

(19)



(11)

**EP 1 706 541 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**08.01.2014 Bulletin 2014/02**

(51) Int Cl.:  
**E01F 9/04** <sup>(2006.01)</sup> **E01F 9/08** <sup>(2006.01)</sup>

(21) Application number: **04797477.9**

(86) International application number:  
**PCT/DK2004/000816**

(22) Date of filing: **25.11.2004**

(87) International publication number:  
**WO 2005/052262 (09.06.2005 Gazette 2005/23)**

(54) **A ROAD MARKING DEVICE**

STRASSENMARKIERUNGSVORRICHTUNG

DISPOSITIF DE BALISAGE ROUTIER

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IS IT LI LU MC NL PL PT RO SE SI SK TR**

(30) Priority: **26.11.2003 DK 200301745**

(43) Date of publication of application:  
**04.10.2006 Bulletin 2006/40**

(73) Proprietor: **Geveko ITS A/S  
5900 Rudkøbing (DK)**

(72) Inventor: **LAUSTSEN, Torben  
DK-9300 Sæby (DK)**

(74) Representative: **Larsson, Malin et al  
Awapatent AB  
Järnväggsgatan 10 A  
251 10 Helsingborg (SE)**

(56) References cited:  
**EP-A- 0 422 696 US-A- 4 925 335  
US-A- 5 984 570 US-A1- 2003 133 750  
US-B1- 6 673 292**

**EP 1 706 541 B1**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

## Description

### The state of the art

**[0001]** The invention relates to a marking device in the form of a light-emitting and/or reflecting fitting for mounting on a road surface.

**[0002]** For the marking and striping of road surfaces, reflecting marking coatings are normally used, designed such that the material can reflect the driving light emitted by the vehicle. This may take place in the form of a so-called passive marking which is completely dependent on driving light and thereby the light conditions, the direction of the vehicle in relation to the coating, etc.

**[0003]** Where the marking stripe is covered by water or snow, the reflecting properties are reduced to a degree which is serious to the traffic safety.

**[0004]** To this should be added that the marking coating is worn by being run over, so that the reflection is reduced as the reflecting properties are worn off.

**[0005]** To remedy this, it is known to use a so-called active marking in the form of a light-emitting fitting. Examples of this are known e.g. from WO 99106636 and WO 03/027397, which describe light-emitting fittings having a light generator provided therein in the form of an LED chip which emits light via the light guides across the roadway.

**[0006]** These fittings are configured such that they are embedded in the road surface and have an external power supply via a buried cable.

**[0007]** This means that a both cumbersome and expensive mounting operation has to be carried out in order for the necessary number of fittings and their connections to be established.

**[0008]** It is moreover difficult to exchange any damaged fittings because of the embedded mounting.

**[0009]** US patent no. 4 925 335 describes a prefabricated road marking tape, which includes retro-reflective components as well as light components, comprising LED's, solar cells and storage batteries.

**[0010]** This tape is easy to mount, as it is placed at the surface of the road. The light components are placed inside a brick made of hard plastic with a wall thickness of e.g. 5 mm. The whole brick has a height of about 2,5 cm.

**[0011]** A brick with this height is uncomfortable to pass in a normal vehicle and there is a risk of breaking the walls of the brick or to tear the whole brick from the tape, e. g. during a breaking action of a heavy vehicle.

**[0012]** US patent no. 5 984 570 describes a similar road marking device comprising a housing made of plastic which contains the elements of the light-arrangement. The house is filled with a solid and stiff potting material so as sand or silicate, bonded with epoxy.

### The object of the invention

**[0013]** The object of the invention is to provide a road

marking of the above mentioned kind with a thickness of max 5 mm, which is simple to mount and which has sufficient strength to withstand any loadings from the passing vehicles.

**[0014]** This is achieved according to the invention by a road marking fitting according to claim 1.

**[0015]** The marking device will appear as a thin, flexible fitting, which can be placed directly on the road surface without any changes of the road surface and be secured, attached to it. It may also be placed in a road stripe, where the reflecting faces on the fitting with the light emissions protrude above the surface of the stripe.

**[0016]** Since the light emission is thus positioned close to the road surface, it will especially be optimum relative to the road-users, without the fitting tab generally interfering with the traffic - on the contrary, when driving over it, one will be made aware of a possible crossing of a stripe corresponding to the running over of point-shaped road stripes.

