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(54) **TRANSPORTATION DEVICE FOR TRANSPORTING AT LEAST ONE MOBILE ELECTRIC SIGNALING DEVICE AND MOBILE SIGNALING DEVICE AND SYSTEM**

(57) The invention is concerned with a transportation device (10) for transporting at least one mobile electric signaling device (12), wherein each signaling device (12) is designed for being placed on a ground (16) on or next to a road and wherein the transportation device (10) comprises a platform (11) for arranging each signaling device (12) during the transport. The invention is characterized in that a wireless power charging unit (13) is integrated into the platform (11), the wireless power charging unit (13) being designed for charging a respective electric energy storage (24) of the at least one signaling device (12) by inductive charging while the at least one signaling device (12) is standing on the platform (11).

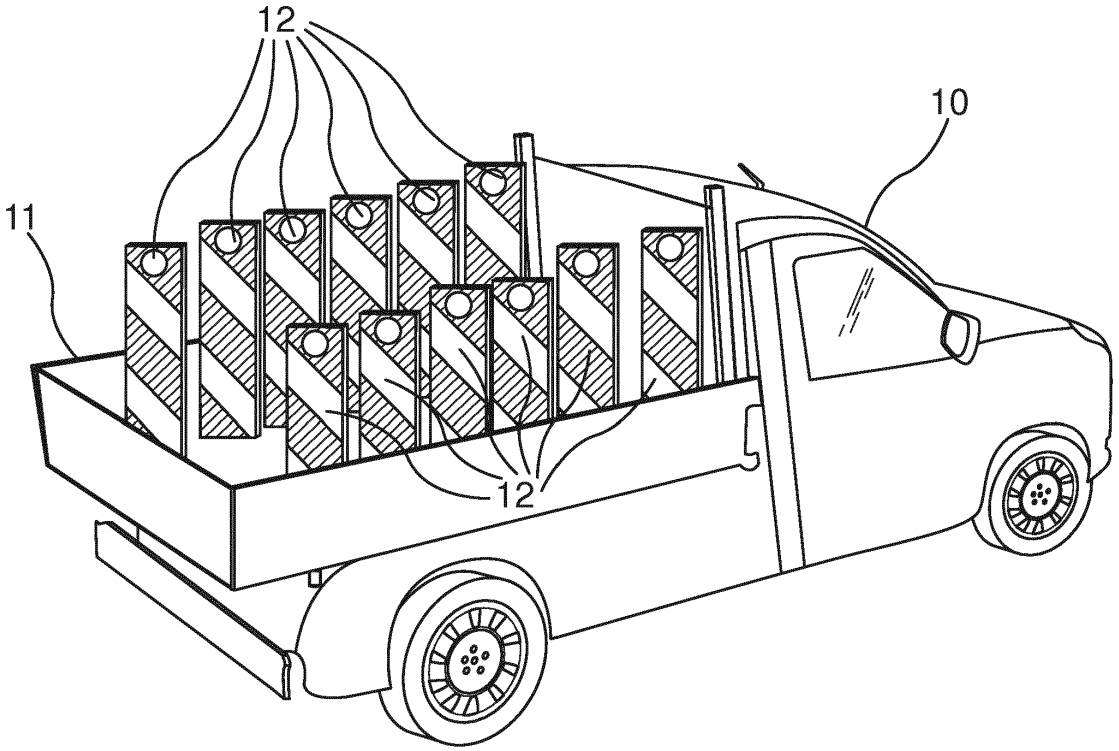

Fig. 1

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Description

[0001] The invention is concerned with a transportation device like, e.g., a van or a truck. The transportation device is designed for transporting at least one mobile electric signaling device like, e.g., a traffic beacon. For transporting the at least one signaling device, each signaling device may be placed or arranged on a platform of the transportation device. The invention is also concerned with a signaling device that may be designed as a traffic beacon. A combination of the transportation device and at least one signaling device is claimed in the form of a system.

[0002] A traffic beacon is a mobile, signaling device that may be positioned on a ground on or next to a road in order to mark a dangerous section of the road, e.g. a road damage or roadworks. In order to increase the visibility of a traffic beacon, an electric signaling light may be integrated into or attached to the traffic beacon. In order to power the electric signaling light, the traffic beacon may comprise an electric energy storage, like e.g. a battery.

[0003] As a traffic beacon is mobile or portable, it may be transported to a dangerous road section by means of a transportation device that can be, e.g. , a van or a truck. Once the transportation device reaches the place where the traffic beacon shall be used, the traffic beacon can be unloaded and moved or placed onto the ground on or next to the road for e.g. marking the dangerous road section. Once the traffic beacon is not needed anymore, it may be transported to another road section.

