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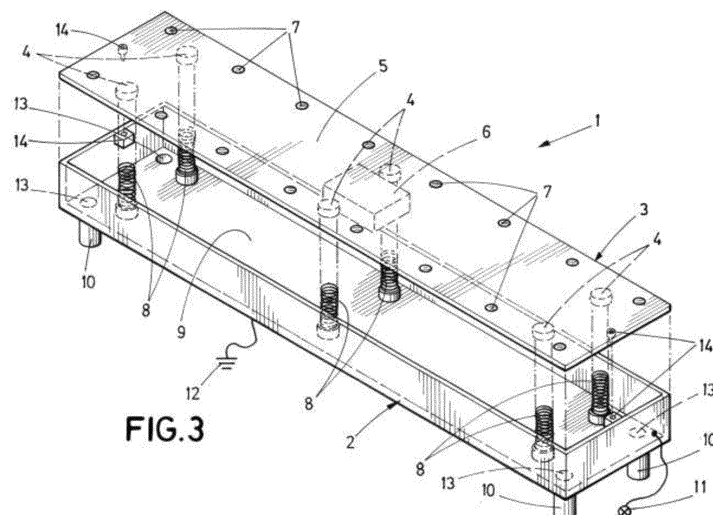
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(54) **PEDESTRIAN PROTECTION DEVICE INTENDED TO BE INSTALLED IN AN ENTRANCE OF A PEDESTRIAN CROSSING**

(57) The invention relates to a pedestrian protection device intended to be installed in an entrance of a pedestrian crossing, comprising a hermetic box (1) arranged along an access of the pedestrian crossing, comprising an underground hollow base (2) adapted to the shape of the entrance of the pedestrian crossing, a cover (3), firmly joined to the base (2) by joining elements (14) and adapted to the shape of said base (2), an elastic and

watertight element arranged between the cover (3) and the base (2), at least one detector (4, 4') located inside the hermetic box (1) in order to measure the pressure exerted on the cover (3) when at least one pedestrian is standing on the cover (3) and a vibration motor (6) incorporated below the cover (3), such that the device pedestrians to be warned by vibration, sounds and/or lights.



**FIG. 3**

## Description

### OBJECT OF THE INVENTION

[0001] The present invention describes a pedestrian protection device intended to be installed at an entrance of a pedestrian crossing in areas with vehicles passing. More particularly, the device comprises a hermetic box adapted to the shape of the road at the entrance of the pedestrian crossing, which enables pedestrians to be warned by vibration, sound or lights when they are entering the pedestrian crossing at a dangerous time when a vehicle is approaching. The implementation of the device is especially indicated for pedestrian crossings regulated by traffic lights in urban areas, but is also useful on highways passing through towns, major thoroughfares, as well as on subway and railway platforms. The use of the device is envisaged for areas of pedestrian preference wherein there is a concentration of bicycles, kick scooters, motorised scooters, as well as crossings for bicycles lanes.

### BACKGROUND OF THE INVENTION

[0002] Several studies show that 20% of accidents involving pedestrians that take place in cities are a result of pedestrian negligence, largely due to distractions caused by their mobile phones. Moreover, pedestrians tend to ignore traffic information around them (signals, traffic lights, pedestrian crossings) while they are talking on the phone or in general interacting with their mobile devices.

[0003] The attempts to reduce road accidents up to now have mainly been made by vehicle manufactures who have incorporated the latest road safety technology into their vehicles, thereby increasing pedestrian safety. Likewise, with regard to road infrastructure, improvements have been made to both horizontal and vertical signs, helping make pedestrian crossings more visible. Thanks to new communication technologies, different mobile applications work on reducing the rate of accidents involving pedestrians, although the ability to disconnect these applications makes them inefficient systems for warning pedestrians and drivers of risks.