**[0017]** As stated in claim 2, the components of the light-emitting device are configured as flat flexible elements arranged in the same plane. This enables the fitting to be as flat as possible and the components to yield to case of outer loads without breaking or the like.

**[0018]** As stated in claim 3, the light-emitting diode is arranged inside the moulding mass, and wherein the lightguide extend from the light-emitting diode and terminate in the inclined face. As stated in claim 4, one or more lenses are provided in the inclined face in front of the ends of the lightguides. This increases the operational safety and enables the fitting to meet the requirements for the emitted light.

**[0019]** As stated in claim 5, the protective shell consists of an upper shell and a lower shell, and wherein the surface of the shell is provided with one or more lenses above the solar cells. This enables the solar cells to receive more incoming light, thus the recharging of the battery is enhanced as an obvious result thereof.

**[0020]** The protective exterior shell is, as stated in claim 6, made of an impact-resistant material such as polycarbonate. The moulding mass is, as stated in claim 7, made of silicone. This enables the fitting not to interfere with the traffic while at the same time allowing the components to yield to case of outer loads and the moulding mass to absorb and distribute outer impacts.

**[0021]** The fitting, as stated in claim 8, further comprises a light sensor, a temperature sensor, and/or a remote control to signal traffic conditions. This enables the fitting to regulate the emitted light and to signal different traffic conditions to the road users.

### The drawing

**[0022]** An embodiment of a fitting according to the invention will be described more fully below with reference to the drawing, in which

Fig. 1 shows a fitting seen from above and embedded

in a stripe on the road surface,

Fig. 2 shows a sectional view of the tab seen in the direction II-II in fig. 1, and

Fig. 3 shows the constituent parts of a tab prior to assembly.

#### Description of an exemplary embodiment

[0023] The fitting according to the invention, as shown in the drawing, comprises a shell consisting of an upper shell 2 which is configured to form the upper side of the fitting with inclined faces 4, which are disposed on both sides of an elevated central part 9 in the example shown. The fitting may hereby be used with light emission through the faces 4 in two oppositely directed directions, as indicated in fig. 2.

[0024] Lenses 5 are provided in these inclined faces 4, as will be explained later.

[0025] The upper shell 2 fits with a lower shell 2a such that in the assembled state the shells 2, 2a form an inner cavity 3 in which the electrical components may be embedded.

[0026] The components embedded in the fitting for light emission and control are indicated in fig. 3. The entire construction of the fitting has been done with a view to achieving a fitting as flat as possible. Therefore, the individual components have been selected with a view to the lowest possible height and extent, so that the components may be positioned in a "flat" order.

[0027] A plurality of solar cells 12 are provided for charging the battery 13, and these solar cells must not be overshadowed, of course, and they are therefore arranged openly upwards.

[0028] The battery 13 is arranged at the side of the solar cells 12. The battery is of the generally known flat type, which is connected via flat wires and various printed circuit boards 14 to a light-emitting diode 10 arranged centrally in the fitting.

[0029] The device may include a light sensor and optionally a temperature sensor.

[0030] These electrical components are all configured as flat flexible elements so as to enable them to yield in case of outer loads on the fitting, without being destroyed by breaking or the like.

[0031] A soft moulding mass 3, such as silicone or the like, is used for embedding the electrical components in the shells 2, 2a, such that the moulding mass may absorb and distribute the outer impacts to which the fitting is subjected.

[0032] The shells 2, 2a are preferably made of polycarbonate or another hard and impact-resistant material.

[0033] The shell constitutes the entire exterior of the fitting and protects the components in such a manner as to allow it to be mounted on a road surface, as indicated in fig. 2. The maximum height of the finished fitting is 1 to 5 mm, which does not differ significantly from the height

of known marking coatings.

[0034] Thus, it will not interfere with the traffic and is positioned so suitably close to the road surface that it cannot be torn off, e.g. by snow ploughs, sweepers or the like.

[0035] The surface of the shell 2 is preferably fluted or rough to achieve the best possible skid resistance for the road-users. Optionally, the surface 8 above the solar cells 12 may be provided with one or more lenses to enhance the incident light on the solar cells 12.

[0036] The light emission takes place from a light-emitting diode 10, which, as indicated in fig. 2, is embedded in the moulding mass 3. The light-emitting diode 10 is positioned inside the fitting itself, and, via a connector and lightguides 11 extending towards the inclined side edges 4 of the fitting, the light 6 is emitted via these lightguides 11, as indicated in fig. 2.

