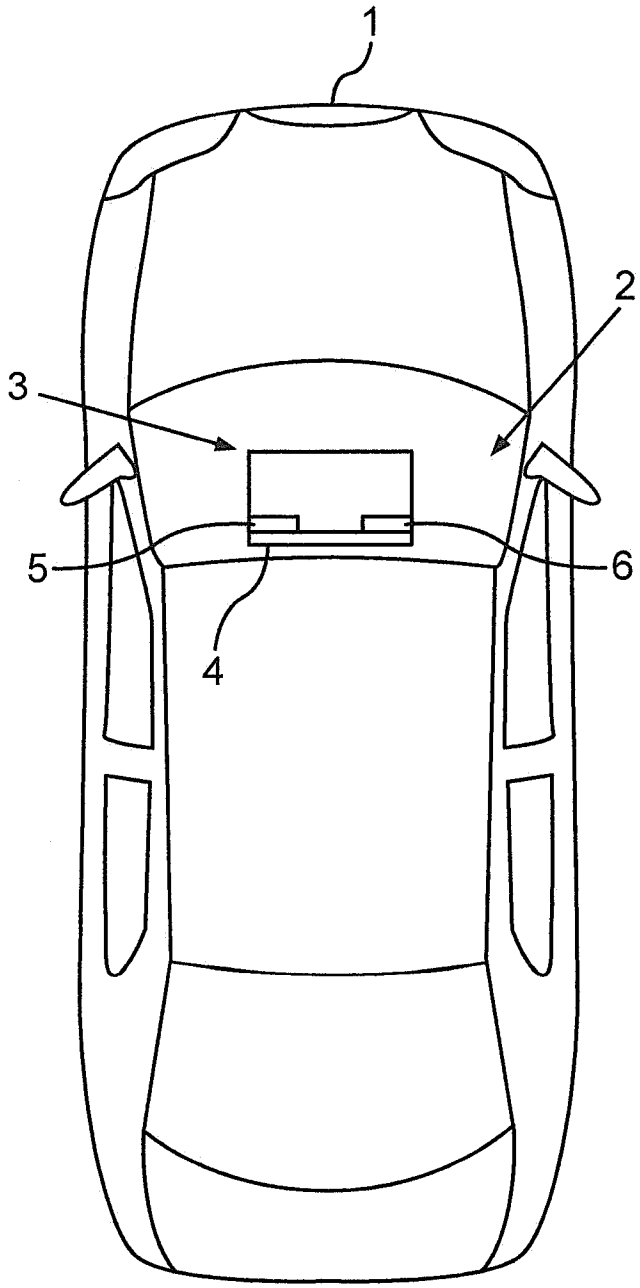


Fig.1

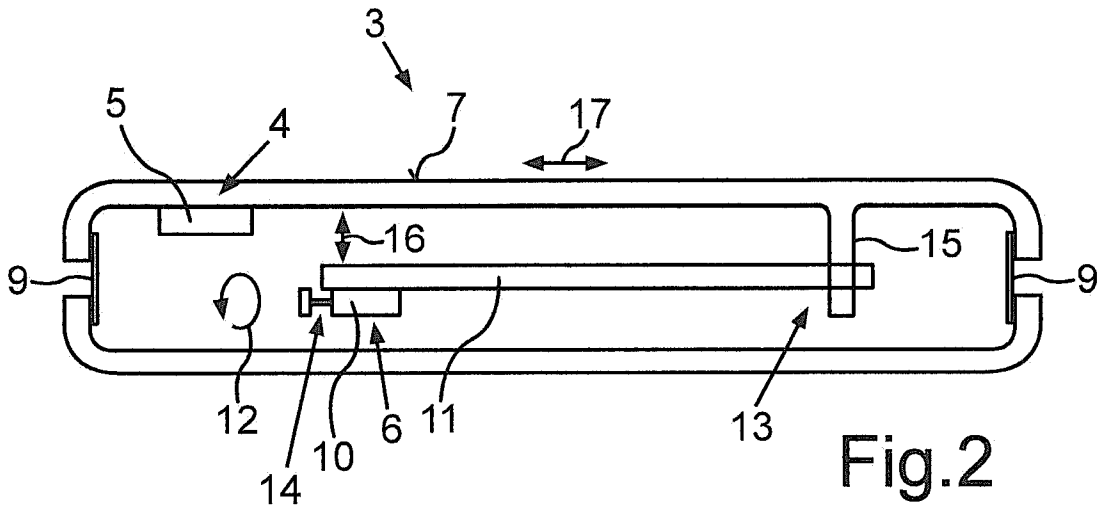


Fig.2

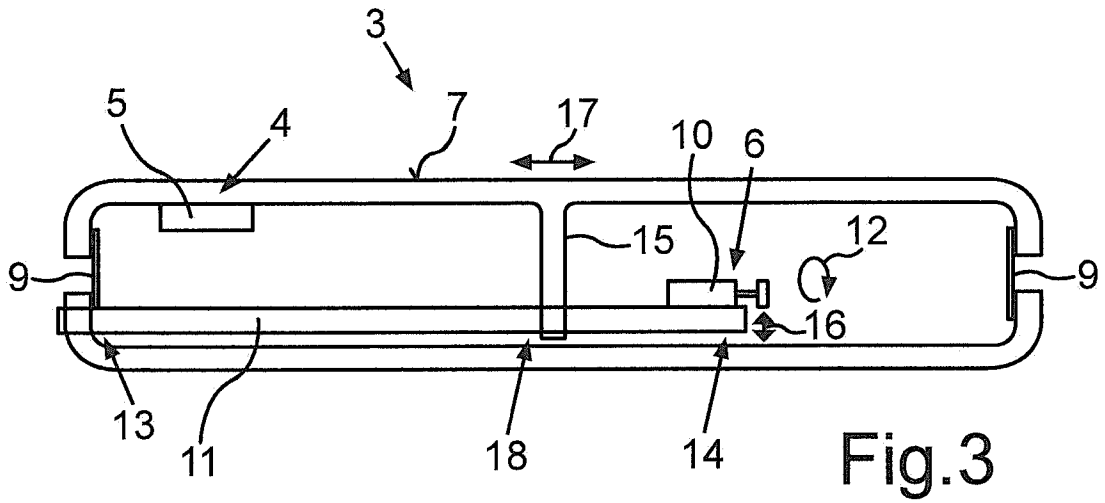


Fig.3

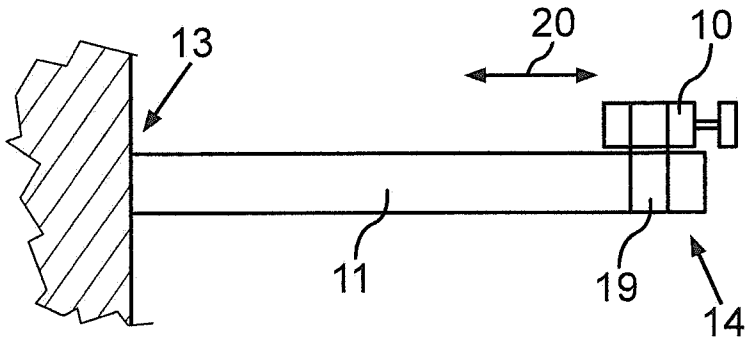


Fig.4

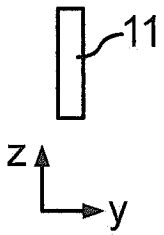


Fig.5

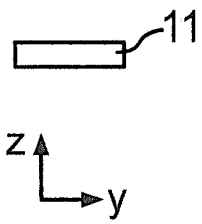


Fig.6

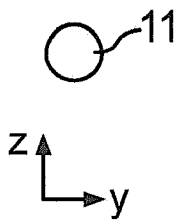


Fig.7

