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(54) **AN APPARATUS AND METHOD FOR EMITTING LIGHT TO DIRECT TRAFFIC**

(57) Apparatus (200) for emitting light to direct or control road traffic includes a container (202). A laser source (204) emits a laser beam (206) into the container (202). The container (202) holds a substance (208) for dissipat-

ing the laser beam (206) emitted into the container (202) by the laser source (204). The container (202) has a transparent wall (212) through which the dissipated laser light can pass.

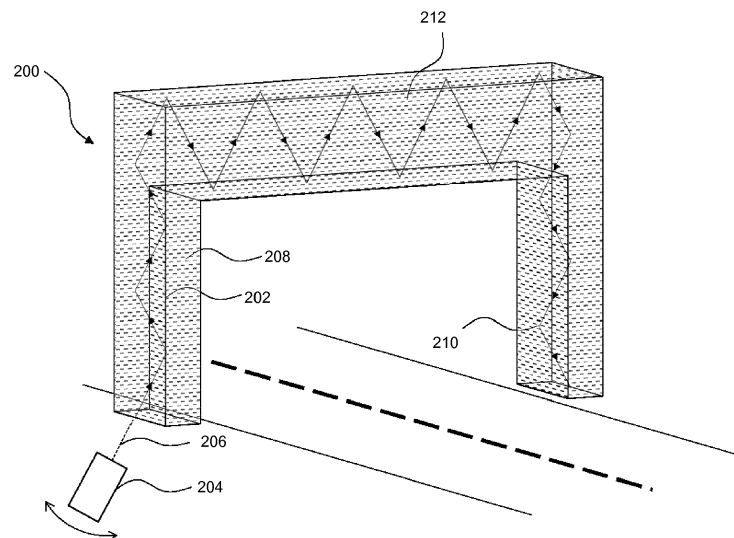


Figure 2

Description

Technical Field

[0001] The present disclosure relates to an apparatus for emitting light to direct or control traffic and to a method of directing or controlling road traffic.

Background

[0002] Road and traffic signalling apparatus are often small and sometimes out of comfortable view of the driver of a vehicle or otherwise not very visible to the driver. Poor road traffic signalling can lead to accidents, particularly when travelling in densely populated areas, areas with unconventional roads and sharp corners, and when vehicles are travelling at high speeds. It can also be difficult to detect colour and signalling changes, for example if travelling at high speeds or where signalling is sparse. Poor weather conditions can also make road and traffic signalling lights difficult to see. Known illuminated road and traffic signals often comprise one or more of a halogen lamp, an incandescent lamp and an LED (light emitting diode) as the light source.

Summary

[0003] According to a first aspect disclosed herein, there is provided an apparatus for emitting light to direct or control road traffic, the apparatus comprising:

a container;
a laser source, the laser source being arranged to emit a laser beam into the container; and
a substance contained within the container for dissipating a laser beam emitted into the container by the laser source;
the container comprising a transparent wall through which the dissipated laser light can pass.

[0004] The use of a laser as the light source means that the light can be seen more easily and clearly by road traffic users. The substance in the container dissipates the laser beam such that the laser light can be emitted over a large surface area. This allows drivers on the road to see the signal indicated by the laser light more clearly and earlier.

[0005] In an example, the substance is arranged to dissipate the laser beam homogeneously across the container.

[0006] The substance dissipates the laser beam such that the entire container is illuminated, thereby maximising the surface area over which the laser beam can exit the container as light.

[0007] In an example, the substance is gaseous.

[0008] A gaseous substance can dissipate light more effectively than a solid or liquid substance.

[0009] In an example the container comprises at least

one wall having a reflective inner surface for reflecting the laser beam within the container.

[0010] A reflective surface increases the path of travel of the laser beam and any light within the container. In an example, all inner surfaces of the walls of the container other than the transparent wall are reflective.

[0011] In an example, the laser source is movable to vary the angle of incidence of the laser beam on at least one reflective inner surface, such that the brightness of the dissipated laser light exiting the container may be varied. A reduced angle of incidence will allow a brighter output of light from the container because the laser light will be reflected more times within the container. An increased angle of incidence will allow a dimmer output of light from the container.

