

OPERATIVE SYSTEM FOR A VEHICLE, AND VEHICLE

The present invention relates to an operative system for a vehicle and to a vehicle, for example a military vehicle.

5

In particular, the present invention relates to a weapon system for a military vehicle having a weapon mounted to be orientable in azimuth and elevation, and having a viewing assembly for a user of the weapon. The invention further relates to a military vehicle, for example a tracked tank, having such a weapon system.

10

Conventional viewing assemblies for tracked tanks use periscopes, particularly direct vision periscopes. For this, the document DE 10 2009 030 100 B4 describes a direct vision periscope comprising a basic periscope device having a rotatable viewing head, an ocular box, and an optical transmission segment disposed in a tubular housing and forming an ocular arm together with the same, wherein the basic periscope device and the ocular box are connected to each other by means of the ocular arm to directly optically transmit a scene image to the ocular box. The design of the ocular arm is articulated and variable in length by means of at least one biaxial hinge device and at least one axial length compensation device, wherein the center of rotation of each hinge device is disposed at the focal point of an intermediate image and the corresponding axial length compensation takes place in the parallel beam path.

15

20

25

However, the user, for example the gunner of the weapon, is disadvantageously limited to the view through the direct vision periscope when operating the weapon.

30

Against this backdrop, an object of the present invention is to provide an improved operative system for a vehicle.

According to a first aspect, an operative system for a vehicle is proposed, having:

a sighting means associated with an operative means mounted to be orientable in azimuth and elevation, the sighting means being adapted for acquiring a target area of the operative means, and

a viewing assembly for a user coupled to the sighting means,

5 wherein the viewing assembly has smartglasses coupled to the sighting means for outputting the target area of the operative means acquired by the sighting means.

10 In particular, the sighting means is a camera-based sighting means. In particular, the sighting means is disposed on an outer skin of the vehicle, wherein the viewing assembly is disposed in an interior space of the vehicle.

Preferably, the vehicle is a military vehicle. For example, the military vehicle is a tracked tank having a track drive or a wheeled tank having a wheel drive. Preferably, the vehicle has a platform having a drive, at least one interior space disposed on the platform, a plurality of seats disposed in the interior space for at least one user or operator, and a weapon particularly disposed on an outer skin of the vehicle and mounted to be orientable in azimuth and elevation. The vehicle may also be a fire-fighting vehicle or a roadheader.

20

In particular, acquiring the target area of the operative means is understood to mean acquiring digital images, particularly video images, of the target area of the operative means. Digital images of the target area of the operative means may be provided to the user in the interior space of the vehicle by the sighting means and the viewing assembly coupled to the sighting means. In particular, the acquired digital images may also be pre-processed prior to being displayed by the smartglasses. For example, the user is also able to scroll into the displayed image by means of an input means, for example a joystick.

25

30 The smartglasses may also be referred to as data glasses. By using the smartglasses as part of the viewing assembly, the present operative means combines

the direct coupling of the user to the operative system and the advantages of using digital images in the display by the smartglasses.

According to one embodiment, the viewing assembly comprises a headrest for the user, wherein the headrest is mechanically connected to the smartglasses.

The present embodiment having the headrest as part of the viewing assembly further increases the effect indicated above of directly coupling the user to the sighting means. High-precision work is thereby made possible for the user.

According to a further embodiment, the smartglasses are mounted in a mounting element, wherein the mounting element is mechanically connected to the headrest.

According to a further embodiment, the headrest and the mounting element are formed as a single piece.

The headrest and the mounting element may be produced, for example, by means of injection molding or 3D printing.

According to a further embodiment, the headrest is implemented as a forehead support for the forehead of the user.

According to a further embodiment, the sighting means comprises at least one electro-optical sensor, preferably a plurality of electro-optical sensors, and/or at least one imaging sensor, preferably a plurality of imaging sensors.

According to the present embodiment, the sighting means may use and combine a plurality of different technologies and thus optimize the visual display for the user in the interior space of the vehicle.

According to a further embodiment, the sensor is implemented as a laser or as a laser scanner.

According to a further embodiment, the sighting means comprises at least one stabilized electro-optical sensor, preferably a plurality of stabilized electro-optical sensors, and/or at least one stabilized imaging sensor, preferably a plurality of stabilized imaging sensors. By stabilizing the at least one electro-optical sensor and/or the at least one imaging sensor, uneven ground areas in particular can be compensated for when the vehicle is moving.