[0004] However, in between the usages of the traffic beacon, its energy storage has to be recharged. Generally, this implies that the traffic beacon has to be returned back to a storage center first where the equipment for charging the battery is available. This implies that in between two usages of the traffic beacon, time is lost during which the battery is transported back and recharged. Additionally, in order to make the transportation device available again, the traffic beacon has to be unloaded from the transportation device for recharging the battery. This makes handling a traffic beacon inefficient.

[0005] A similar case is given by temporal mobile traffic lights. They can be used at crossroads, where the regular traffic light is out of order or not yet installed. In general, any mobile electric signaling device that is designed for being placed on the ground on or near a road may cause the problem that recharging its battery is time-consuming and demands unloading the signaling device from the transportation device.

[0006] It is an object of the present invention to provide means for efficiently handling at least one mobile electric signaling device like, e.g., a traffic beacon.

[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 figure.

[0008] One aspect of the invention is a transportation device for transporting at least one mobile electric signaling device. The transportation device can be a van or a truck. A signaling device according to the invention is in general an electric device for marking a part of a road, e.g. a construction site for roadworks or a damaged road section. Such a signaling device is designed for being placed on a ground on or next to a road, e.g. for marking a dangerous or critical road segment, like roadworks or a road damage. Alternatively, a signaling device may be for controlling traffic and/or monitoring traffic.

[0009] The inventive transportation device comprises a platform for arranging or storing each signaling device during the transport. Such a platform may be, for example, a floor covered with planks or boards made of e.g. wood.

[0010] For increasing the efficiency of handling the at least one electric signaling device, a wireless power charging unit is integrated into the platform. The wireless power charging unit is designed for charging an electric energy storage of the at least one signaling device by inductive charging. The charging may take place, while the at least one signaling device is standing on the platform. The wireless power charging unit may comprise at least one electromagnetic coil that may be integrated into the platform. By means of a time varying electric current, e.g. an alternating current AC, a time varying magnetic flux may be generated by one electromagnetic coil. In the signaling device, the magnetic flux may be converted into electric power by a wireless power receiver of the signaling device. Such a wireless power receiver may be based on at least one electromagnetic coil.

[0011] The invention provides the advantage that the respective energy storage in the at least one electric current signaling device may be recharged with electric energy while the signaling device is standing on the platform of the transportation device and is transported to e.g. a dangerous road section or between two dangerous road sections. There is no need to return the signaling device to a central storage and to unload the at least one signaling device from the transportation device. Thus, no time is lost for recharging the energy storage of the at least one signaling device.

[0012] The invention also comprises optional embodiments that provide features which afford additional technical advantages.

[0013] In one embodiment, the wireless power charging unit is integrated into a floor of the platform. The at least one signaling device may thus stand on top of the wireless power charging unit. While the signaling device is stand in the ground of the platform, this provides for a reliable transmission of the energy from the wireless power charging unit to the respective wireless power receiver of each signaling device.

[0014] In one embodiment each signaling device comprises a foot piece that is designed for standing on the ground. Such a foot piece may comprise a weight and/or a floor contacting area for stabilizing the standing position

of the respective signaling device. The platform of the transportation device is designed for placing each signaling device in a pre-defined standing position in which each signaling device is standing on its foot piece during the transport. In other words, the at least one signaling device may be arranged on the platform in the same standing position that is also its position on the ground. This provides for a stable stand or positioning of the at least one signaling device. The signaling device is thus self-standing.

[0015] In one embodiment the transportation device comprises an electric energy storage and/or an electric generator for providing energy to the wireless power charging unit. The wireless power charging device may be provided with energy by the transportation device is driving or moving.

[0016] In one embodiment the transportation device comprises an electric connecting unit for connecting its wireless power charging unit to a stationary power supply while the transportation device is in a parking position. The connecting unit may comprise a cable and/or a plug or a socket. The stationary power supply may be an electric power network or electric grid. This yields the advantage that the amount of energy is not limited to the capacity of an energy storage and/or fuel tank of the transportation device.

[0017] In one embodiment the platform is flat or even such that the at least one signaling device is movable on the platform by pushing. This allows for arranging the at least one signaling device in a predefined charging position without any requirement of lifting the at least one signaling device. Thus, even a signaling device with a weight larger than 20 kg can be handled by a person without any lifting required.

[0018] In one embodiment the platform comprises at least one marked area underneath which at least one electromagnetic coil of the wireless power charging unit is positioned. The at least one coil can thus be completely covered by a floor of the platform. This protects the at least one coil from damage. Nevertheless, although the at least one coil is covered and thus not easily visible, the at least one signaling device may be correctly arranged in said charging position by placing them relative onto the marked area. Preferably the wireless power charging unit provides electromagnetic coils only underneath the marked area and in no other area. This prevents damage from accidental induction of electric energy into other objects that may be placed outside the at least one marked area.