[0012] In an example, the apparatus comprises a white laser source.

[0013] In an example, the apparatus comprises one or more coloured filters which may be selected to select the colour of the laser beam passing into the substance.

[0014] Use of filters allow several lights colours and patterns to be rendered with just one laser beam. The apparatus is there able to be used for various road signage needs.

[0015] In an example, the apparatus comprises a red laser source, a yellow laser source and a green laser source.

[0016] According to a second aspect disclosed herein, there is provided a method of directing or controlling road traffic, the method comprising:

causing a laser source to emit a laser beam into a container, the container containing a substance that dissipates the laser beam and the container comprising a transparent wall through which the dissipated laser light can pass to exit the container; and

selectively controlling the emission of light by the laser beam into the container so as to vary at least one of the brightness and colour of the dissipated laser light which exits the container.

[0017] In an example, varying the brightness of the dissipated laser light exiting the container includes at least one of:

turning the laser source on and off;
varying the intensity of the laser beam entering the container; and
varying the angle of incidence of the laser beam into the container.

[0018] In an example, varying the colour of the dissipated laser beam comprises selecting at least one of a plurality of coloured filters to select the colour of the laser beam passing into the substance.

[0019] In an example, one of a red filter, a yellow filter and a green filter are selected to select the colour of the

laser beam passing into the substance.

[0020] In an example, the container comprises at least one wall having a reflective inner surface, the reflective inner surface causing the laser beam to reflect within the container.

[0021] In an example, all inner surfaces of the walls of the container other than the transparent wall are reflective to cause the laser beam to reflect within the container.

Brief Description of the Drawings

[0022] To assist understanding of the present disclosure and to show how embodiments may be put into effect, reference is made by way of example to the accompanying drawings in which:

Figures 1a and 1b show schematically perspective views of an example of an apparatus as described herein; and

Figure 2 shows schematically a perspective view of another example of an apparatus as described herein.

Detailed Description

[0023] As mentioned previously, road and traffic signalling apparatus can be small and sometimes difficult to be seen clearly by a road traffic user such as a driver of a vehicle. It is also sometimes difficult to detect changes between colours/patterns/signs from a distance, making it difficult to adjust speed and/or direction accordingly. Known traffic signage uses one or more of a halogen lamp, an incandescent lamp and an LED (light emitting diode) as the light source. Such light sources may not be sufficiently bright or otherwise noticeable for road traffic users.

[0024] According to examples described herein, there is provided an apparatus for emitting light to direct or control road traffic. The apparatus comprises a container. The apparatus comprises a laser source. The laser source is arranged to emit a laser beam into the container. The container comprises a substance for dissipating the laser beam emitted into the container by the laser source. The container comprises a transparent wall through which the dissipated laser light can pass.

[0025] Referring now to the drawings, Figures 1a and 1b show schematically an example of an apparatus for controlling and directing traffic using a laser beam. Figure 1a shows schematically a perspective view of the travel of the laser beam within a container. Figure 1b shows schematically the perspective view of Figure 1a as would be seen to a road user.

[0026] Referring to Figure 1a, the apparatus 100 comprises a container 102. The apparatus 100 comprises a laser source 104 arranged to emit a laser beam 106 into the container 102. The laser source 104 may be provided as a separate component or may be integrally provided

with the container 102, optionally being contained entirely within the container 102. In some examples, there may be plural laser sources 104 located at different positions.

[0027] A laser beam is a stimulated emission of light. Lasers are bright and can emit light of a single wavelength with a high degree of coherence. Laser beams also have a high irradiance and are able to travel large distances with minimal loss of power.

[0028] The container 102 contains a substance 108 which scatters the incident laser beam 106. The incidence of an uninterrupted laser beam 106 upon the human eye is dangerous and can even cause blindness. The presence of the substance 108 avoids laser beams exiting the container 102 directly as the substance 108 causes the beam to scatter and dissipate.