According to a further embodiment, the electro-optical sensor is implemented as a camera. Each camera may be implemented, for example, as a video camera, as a daylight camera, as a thermal imaging camera, as an infrared camera, or as a photo camera.

According to a further embodiment, the camera is implemented as a stabilized camera. By stabilizing the camera, uneven ground areas in particular can be compensated for when the vehicle is moving.

According to a further embodiment, the operative system comprises the operative means mounted to be orientable in azimuth and elevation. For the embodiments discussed above, the operative means is not necessarily part of the operative system. For the present embodiment, however, the operative system comprises the operative means. One example of this is a tracked tank comprising a weapon, for example a gun barrel, as the operative means.

According to a further embodiment, the operative system is a weapon system for a military vehicle and the operative means is a weapon mounted to be orientable in azimuth and elevation. The smartglasses of the viewing assembly coupled to the sighting means are therein configured to output the target area of the weapon acquired by the sighting means.

Preferably, the weapon of the weapon system is mounted in a carriage to be orientable in azimuth and elevation. In particular, the weapon is a gun and the sighting means is preferably disposed at or on the gun.

5 According to a further embodiment, the operative system is a fire-fighting system for a fire-fighting vehicle and the operative means is a fire-fighting lance mounted to be orientable in azimuth and elevation. The smartglasses of the viewing assembly coupled to the sighting means are therein configured to output the target area of the fire-fighting lance acquired by the sighting means. In particular,
10 lar, the sighting means is disposed on or at the fire-fighting lance.

According to a further embodiment, the operative means is a working system for a roadheader and the operative means is a boom mounted to be orientable. The smartglasses of the viewing assembly coupled to the sighting means are therein
15 configured to output the target area of the boom acquired by the sighting means. In particular, the sighting means is disposed in the front region, for example in the region of the tip, of the boom of the roadheader.

According to a further embodiment, the sighting means is disposed on or in the
20 vehicle, wherein the viewing assembly coupled to the sighting means is part of a device external to the vehicle.

For the present embodiment, the viewing assembly is not part of the vehicle, but is part of the external device. The external device may, for example, be a building,
25 ing, a building complex, or a different vehicle.

According to a second aspect, a vehicle having an operative system is proposed, wherein the operative system is implemented according to the first aspect or one of the embodiments of the first aspect.

30

In particular, the vehicle is a military vehicle, the operative system is particularly a weapon system for the military vehicle, and the operative means is

particularly a weapon mounted to be orientable in azimuth and elevation. Preferably, the weapon and the sighting means are disposed on an outer skin of the military vehicle, wherein the viewing assembly is disposed in an interior space of the military vehicle. In particular, the military vehicle is implemented as a land vehicle, for example as a tank, or as a ship, for example as a warship.

Furthermore, the vehicle preferably also has a microphone arrangement disposed on the outer skin of the vehicle, configured to output the ambient sounds of the vehicle to the operator in the interior space of the vehicle. The microphone arrangement may also be referred to as a transducer arrangement.

The operator in the interior space therefore has an output by an output device of the vehicle particularly comprising the ambient sounds but not the intrinsic sounds of the vehicle. It is thereby easier, or possible in the first place, depending on the application, for the operator to register ambient sounds, such as the sounds of other vehicles, launching of impacts or dense impacts, or speech in the surrounding area of the vehicle, for example of a tracked tank, and to consider such sounds when operating the vehicle. For example, when the gunner of the weapon of a tracked tank is able to register the sound of a different vehicle by means of the present microphone arrangement, said gunner is able to aim the weapon at said vehicle and engage in combat accordingly. In particular, the output device comprises a plurality of speakers or suitable headphones for outputting the acquired ambient sounds to the user. The ambient sounds may also be referred to as exterior sounds.

The output device may, in addition to the plurality of speakers, also comprise at least one screen coupled to a plurality of cameras disposed on the outer skin of the vehicle for acquiring images of the surrounding area. The output device is thereby able to output not only ambient sounds but also images of the surrounding area to the operator.

According to one embodiment, the microphones of the microphone arrangement are disposed such that sound from a vertical direction, particularly from the direction of the platform having the drive, is more strongly attenuated than sound from a horizontal direction when acquired by the microphone arrangement.