[0037] A lens 5 may be provided in front of the lightguide ends, and, as will appear from the dashed line in fig. 2, it is expedient that the light emission takes place at an angle 7 of about 3° relative to the horizontal plane of the fitting. This meets the requirements with respect to light which must be visible to a driver at a distance of 30 metres.

[0038] The advantage of using lightguides 11 is partly to utilize the light from just one diode 10 and also to improve the operational safety partly by the protected arrangement of the diode and partly in that the lightguide ends can operate even though the ends are worn.

[0039] A considerable degree of software may be used for regulation and control of the fitting according to the invention.

[0040] A light sensor may thus be used for example for turning the light-emitting diode on and off, just as it may regulate the light intensity/colour according to the external light conditions and needs.

[0041] A temperature sensor may also be included and registers low temperatures involving the risk of slippery roads, thus providing the possibility of changing the colour of the diode to e.g. red and optionally again changing the light to e.g. flashing light emission.

[0042] Many forms of optional remote control may be incorporated so as to allow signalling, e.g. by means of an external sensor, of traffic conditions which are to be signalled from one or more fittings, whereby the traffic safety may be improved.

[0043] Since the fitting according to the invention is an independent unit, it will operate entirely without any need of service. It is sturdy, impact-resistant, and, as mentioned, so flat that it cannot be either damaged or constitute a risk to the road-users.

[0044] The fitting may have all possible forms and sizes, so that it may also form part of the general traffic marking, such as signs and instructions of various types.

[0045] The colour of the light depends on the diode/lens, and it may therefore be designed in any desired colour scale as needed.

## Claims

1. A marking device in the form of a light-emitting and/or reflecting fitting for mounting on a road surface, wherein the fitting is configured as a tab (1) with a height of max. 5mm and with at least one inclined face (4) facing towards the approaching vehicles through which the light emission (6) takes place, wherein the fitting (1) comprises a protective exterior shell (2, 2a), which contains a light-emitting device comprising solar cells (12), a battery (13), a light-emitting diode (10), and lightguides (11), which are embedded in a soft moulding mass (3). 5
2. A marking device according to claim 1, **characterized in that** the components of the light-emitting device (10, 12, 13) are configured as flat flexible elements arranged in the same plane. 10
3. A marking device according to any one of claims 1 - 2, **characterized in that** the light-emitting diode (10) is arranged inside the moulding mass (3), and wherein the lightguides (11) extend from the light-emitting diode and terminate in the inclined face (4). 15
4. A marking device according to claim 3, **characterized in that** one or more lenses (5) are provided in the inclined face (4) in front of the ends of the lightguides (11). 20
5. A marking device according to any one of claims 1 - 4, **characterized in that** the protective shell consists of an upper shell (2) and a lower shell (2a), and wherein the surface (8) of the upper shell (2) is provided with one or more lenses above the solar cells (12). 25
6. A marking device according to any one of the claims 1 - 5, **characterized in that** the protective exterior shell (2, 2a) is made of a impact-resistant material such as polycarbonate. 30
7. A marking device according to any one of claims 1 - 6, **characterized in that** the soft moulding mass (3) is made of silicone. 35
8. A marking device according to any one of claims 1 - 7, **characterized in that** the fitting (1) further comprises a light sensor, a temperature sensor, and/or a remote control to signal traffic conditions. 40

## Patentansprüche

1. Markierungsvorrichtung in der Form eines lichtaus- 55  
sendenden und/oder -reflektierenden Befestigungs-  
stücks zum Anbringen auf einer Straßenoberfläche,  
wobei das Befestigungsstück als Streifen (1) mit ei-

ner Höhe von maximal 5 mm und mit zumindest einer geneigten Seitenfläche (4), die den sich nähernden Fahrzeugen zugekehrt ist und über die die Lichtaus- sendung (6) stattfindet, konfiguriert ist, wobei das Befestigungsstück (1) eine äußere Schutzschale (2, 2a) umfasst, die eine Lichtaussendevorrichtung mit Solarzellen (12), einer Batterie (13), einer Leuchtdiode (10) und Lichtwellenleitern (11), die in einer weichen Formmasse (3) eingelassen sind, enthält.

2. Markierungsvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Bauteile der Lichtaus- sendevorrichtung (10, 12, 13) als flache Elemente, die in derselben Ebene angeordnet sind, konfiguriert sind.
3. Markierungsvorrichtung nach einem der Ansprüche 1 bis 2, **dadurch gekennzeichnet, dass** die Leuchtdiode (10) innerhalb der Formmasse (3) angeordnet ist, und wobei die Lichtwellenleiter (11) von der Leuchtdiode her verlaufen und in der geneigten Seitenfläche (4) enden.
4. Markierungsvorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** eine oder mehr Linsen (5) in der geneigten Seitenfläche (4) vor den Enden der Lichtwellenleiter (11) vorgesehen sind.
5. Markierungsvorrichtung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Schutzschale aus einer oberen Schale (2) und einer unteren Schale (2a) besteht, und wobei die Oberfläche (8) der oberen Schale (2) mit einer oder mehr Linsen über den Solarzellen (12) versehen ist.
6. Markierungsvorrichtung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die äußere Schutzschale (2, 2a) aus einem schlagzähem Material wie etwa Polycarbonat hergestellt ist.
7. Markierungsvorrichtung nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** die weiche Formmasse (3) aus Silikon hergestellt ist.
8. Markierungsvorrichtung nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** das Befestigungsteil (1) ferner einen Lichtsensor, einen Temperatursensor und/oder eine Fernsteuerung zum Signalisieren von Verkehrsbedingungen umfasst.

## Revendications

1. Dispositif de balisage sous la forme d'un plot d'émission et/ou de réflexion de lumière à monter sur une surface de route, dans lequel le plot est configuré en tant qu'élément plat (1) et avec au moins une face inclinée (4) tournée vers les véhicules qui appro-

chent grâce à quoi l'émission de lumière (6) a lieu, dans lequel le plot (1) avec une hauteur d'un maximum de 5 mm comprend une coque de protection extérieure (2, 2a), laquelle contient un dispositif d'émission de lumière comprenant des cellules solaires (12), un accumulateur (13), une diode d'émission de lumière (10) et des guides de lumière (11), qui sont noyés dans une masse de moulage molle (3).

5

10

2. Dispositif de balisage selon la revendication 1, **caractérisé en ce que** les composants du dispositif d'émission de lumière (10, 12, 13) sont configurés en tant qu'éléments plats flexibles disposés dans le même plan. 15
3. Dispositif de balisage selon l'une quelconque des revendications 1 - 2, **caractérisé en ce que** la diode d'émission de lumière (10) est disposée à l'intérieur de la masse de moulage (3), et dans lequel les guides de lumière (11) s'étendent à partir de la diode d'émission de lumière et se terminent dans la face inclinée (4). 20
4. Dispositif de balisage selon la revendication 3, **caractérisé en ce que** une ou plusieurs lentilles (5) sont fournies dans la face inclinée (4) devant les extrémités des guides de lumière (11). 25
5. Dispositif de balisage selon l'une quelconque des revendications 1 - 4, **caractérisé en ce que** la coque de protection est formée par une coque supérieure (2) et une coque inférieure (2a), et dans lequel la surface (8) de la coque supérieure (2) est garnie avec une ou plusieurs lentilles au-dessus des cellules solaires (12). 30 35
6. Dispositif de balisage selon l'une quelconque des revendications 1 - 5, **caractérisé en ce que** la coque de protection extérieure (2, 2a) est formée par un matériau résistant aux impacts tel du polycarbonate. 40
7. Dispositif de balisage selon l'une quelconque des revendications 1 - 6, **caractérisé en ce que** la masse de moulage molle (3) se compose de silicone. 45
8. Dispositif de balisage selon l'une quelconque des revendications 1 - 7, **caractérisé en ce que** le plot (1) comprend en outre un capteur de lumière, un capteur de température et/ou une commande à distance afin de signaler les conditions de circulation. 50