[0029] The path of the laser beam 106 through the substance 108 can be lengthened by causing laser beam 106 to reflect within the container 102 one or more times. To facilitate this, the container 102 has at least one wall having a reflective inner surface 110 for reflecting the laser beam 106 within the container 102. The container 102 has a transparent wall 112 to allow the dissipated laser beam to exit. In an example, all of the walls of the container 102 other than the transparent wall 112 have reflective inner surfaces 110 to reflect the incident laser beam 106 or dissipated laser light within the container 102. The or each reflective inner surface 110 reflects the laser beam 106 incident on it back towards the centre of the container 102. Additionally, the or each reflective inner surface 110 may also reflect the diffused laser beam within the container 102. The scattered/dispersed laser light, which has been scattered or dispersed by passing through the substance 108, exits the container through the transparent wall 112. The dispersed laser light will be safe for the human eye to be exposed to.

[0030] The laser beam 106 may be arranged to enter the container 102 at an angle (i.e. not at 0° or 90° say). Arranging the laser beam 106 to enter the container 102 at an angle will increase the path of travel of the laser beam 106 within the container 102. Lengthening the path of the laser beam 106 will increase the contact between the laser beam 106 and the substance in the container 102. The increased contact results in higher dissipation of the laser beam into visible laser light.

[0031] Additionally, the angle of the laser beam 106 may be selectively and controllably varied to vary the brightness of the dissipated light leaving the container 102 when the apparatus 100 is in use. Increasing the angle of incidence of the laser beam 106 on a reflective inner surface 110 (i.e. increasing the angle between the incident laser beam 106 and the normal to the reflective inner surface 110) will (usually) decrease the length of the path of the laser beam 106 within the container 102, leading to less dispersion of the laser beam 106 by the substance 108. As a consequence, the dispersed laser light leaving the container 102 through the transparent wall 112 will be relatively dimmer. On the other hand, a decreased angle of incidence of the laser beam 106 on

a reflective inner surface 110 will (usually) result in a larger number of reflections within the container 102, which increases the path length through the substance 108 and therefore provides a brighter output of dispersed laser light from the container 102. In an example scenario, a brighter output of light may be required during daytime or when the weather conditions are foggy or the visibility is poor for other reasons.

[0032] In an example, the brightness of the dissipated light leaving the container 102 may be varied at the time of changes in the colour of the output light. For example, when the output colour of the light is about to change, the brightness of the output may be decreased. This may act as an indicator or warning to road users and pedestrians that the colour of the output light is about to change. This may be particularly useful in the case that the apparatus 100 is used for traffic lights, in which for example the brightness is reduced when the traffic light is about to change from green to red, or from red to green or amber, etc. In an example, this may be achieved by adjusting the angle of incidence of the laser beam 106 as described above.

[0033] In another example, the laser source 104 can be moved so that the laser beam 106 is moved around or back and forth. For example, the laser beam 106 may be caused to rotate in a generally circular motion. This can enhance the spreading of the laser light as it moves through the substance 108.

[0034] Figure 1b shows schematically the apparatus 100 as would be seen by a road user. One wall 112 of the container 102 is transparent in this example. The remaining external walls of the container 102 in this example are opaque and have inner surfaces which are reflective. The container 102 is arranged to allow the light to exit the transparent surface 112 against the direction of traffic, so as to be visible to drivers. The laser light exits uniformly across the container 102. The larger surface area devoted to emitting light will ensure oncoming traffic is more likely to notice the signals.

[0035] The substance may be gaseous. The substance may be distributed evenly throughout the container. The even distribution of the substance may be maintained by a mechanism. For example, the container may comprise one or more fans to keep the substance spread evenly throughout the container.

[0036] In one example, the substance 108 may be carbon dioxide which is stored in solid form (so-called "dry ice") and which can be released into the container as necessary. Dry ice has the advantage of being simple to produce and store and is also non-flammable. In another example, the substance 108 may be nitrogen, which may be stored in liquid form. Nitrogen is unreactive and again non-flammable, and therefore a relatively low risk substance for use in examples. In other examples, the substance 108 may be for example a water or glycol-based or glycerin-based fluid or a mineral oil, which may be atomised and/or heated as necessary.