5

The spacing of the microphones and/or the overall height of the microphone arrangement are therein adapted to the particular application, for example to the particular model of the tracked tank. Intrinsic sounds of the vehicle, that is, sound from the vertical direction, can thereby be more strongly attenuated than the ambient sounds, that is, the sound from the horizontal direction.

10

According to a third aspect, a weapon system for a military vehicle is proposed, having:

a weapon mounted to be orientable in azimuth and elevation,

15

a camera-based sighting means associated with the weapon for acquiring a target area of the weapon, and

a viewing assembly for a user of the weapon coupled to the sighting means, wherein the viewing assembly has smartglasses coupled to the sighting means for outputting the target area of the weapon acquired by the sighting means.

20

Further potential implementations of the invention comprise combinations, including such combinations not explicitly stated, of features or embodiments described above or hereafter with respect to the embodiment examples. The person skilled in the art will also add individual considerations as improvements or extensions of each primary form of the invention.

25

Further advantageous embodiments and considerations of the invention are the subject-matter of the subclaims and of the embodiment examples of the invention described hereafter. The invention is further explained in detail using preferred embodiments with reference to the attached figure.

30

Fig. 1 shows a schematic view of an exemplary embodiment of a vehicle;

Fig. 2 shows a schematic view of an exemplary embodiment of a viewing assembly for a vehicle according to Fig. 1;

5 Fig. 3 shows a schematic view of the smartglasses and the mounting element of the viewing assembly according to Fig. 2;

Fig. 4 shows a further schematic view of the smartglasses and the mounting element of the viewing assembly according to Fig. 2;

10

Fig. 5 shows a further schematic view of the mounting element of the viewing assembly according to Fig. 2;

15 In the figures, identical or functionally identical elements are labeled with the same reference numeral unless otherwise indicated.

Fig. 1 shows a schematic view of an exemplary embodiment of a vehicle 10. In the example of Fig. 1, the vehicle 10 is a tracked tank comprising a platform 11 having a track drive 12. An interior space 13 is disposed on the platform 11 of the tracked tank 10, in which users or operators of the tracked tank 10 are accommodated. Accordingly, a plurality of seats 14 for the users of the tracked tank 10 are disposed in the interior space 13. Without limiting generality, the example of Fig. 1 shows a seat 14 for an operator, for example operating the weapon 21 of the tracked tank 10.

25

Furthermore, the vehicle 10 of Fig. 1 has a weapon system 20. The weapon system 20 is an example of the operative system described above. The operative system may, for example, also be a fire-fighting system for a fire-fighting vehicle or a working system for a roadheader.

30

The weapon system 20 of Fig. 1 has a weapon 21 mounted to be orientable in azimuth and elevation and a sighting means 22 associated with the weapon 21 for

acquiring a target area of the weapon 21. In particular, the sighting means 22 is a camera-based sighting means. The sighting means 22 preferably comprises at least one electro-optical sensor, preferably a plurality of electro-optical sensors, and/or at least one imaging sensor, preferably a plurality of imaging sensors. One example of an electro-optical sensor is a camera. One example of an imaging sensor is a lidar.

According to the example of Fig. 1, the sighting means 22 is disposed on the weapon 21, for example a gun. Various other positions are conceivable for the sighting means 22, in particular for such embodiments for which the sighting means 22 comprises a plurality of electro-optical sensors and/or imaging sensors.

Furthermore, the vehicle 10 of Fig. 1 has a viewing assembly 23 coupled to the viewing assembly 22 and disposed in the interior space 13 of the vehicle 10.

An embodiment of the viewing assembly 23 for the vehicle 10 according to Fig. 1 is shown in Figs. 2 through 5.

Fig. 2 shows that the viewing assembly 23 comprises smartglasses 24 for outputting the target area of the weapon 21 acquired by the sighting means 22 and a headrest 25 for the user A. The user A is, for example, a gunner for the weapon 21. The user A places the forehead on the headrest 25 and thereby has the smartglasses 24 directly in the line of sight, and thereby has the acquired target area of the weapon 21, preferably provided by digital images of the sighting means 22, directly in the line of sight.

As shown in Fig. 2, the smartglasses 24 are received in a mounting element 26. Preferably, the mounting element 26 and the headrest 25 are mechanically connected to each other. For example, the headrest 25 and the mounting element 26 may also be formed as a single piece.