[0019] In one embodiment a charging level monitoring unit is provided, wherein the charging level monitoring unit is designed to monitor and visually and/or acoustically indicate an individual charging level of the at least one signaling device while the at least one signaling device is positioned on the platform. The charging level monitoring unit may be based on a charging level monitoring unit as is known from the prior art. By providing the charging level monitoring unit in the transportation device, a user can see which signaling device is ready for unloading und usage.

[0020] In one embodiment the transportation device is designed for hosting and charging not only one signaling device, but several signaling devices at a time at once. This allows for transporting several signaling devices to a large road section that demands for several signaling devices and/or to several dangerous road sections.

[0021] According to one embodiment, the transportation device is designed for transporting as a respective signaling device: a signal beacon or a signal lamp (for marking a road section) or a transportable traffic light (for controlling traffic) or a radar device (for monitoring traffic) . The transportation device provides the advantage that at least one signaling device of said type may be used in a road network continuously, as no recharging in a central storage is needed.

[0022] In one embodiment the transportation device is designed as a flatbed truck, a pickup truck, a box truck or a truck trailer or a van. In these cases, the platform is a load floor for placing or arranging load or freight. In general, the transportation device comprises wheels. The transportation device may therefore be driven or towed.

[0023] The invention is also concerned with a mobile signaling device that may be placed on or next to a road on the ground. The signaling device comprises an electrical energy storage for powering at least one electric signal sending element. Such a signal sending element may be a lamp or a radar transceiver or a radio transmitter circuit for sending radio signals. The inventive signaling device comprises a wireless power receiving unit for inductively charging the energy storage. The wireless power receiving unit may be designed in the above-described way. The inventive signaling device provides the advantage that the energy storage may be recharged while the signaling device is transported with a transportation device of the described inventive design.

[0024] In one embodiment the signaling device comprises a foot piece that is designed for standing on the ground, wherein at least one electromagnetic receiving coil of the wireless power receiver is positioned inside the foot piece.

[0025] In one embodiment the signaling device is a signal beacon or a transportable traffic light or a radar device or a signal lamp.

[0026] The invention also comprises the combination of the transportation device and at least one signaling device. This results in the inventive system comprising a transportation device according to the invention and at least one signaling device according to the invention.

[0027] In the following, an exemplary implementation of the invention is described. The figures show:

Fig. 1 a schematic illustration of a perspective view of an embodiment of the inventive transportation device with several signaling devices on a platform;

Fig. 2 a schematic illustration of a top view of the platform without the signaling devices;

Fig. 3 a schematic illustration of a perspective view of several signaling devices of different types;

Fig. 4 a schematic illustration of a perspective view of an electric connecting unit that may be provided in the transportation device of Fig. 1; and

Fig. 5 a schematic illustration of a sectional view of the platform of the transportation device of Fig. 1.

[0028] 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.

[0029] In the figures elements that provide the same function are marked with identical reference signs.

[0030] Fig. 1 shows a transportation device 10 that can be designed as a pickup truck or a platform truck or a van. The transportation device 10 comprises a platform 11 for transporting a load or freight. The transportation device 10 can be used for transporting electric signaling devices 12. Each signaling device 12 can be, e.g., a bright beacon or a signal beacon or signal lamp. The signaling devices 12 can be transported by means of the transportation device 10. During transportation, the signaling devices 12 can stand upright in their normal usage position on the platform 12.

[0031] Fig. 2 shows a top view of the platform 11 without the signaling devices 12 loaded on top of the platform 11. In the platform 11, a wireless power charging unit 13 may be integrated. Marked areas 14 may indicate, where at least one electromagnetic coil of the wireless power charging unit 13 is provided or positioned.

[0032] Fig. 3 illustrates several different embodiments of a signaling device 12. A signaling device 12 may comprise a foot piece 15 on which the respective signaling device 12 may stand on a floor or ground 16.

[0033] Fig. 4 illustrates that the transportation device 10 may comprise a connecting unit 17 for connecting the wireless power charging unit 13 of the transportation device 10 to a stationary power supply 18. The power supply 18 may comprise a socket 19 for connecting an electric cable 20 that may conduct an electric current to the connecting unit 13. The power supply 18 may be provided by an electricity network or an electric power network.

[0034] The wireless power charging unit 13 may also be supplied with electric power from an energy storage and/or an electric generator of the transportation device 10.