[0037] Figure 2 shows schematically another example

apparatus 200 according to an embodiment of the invention. The apparatus 200 comprises a container 202. A laser source 204 shines a laser beam 206 into the container 202. The container 202 contains a substance 208.

The container 202 has one transparent wall 212. The other walls are opaque and have reflective inner surfaces 210 in this example.

[0038] The incident laser beam 206 is reflected by the reflective inner surfaces 210. The laser beam is also diffused by the substance 208 within the container 202. Subsequently, the reflective inner surfaces 210 will also reflect the diffused laser light. The reflected and diffused laser beams can exit through the transparent wall 212. In this example, the container 202 is in an inverted U shape, which may for example extend across a road. The container 202 may alternatively be of another shape, for example a rectangular box. The rectangular box may be suspended above the road at a visible height.

[0039] Therefore, optimal use of a laser beam to output light across a container will involve a substance contained within the container to diffuse the laser beam into visible light. Additionally, the walls of the container may be reflective, so as to reflect the laser beam and diffused laser light within the container. Additionally or alternatively, the laser source may be movable so as to cause the laser beam to reflect off the walls of the container. This increases the path length of the laser beam travelling within the container.

[0040] The apparatus 100, 200 for controlling road and traffic may be constructed (predominately) using material that will not resist the force of a speeding car, thereby reducing risk of vehicular damage and injury. For example, the walls of the container 102, 202 may be constructed out of plastics. This is important for minimising the effect of a collision between a vehicle and the apparatus when in use. This is of particular importance for use on high speed and congested roads/areas.

[0041] The examples described herein are to be understood as illustrative examples of embodiments of the invention. Further embodiments and examples are envisaged. Any feature described in relation to any one example or embodiment may be used alone or in combination with other features. In addition, any feature described in relation to any one example or embodiment may also be used in combination with one or more features of any other of the examples or embodiments, or any combination of any other of the examples or embodiments. Furthermore, equivalents and modifications not described herein may also be employed within the scope of the invention, which is defined in the claims.