55

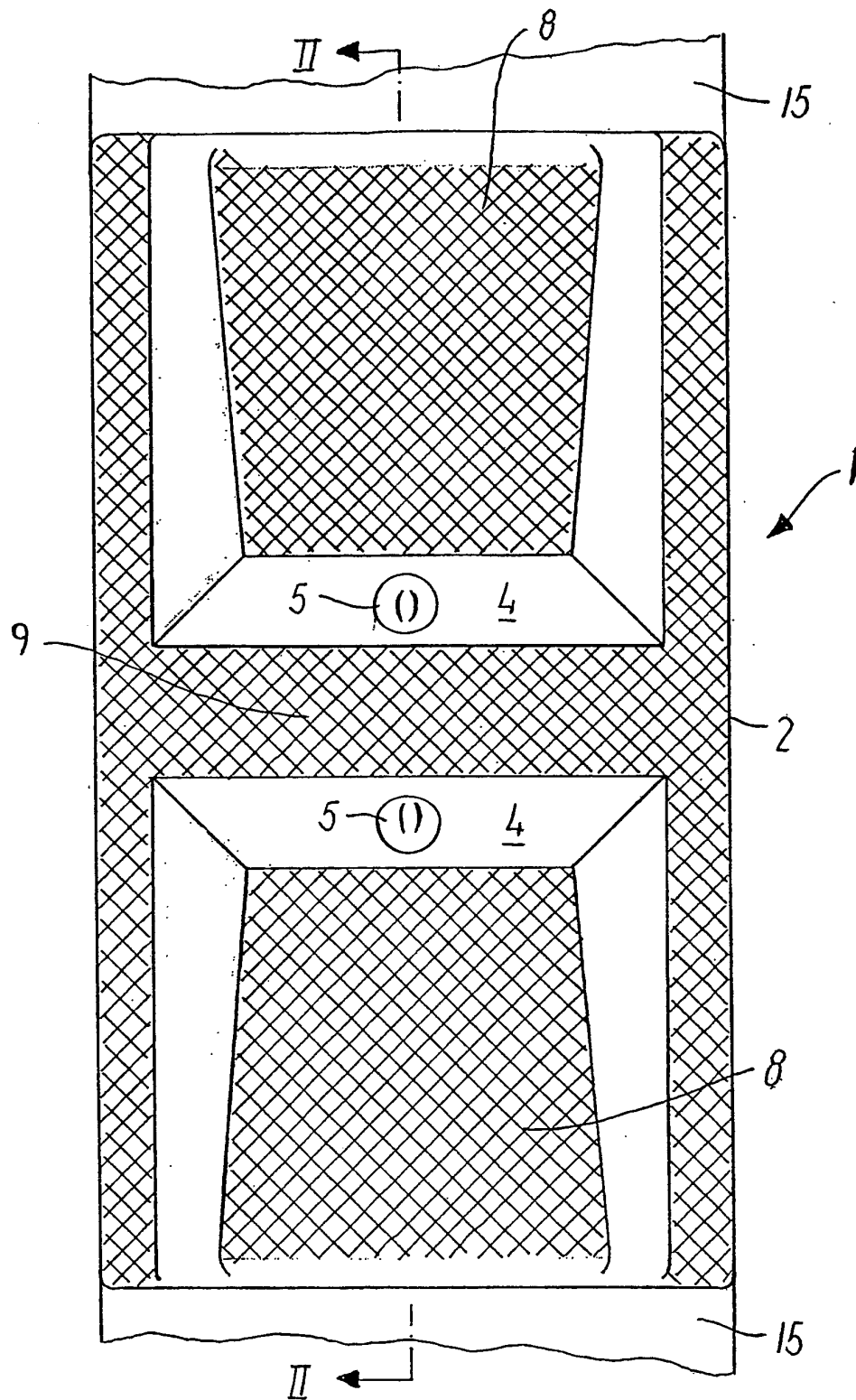


FIG. 1

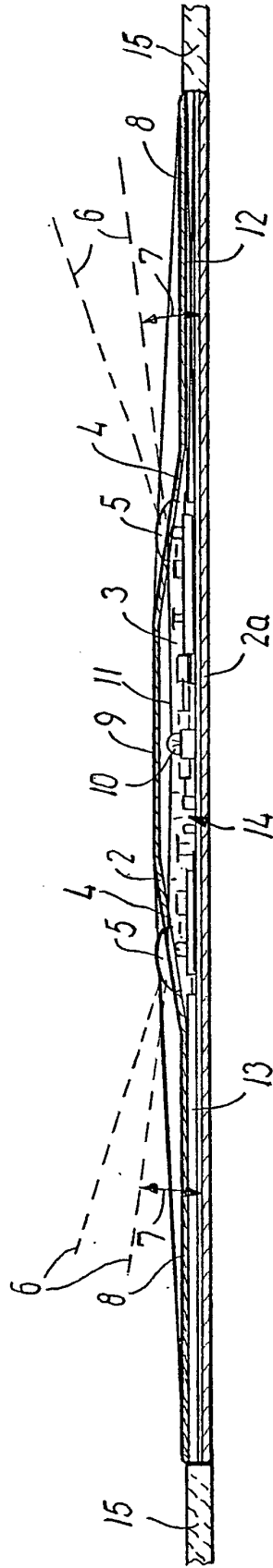


FIG. 2

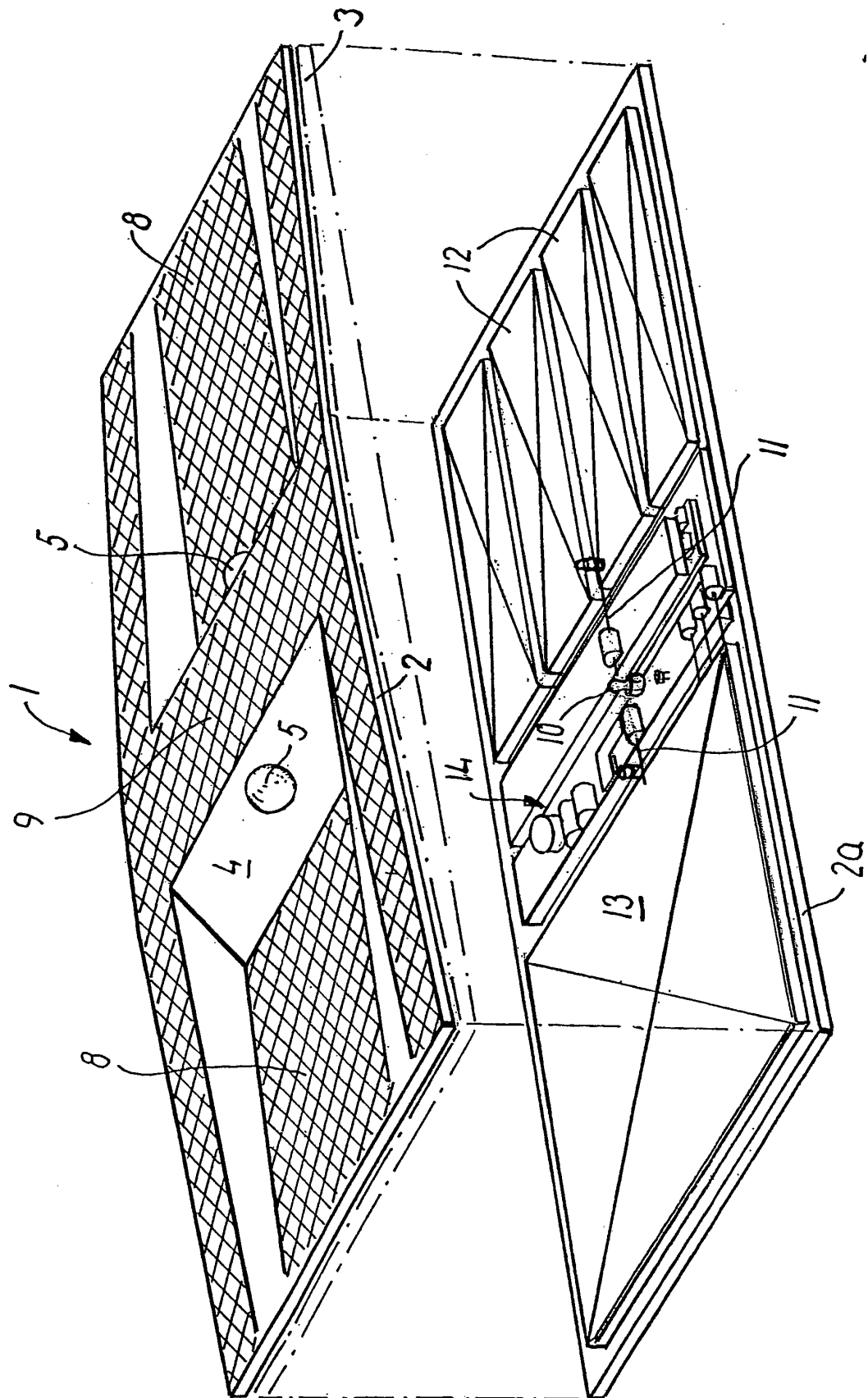


FIG. 3



**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- WO 99106636 A [0005]
- WO 03027397 A [0005]
- US 4925335 A [0009]
- US 5984570 A [0012]