[0035] Fig. 5 illustrates by means of a sectional view, how the wireless power charging unit 13 may comprise at least one electromagnetic coil 21 that may be placed underneath a surface 22 of platform 11. An electric current through the coil 21 may be controlled by a power electronics module 23. The power electronics module 23 may be supplied with electric energy from the connecting unit 17 and/or the energy storage and/or the generator of the transportation device 10. The power electronics module 23 may be designed as is known from the prior art.

[0036] Fig. 5 illustrates how the foot piece 15 of a signaling device 12 may be placed on top of the coil 21. Inside the foot piece 15 a wireless power receiving unit 23 may generate an electric current from the magnetic flux generated by the coil 21. To this end, the wireless power receiving unit 23 may comprise at least one electromagnetic coil. By means of the electric current from the coil, an energy storage 24 of the signaling device 12 may be recharged.

[0037] The energy storage 24 may then provide electric energy for driving a signal sending element 25, like, e.g., a lightbulb or a light-emitting diode arrangement. The sending element 25 can thus be supplied with electric energy after the signaling device 12 is removed from platform 11 and positioned e.g. on a ground 16 on a road or next to a road (see Fig. 3).

[0038] While positioned on platform 11, the signaling devices 12, like bright beacons, can thus be charged using the wireless power charging unit 13, when an engine of the transportation device is switched on and drives said generator and/or when the transportation device is e.g. in a garage and the connecting unit 17 is connected to an electricity network.

[0039] The advantage is that charging the battery of a bright beacons signaling or in general a signaling device can be accomplished automatically and without unloading a signaling device from the transportation device, like, e.g., a van. The battery of a signaling device may also be charged automatically while moving it between two working points, e.g. a road segments.

[0040] By means of the transportation device 10 and the signaling devices 12 equipped with the wireless power receiving unit 23, charging is possible using wireless power charging technology without moving a signaling device 12 from the platform 11 of a transportation device 12. The solution is to install in the bottom of the signaling device 12 a wireless power receiving unit or receiver which will charge the energy storage 24. This receiving unit 23 will generate the electric current from one transmitter (i.e. coil 21) which will be placed on the floor of the transportation device, where the signaling device 12 is placed.

[0041] Monitoring the charging status of each signaling device 12 may also be automated by means of a monitoring unit 26.

[0042] Overall, the example shows how bright beacon signaling may be charged using wireless power charging technology.

Reference signs

[0043]

10	transportation device
11	platform
12	signaling device
13	charging unit
14	marked area
15	foot piece
16	ground
17	connecting unit
18	power supply
19	socket
20	cable
21	electromagnetic coil
22	surface
23	power electronics module
24	energy storage
25	signal sending element

Claims

1. Transportation device (10) for transporting at least one mobile electric signaling device (12), wherein each signaling device (12) is designed for being placed on a ground (16) on or next to a road and wherein the transportation device (10) comprises a platform (11) for arranging each signaling device (12) during the transport, **characterized in that** a wireless power charging unit (13) is integrated into the platform (11), the wireless power charging unit (13) being designed for charging a respective electric energy storage (24) of the at least one signaling device (12) by inductive charging while the at least one signaling device (12) is standing on the platform (11).

2. Transportation device (10) according to claim 1, wherein the wireless power charging unit (17) is integrated in a floor (22) of the platform (11).

3. Transportation device (10) according to any of the preceding claims, wherein each signaling device (12) comprises a foot piece (15) that is designed for standing on the ground (16) and wherein the platform (11) is designed for placing each signaling device (12) during the transport in a pre-defined standing position in which each signaling device (12) is standing on its foot piece (15).

4. Transportation device (10) according to any of the preceding claims, wherein the transportation device (10) comprises an electric energy storage and/or an electric generator for providing energy to the wireless power charging unit (13).

5. Transportation device (10) according to any of the preceding claims, wherein the transportation device (10) comprises an electric connecting unit (17) for connecting the wireless power charging unit (13) to a stationary power supply (18) while the transportation device (10) is in a parking position.

6. Transportation device (10) according to any of the preceding claims, wherein the platform (11) is flat such that the at least one signaling device (12) is movable on the platform (11) by pushing.

7. Transportation device (10) according to any of the preceding claims, wherein the platform (11) comprises at least one marked area (14) underneath which at least one electromagnetic coil (21) of the wireless power charging unit (13) is positioned.

8. Transportation device (10) according to any of the preceding claims, wherein a charging level monitoring unit (26) is provided, wherein the charging level monitoring unit (26) is designed to monitor and visually and/or acoustically indicate an individual charging level of the at least one signaling device (12) while the at least one signaling device (12) is positioned on the platform (11).

9. Transportation device (10) according to any of the preceding claims, wherein the transportation device (10) is designed for hosting and charging several signaling devices (12) of a pre-defined type at once.