Claims

1. An apparatus (100, 200) for emitting light to direct or control road traffic, the apparatus (100, 200) comprising:

- a container (102, 202);
 a laser source (104, 204), the laser source (104, 204) being arranged to emit a laser beam (106, 206) into the container (102, 202); and
 a substance (108, 208) (108, 208) contained within the container (102, 202) for dissipating a laser beam (106, 206) emitted into the container (102, 202) by the laser source (104, 204);
 the container (102, 202) comprising a transparent wall (112, 212) through which the dissipated laser light can pass.
2. An apparatus (100, 200) according to claim 1, wherein the substance (108, 208) is arranged to dissipate the laser beam (106, 206) homogenously across the container (102, 202).
3. An apparatus (100, 200) according to claim 1 or claim 2, wherein the substance (108, 208) is gaseous.
4. An apparatus (100, 200) according to any of claims 1 to 3, wherein the container (102, 202) comprises at least one wall having a reflective inner surface (110, 210) for reflecting the laser beam (106, 206) within the container (102, 202).
5. An apparatus (100, 200) according to claim 4, wherein all inner surfaces of the walls of the container (102, 202) other than the transparent wall (112, 212) are reflective.
6. An apparatus (100, 200) according to claim 4 or claim 5, wherein the laser source (104, 204) is movable to vary the angle of incidence of the laser beam (106, 206) on at least one reflective inner surface (110, 210), such that the brightness of the dissipated laser light exiting the container (102, 202) may be varied.
7. An apparatus (100, 200) according to any of claims 1 to 6, comprising a white laser source (104, 204).
8. An apparatus (100, 200) according to claim 7, comprising one or more coloured filters which may be selected to select the colour of the laser beam (106, 206) passing into the substance (108, 208).
9. An apparatus (100, 200) according to any of claims 1 to 8, comprising a red laser source (104, 204), a yellow laser source (104, 204) and a green laser source (104, 204).
10. A method of directing or controlling road traffic, the method comprising:
- causing a laser source (104, 204) to emit a laser beam (106, 206) into a container (102, 202), the container (102, 202) containing a substance (108, 208) that dissipates the laser beam (106, 206) and the container (102, 202) comprising a transparent wall (112, 212) through which the dissipated laser light can pass to exit the container (102, 202); and
 selectively controlling the emission of light by the laser beam (106, 206) into the container (102, 202) so as to vary at least one of the brightness and colour of the dissipated laser light which exits the container (102, 202).
11. A method according to claim 10, wherein varying the brightness of the dissipated laser light exiting the container (102, 202) includes at least one of:
- turning the laser source (104, 204) on and off;
 varying the intensity of the laser beam (106, 206) entering the container (102, 202); and
 varying the angle of incidence of the laser beam (106, 206) into the container (102, 202).
12. A method according to claim 10 or claim 11, wherein varying the colour of the dissipated laser beam (106, 206) comprises selecting at least one of a plurality of coloured filters to select the colour of the laser beam (106, 206) passing into the substance (108, 208) (108, 208).
13. A method according to claim 12, wherein one of a red filter, a yellow filter and a green filter are selected to select the colour of the laser beam (106, 206) passing into the substance (108, 208).
14. A method according to any of claims 10 to 13, wherein the container (102, 202) comprises at least one wall having a reflective inner surface (110, 210), the reflective inner surface (110, 210) causing the laser beam (106, 206) to reflect within the container (102, 202).
15. A method according to any of claims 10 to 14, wherein all inner surfaces of the walls of the container (102, 202) other than the transparent wall (112, 212) are reflective to cause the laser beam (106, 206) to reflect within the container (102, 202).