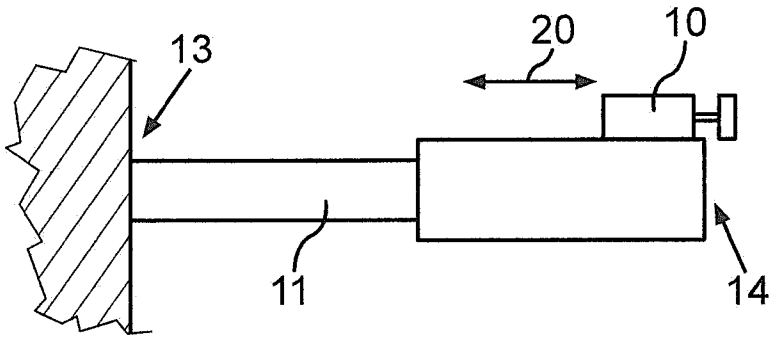


Fig.8

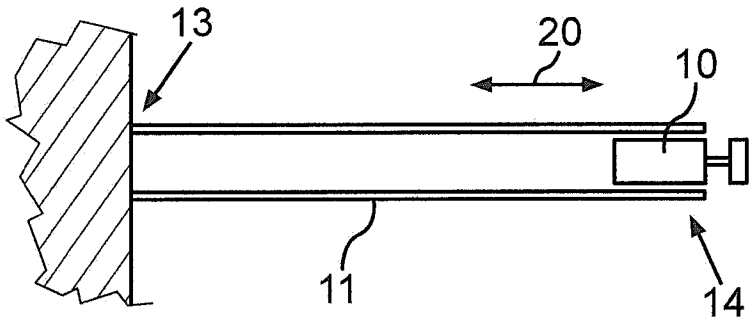


Fig.9

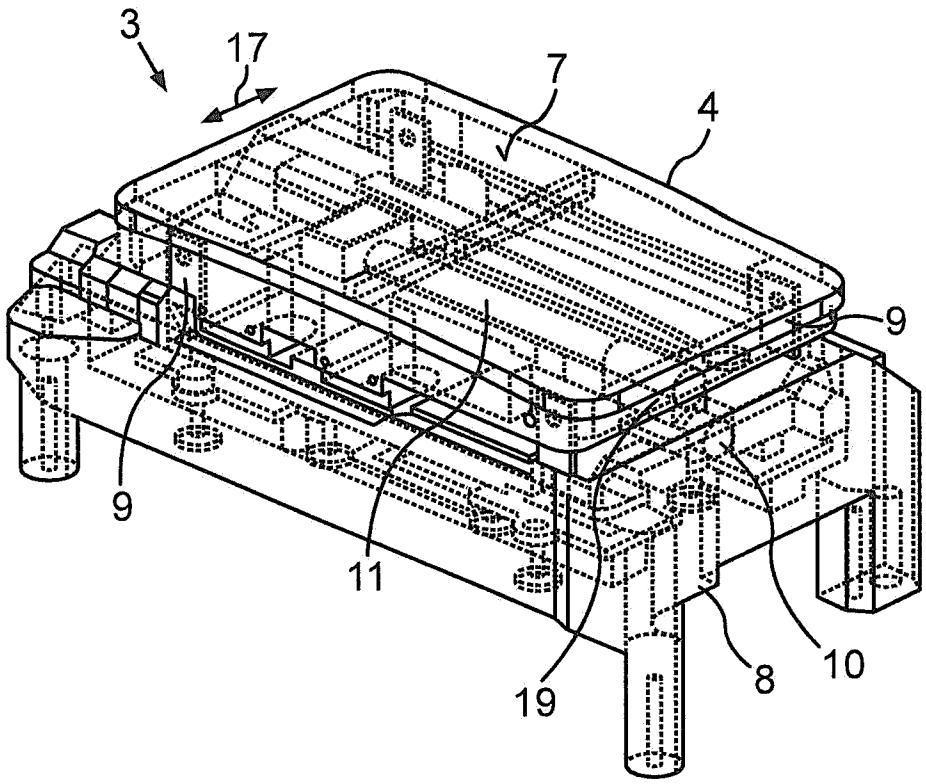


Fig.10

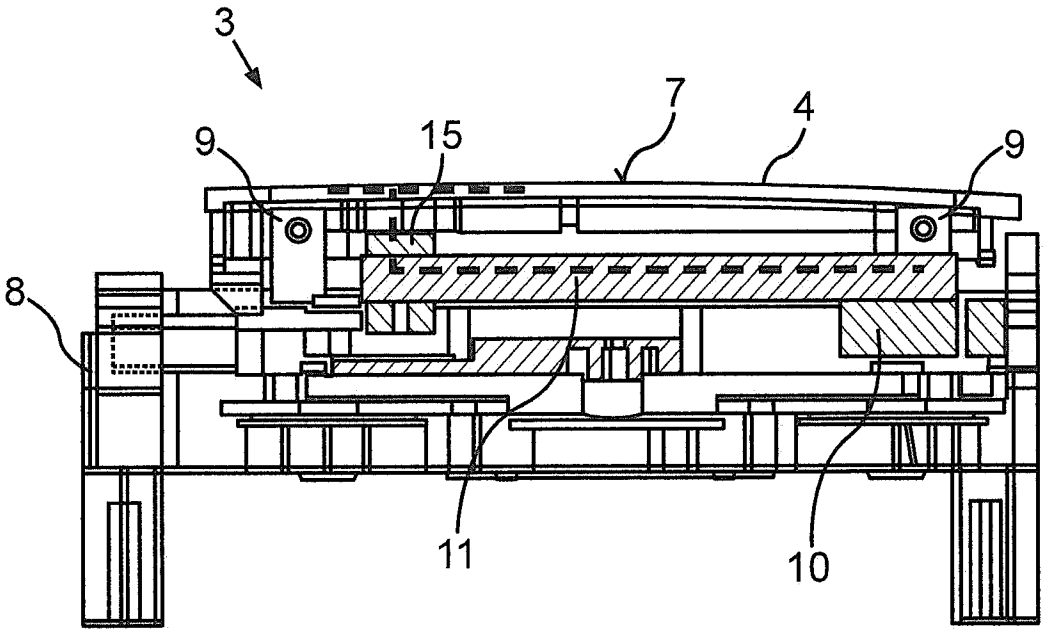


Fig.11

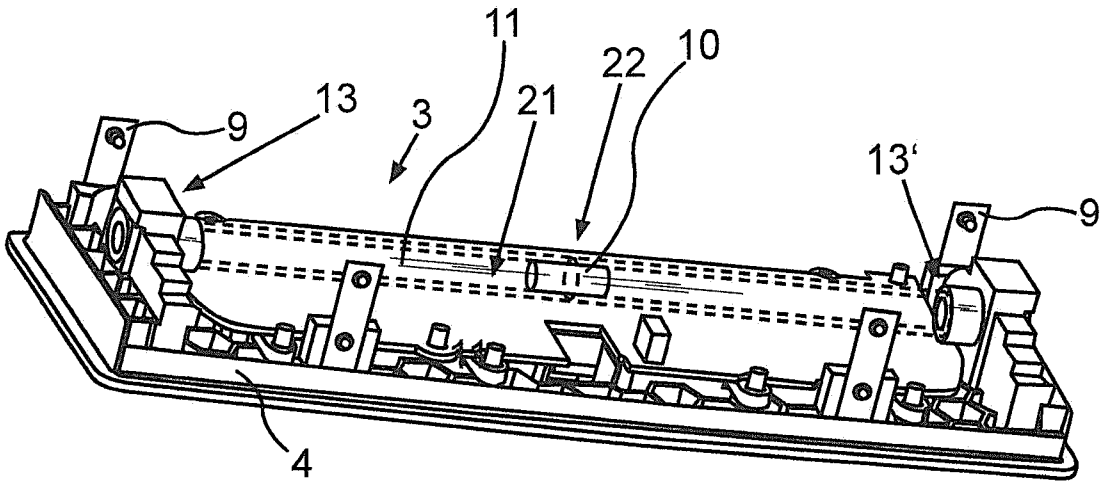


Fig.12

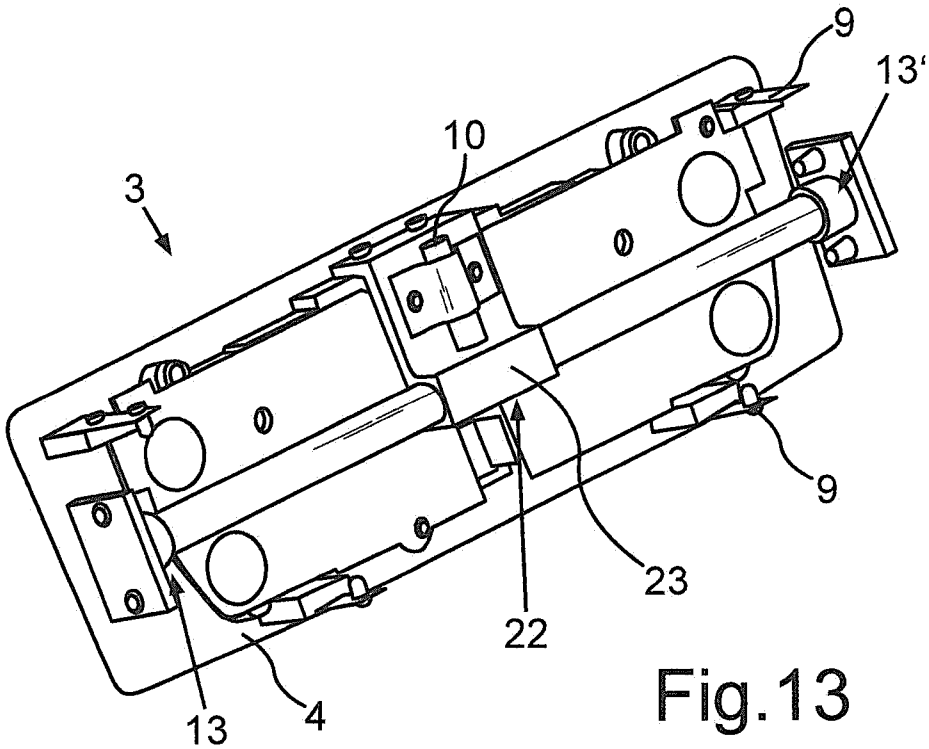


Fig.13

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/066717

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F3/01
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F G05G A63F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP S63 164127 U (NEC ELECTRONIC HOME) 26 October 1988 (1988-10-26)	1-3,5-15
A	the whole document	4
X	US 2007/097073 A1 (TAKASHIMA KOUICHIRO [JP] ET AL) 3 May 2007 (2007-05-03) paragraphs [0050] - [0054]; figures 5-6	1,2,5
X	US 2013/285801 A1 (JUNG HE WON [KR] ET AL) 31 October 2013 (2013-10-31) the whole document	1-6, 8-11,14, 15
Y	US 2015/277562 A1 (BARD BENJAMIN A [US] ET AL) 1 October 2015 (2015-10-01) paragraphs [0039] - [0053]; figures 5-7	1-3,5-15

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 October 2017	30/10/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Suarez Y Gonzalez, R

3

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 6 680 729 B1 (SHAHOIAN ERIK J [US] ET AL) 20 January 2004 (2004-01-20) column 12, line 39 - column 13, line 30; figure 9	8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2017/066717

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