In this regard, Fig. 3 shows the smartglasses 24 received in the mounting element 26. Furthermore, Fig. 4 shows a rear view of Fig. 3, and Fig. 5 shows exclusively the mounting element 26.

- 5 Although the present invention has been described using embodiment examples, the invention can be variously modified.

REFERENCE LIST

	10	Vehicle
	11	Platform
5	12	Drive
	13	Interior space
	14	Seat
	15	Outer skin
	20	Operative system, e.g. weapon system
10	21	Operative means, e.g. weapon
	22	Sighting means
	23	Viewing assembly
	24	Smartglasses
	25	Headrest
15	26	Mounting element
	A	User

CLAIMS

1. Operative system (20) for a vehicle (10), having
a sighting means (22) associated with an operative means (21) mounted to
5 be orientable in azimuth and elevation, the sighting means (22) being adapted for
acquiring a target area of the operative means (21), and
a viewing assembly (23) for a user (A) coupled to the sighting means (22),
wherein the viewing assembly (23) has smartglasses (24) coupled to the
sighting means (22) for outputting the target area of the operative means (21) ac-
10 quired by the sighting means (22), wherein the viewing assembly (23) comprises
a headrest (25) for the user (A), wherein the headrest (25) is mechanically con-
nected to the smartglasses (24).
2. The operative system according to claim 1,
15 characterized in that
the smartglasses (24) are mounted in a mounting element (26), wherein the
mounting element (26) is mechanically connected to the headrest (25).
3. The operative system according to claim 2,
20 characterized in that
the headrest (25) and the mounting element (26) are implemented as a single
piece.
4. The operative system according to any one of the claims 1 through 3,
25 characterized in that
the headrest (25) is implemented as a forehead support for the forehead of the
user (A).
5. The operative system according to any one of the claims 1 through 4,
30 characterized in that

the sighting means (22) comprises at least one electro-optical sensor, preferably a plurality of electro-optical sensors, and/or at least one imaging sensor, preferably a plurality of imaging sensors.

- 5 6. The operative system according to any one of the claims 1 through 4, characterized in that
the sighting means (22) comprises at least one stabilized electro-optical sensor, preferably a plurality of stabilized electro-optical sensors, and/or at least one stabilized imaging sensor, preferably a plurality of stabilized imaging sensors.

10

7. The operative system according to claim 5 or 6, characterized in that
the electro-optical sensor (22) is implemented as a camera.

- 15 8. The operative system according to claim 7, characterized in that
the camera (22) is implemented as a video camera, in particular as a daylight camera or as a thermal imaging camera.

- 20 9. The operative system according to any one of the claims 1 through 8, characterized in that
the operative system (20) comprises the operative means (21) mounted to be orientable in azimuth and elevation.

- 25 10. The operative system according to any one of the claims 1 through 9, characterized in that
the operative system (20) is a weapon system for a military vehicle (10) and the operative means (21) is a weapon mounted to be orientable in azimuth and elevation, wherein the smartglasses (24) of the viewing assembly (23) coupled to the
30 sighting means (22) are configured to output the target area of the weapon (21) acquired by the sighting means (22).

11. The operative system according to any one of the claims 1 through 9,
characterized in that

the operative system (20) is a fire-fighting system for a fire-fighting vehicle and
the operative means (21) is a fire-fighting lance mounted to be orientable in azi-
5 muth and elevation, wherein the smartglasses (24) of the viewing assembly (23)
coupled to the sighting means (22) are configured to output the target area of the
fire-fighting lance acquired by the sighting means (22).

12. The operative system according to any one of the claims 1 through 9,
10 characterized in that

the operative means (20) is a working system for a roadheader and the operative
means (21) is a boom mounted to be orientable, wherein the smartglasses (24) of
the viewing assembly (23) coupled to the sighting means (22) are configured to
output the target area of the boom acquired by the sighting means (22).

13. The operative system according to any one of the claims 1 through 12,
characterized in that

the sighting means (22) is disposed on or in the vehicle (10), wherein the viewing
assembly (23) coupled to the sighting means (22) is part of a device external to
20 the vehicle (10).

14. A vehicle (10) having an operative system (20) according to any one of the
claims 1 through 12.