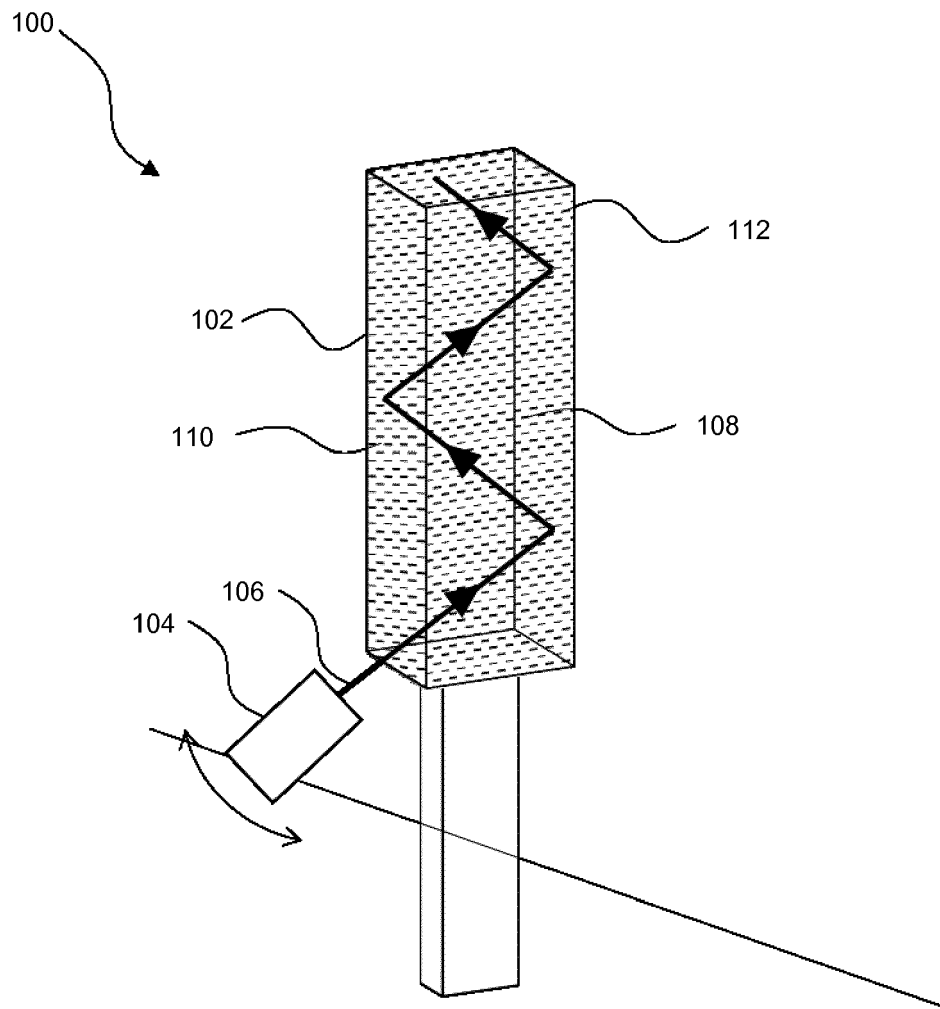


Figure 1a

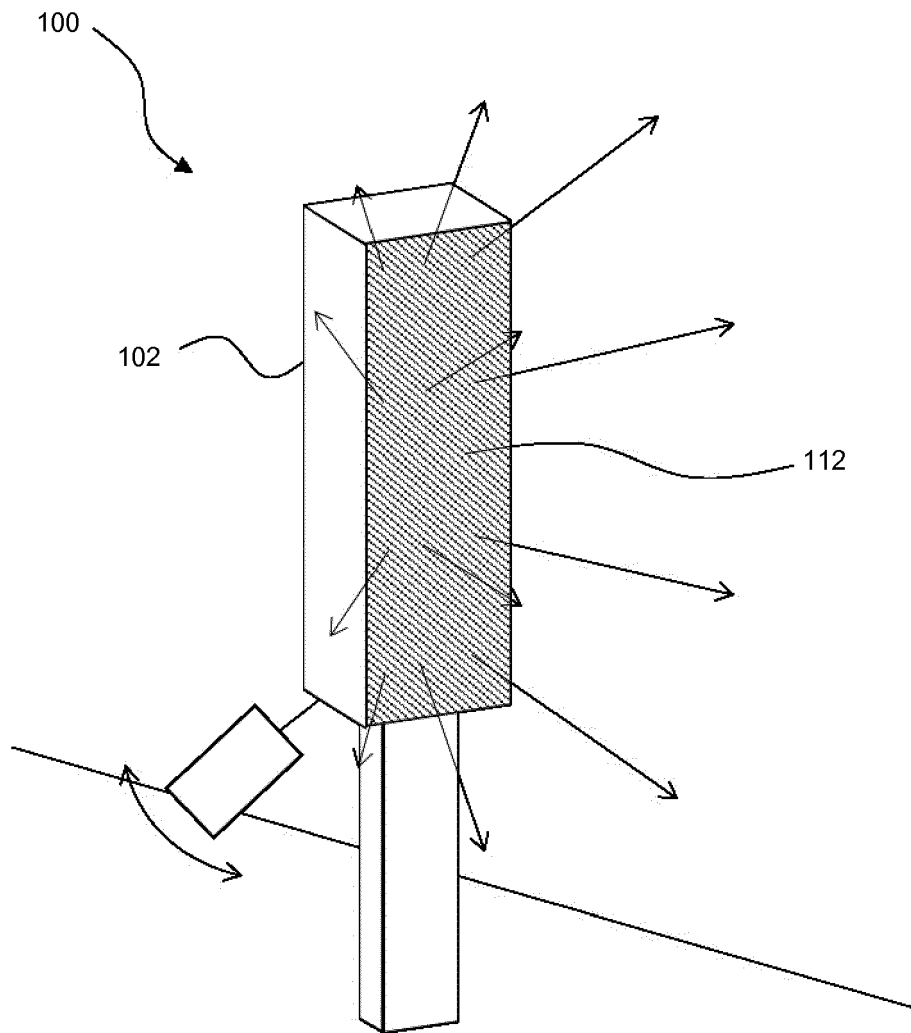


Figure 1b

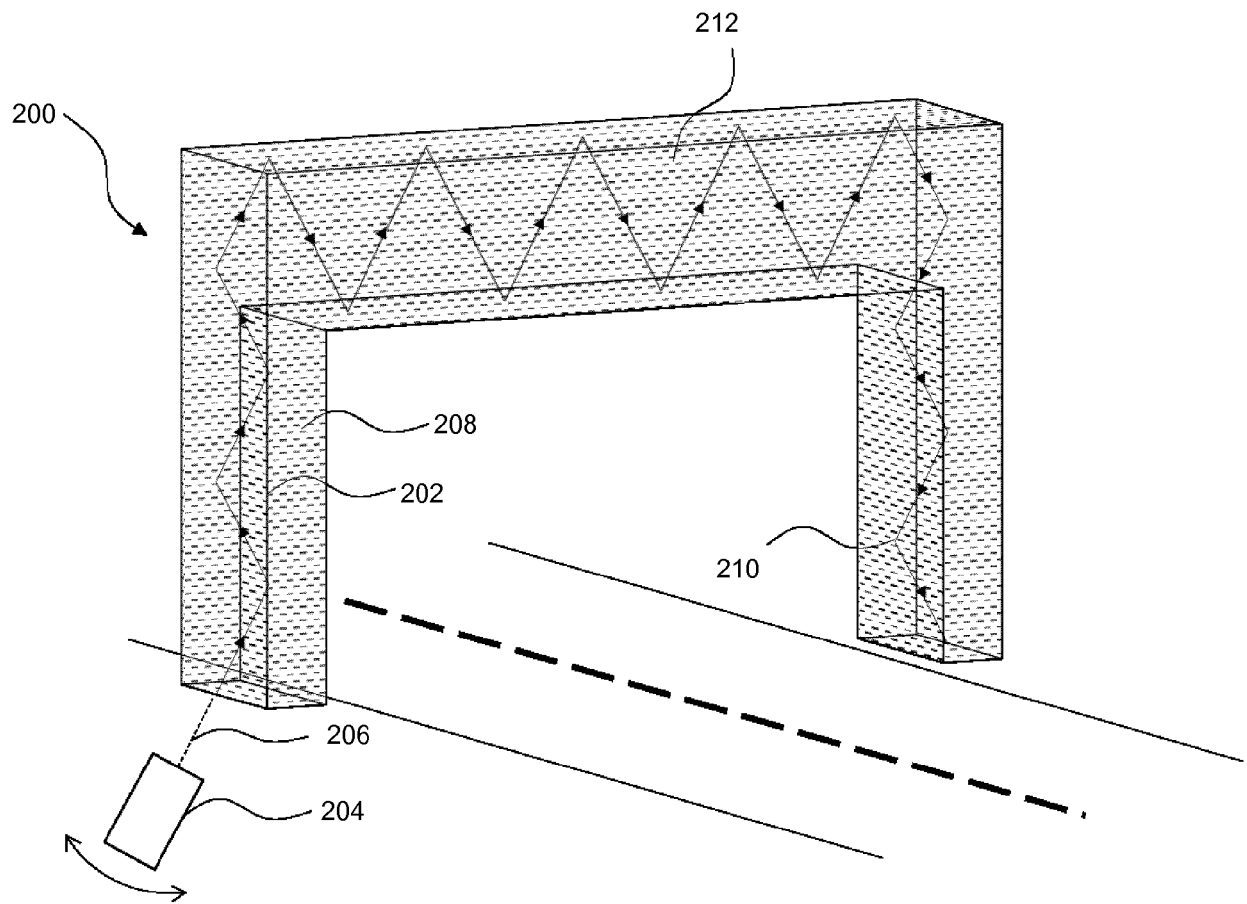


Figure 2



EUROPEAN SEARCH REPORT

Application Number
EP 17 18 7574

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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