10. Transportation device (10) according to any of the preceding claims, wherein transportation device (10) is designed for transporting as a respective signaling device (12): a signal beacon or a transportable traffic light or a radar device or a signal lamp.

11. Transportation device (10) according to any of the preceding claims, wherein the transportation device (10) comprises wheels and is preferably designed as a flatbed truck, pickup truck, box truck or a truck trailer or a van, wherein the platform (11) is the a load floor.

12. Mobile signaling device (12) for placing on a ground (16) on or next to a road, where in the signaling device (12) comprises an electric energy storage (24) for powering at least one electric signal sending element (25), **characterized in that** the signaling device (12) comprises a wireless power receiving unit (23) for inductively charging the energy storage (24).

13. Signaling device (12) according to claim 12, wherein the signaling device (12) comprises a foot piece (25)

that is designed for standing on a ground (16) and wherein at least one electromagnetic receiving coil of the wireless power receiving unit (23) is positioned inside the foot piece (15).

14. Signaling device (12) according to claim 12 or 13, wherein the signaling device (12) is a signal beacon or a transportable traffic light or a radar device or a signal lamp.

15. System comprising a transportation device (10) according to any of claims 1 to 11 and at least one signaling device (12) according to any of claims 12 to 14.

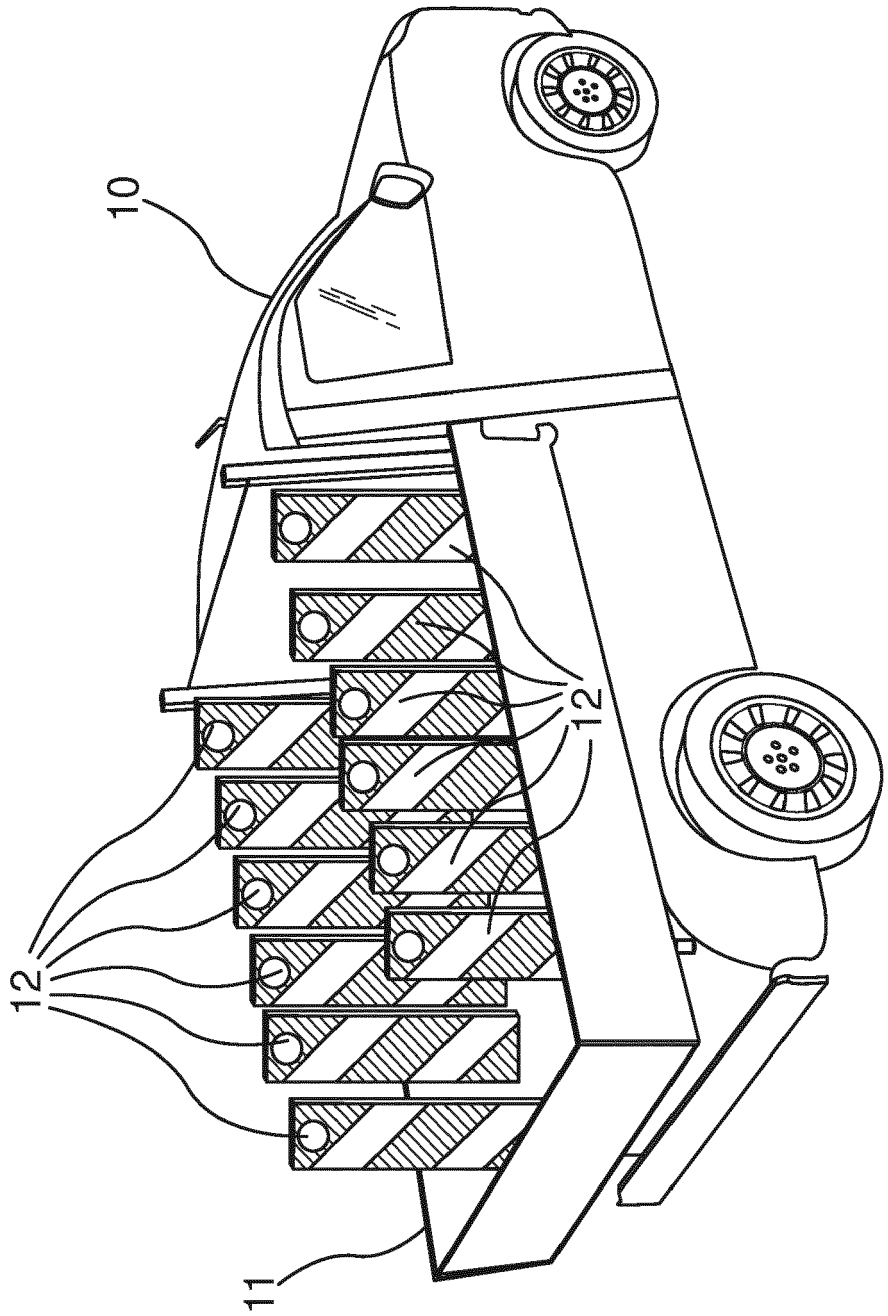

Fig. 1

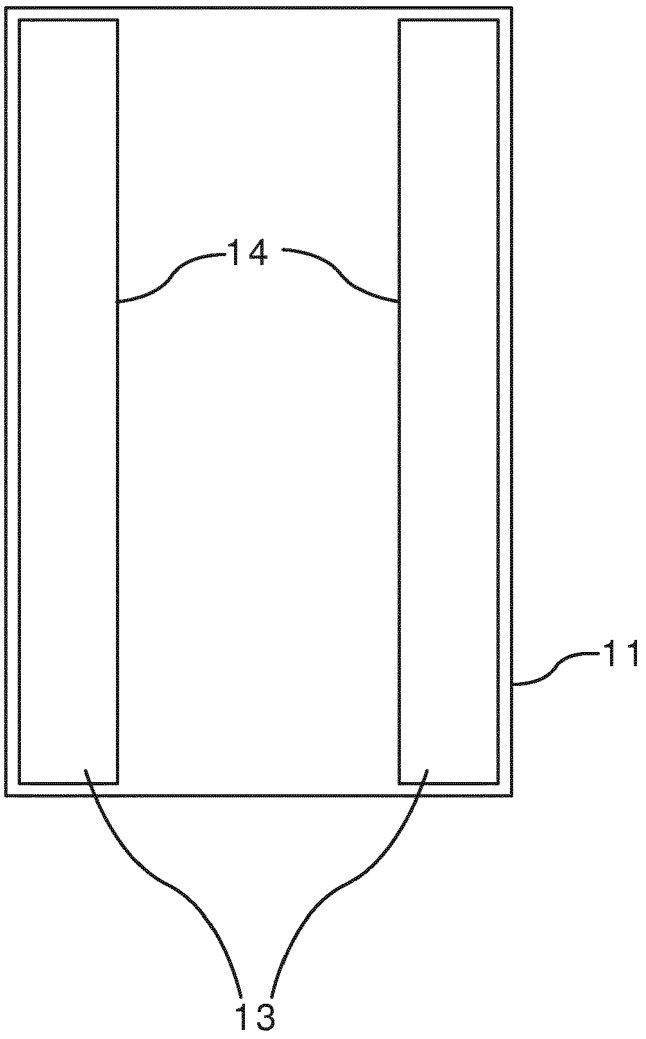

Fig.2

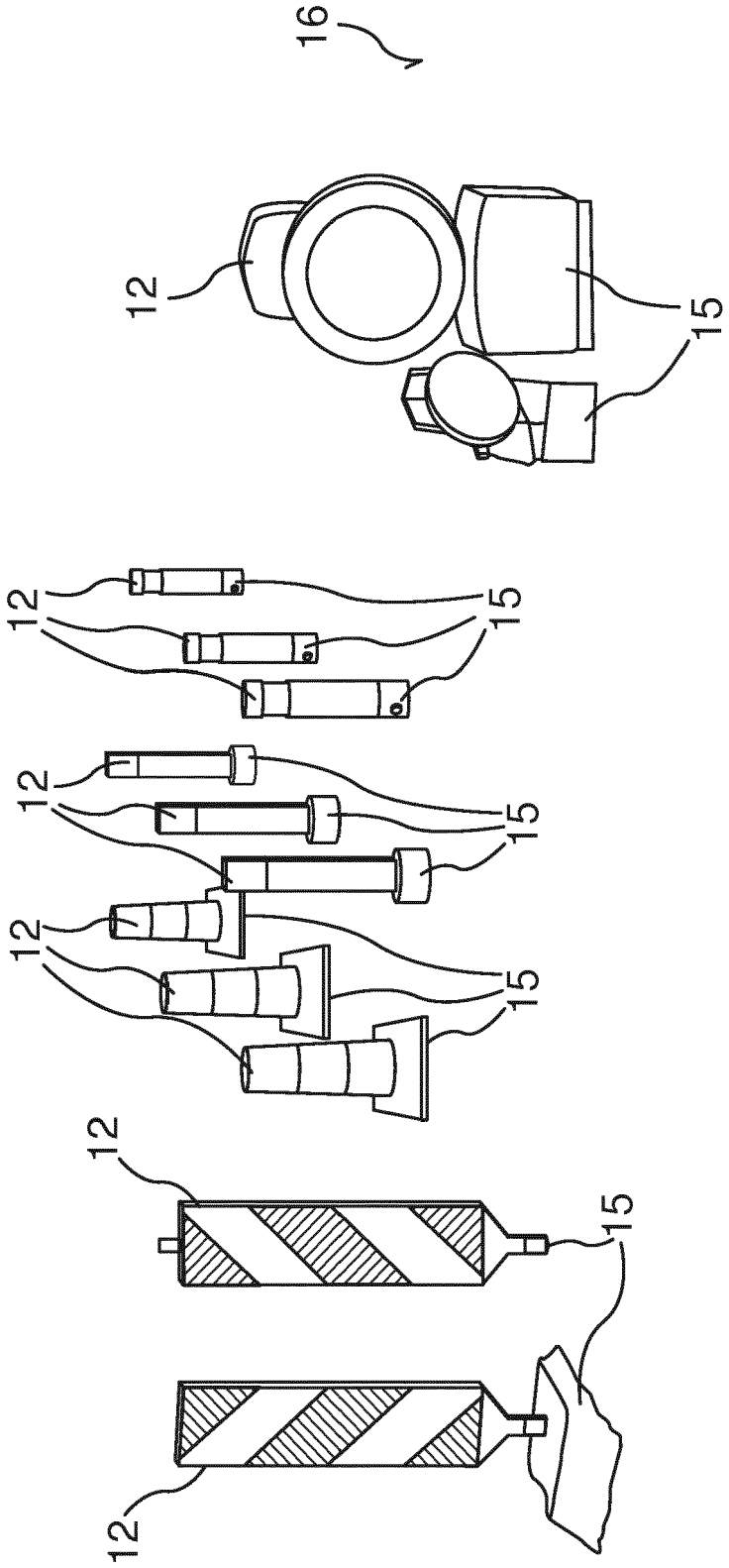

Fig.3

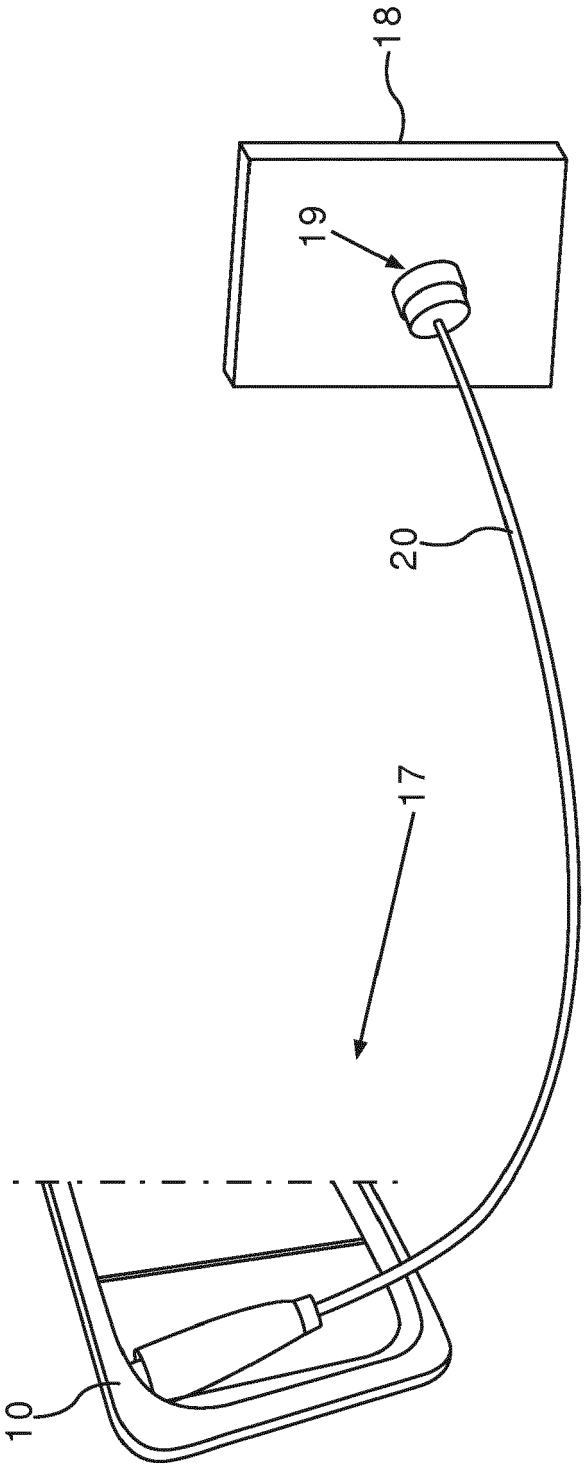

Fig. 4

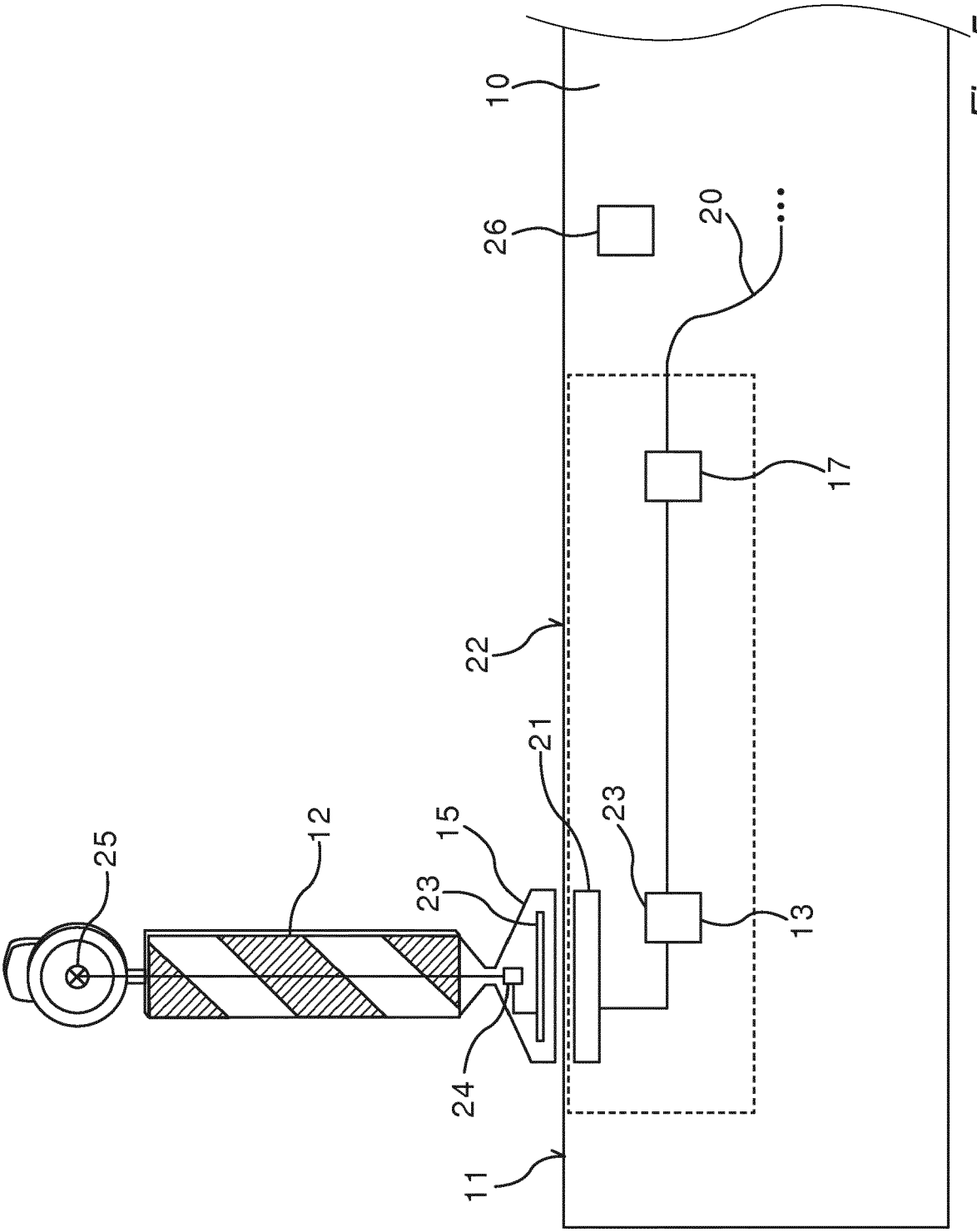

Fig.5

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EUROPEAN SEARCH REPORT

Application Number
EP 17 46 5537

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 7 088 222 B1 (DUEKER KENNETH S [US] ET AL) 8 August 2006 (2006-08-08) * the whole document * -----	1-15	INV. E01F9/688 B60P3/00 E01F9/70
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X	DE 91 01 806 U1 (LIEBENDÖRFER R [DE]) 8 May 1991 (1991-05-08) * page 4, line 34 - page 5, line 15 * * page 6, line 27 - page 8, line 8; figures 1,2 * -----	1-4,6, 9-15	
A	FR 2 855 798 A1 (CSM CHAUDRONNERIE DE SAINT MAR [FR]) 10 December 2004 (2004-12-10) * page 6, lines 7-26; figures 1-3 * -----	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

E01F
B60P
B60Q
F21W

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 January 2018	Flores Hokkanen, P

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