[0004] Additionally, with regard to bicycle lanes, on numerous occasions pedestrians enter bicycle lanes due to carelessness or unawareness, which also causes accidents, even death in some cases, when pedestrians are hit by cyclists due to improper or careless behaviour by pedestrians.

[0005] New urban designs have created pedestrian crossings which, in spite of the signs, make it difficult for drivers to distinguish the pedestrian area from the road, which causes a real risk for pedestrians.

[0006] In the case of trams, horns are currently used in cases when there is an imminent risk to the pedestrian and there have also been several serious accidents involving trams. Therefore, the speed of these vehicles

is now regulated in sensitive areas through which the tram passes where there is a risk of accidents with pedestrians.

[0007] In the case of new transportation technologies, highlighting the application of the use of electric motors, while it is true these vehicles have caused a large amount of progress, especially for the emission of harmful gases, the fact that they emit almost no sound makes them very risky in the interactions thereof with pedestrians.

### DESCRIPTION OF THE INVENTION

[0008] The present invention aims to solve some of the problems mentioned in the state of the art. More particularly, it describes a device for reducing the rate of accidents for pedestrians by reducing the ability of pedestrians to be distracted, careless and/or negligent.

[0009] More specifically, the present invention describes a pedestrian protection device intended to be installed at an entrance of a pedestrian crossing in areas where vehicles are passing through, which comprises:

- a hermetic box arranged along an access to the pedestrian crossing comprising:
  - an underground, hollow base adapted to the shape of the entrance of the pedestrian crossing,
  - a cover, firmly joined to the base by joining elements adapted to the shape of said base, intended to support pedestrians passing over said cover,
  - an elastic and watertight element arranged between the cover and the base,
- at least one detector located inside the hermetic box in order to measure the pressure exerted on the cover when at least one pedestrian is standing on said cover,
- a vibration motor incorporated below the cover able to make the cover vibrate,

[0010] which is in communication with an external element which warns pedestrians about the imminent risk of at least one vehicle passing, and with the detector, wherein said vibration motor is activated when the detector detects a pedestrian on the cover and the external element simultaneously warns about the imminent risk of at least one vehicle passing.

[0011] The device preferably comprises a plurality of springs between a lower face of the base and the cover in order to cushion a relative movement between the cover and the base of the hermetic box when pressure is exerted on said cover.

[0012] Furthermore, the detector can be a switch placed inside each spring located close to the cover or on the sides, such that the device comprises a plurality of switches which are actuated by the push from the rel-

ative movement of the cover with respect to the base when a pedestrian is standing on said cover. As such, the elastic element is highly flexible, enabling the movement of the cover to be cushioned by the springs. Said elastic elements can be, for example, Teflon or any similar airtight elastomer.

**[0013]** The device can also comprise a plurality of alarm lights on the cover in communication with the external element which warns pedestrians about the imminent risk of at least one vehicle passing and with the detector, in order to turn on and off when a pedestrian is standing on the cover and there is simultaneously an imminent risk of at least one vehicle passing.

**[0014]** The external element which warns pedestrians about the imminent risk of a vehicle passing can be a pedestrian traffic light, proximity sensors, screens for warning pedestrians about trains, or any other similar element.

**[0015]** The pedestrian protection device can also have sound elements in communication with the external element which warns pedestrians about the imminent risk of at least one vehicle passing, and with the detector, in order to interactively turn on when a pedestrian is standing on the cover and there is simultaneously an imminent risk of at least one vehicle passing.

**[0016]** Additionally, it can also have sound elements in communication with the external element and with the detector in order to interactively turn on when a pedestrian is standing on the cover and there is simultaneously an imminent risk of at least one vehicle passing.

**[0017]** Preferably, the cover has an anti-slip platform on the upper face thereof to prevent pedestrians from falling.

**[0018]** The system can be analogue, such that the warning elements using vibration, light, and sound are exclusively powered when the exterior warning element, such as a traffic light, warns about the risk, and they are subsequently actuated when, simultaneously, a pressure-detecting switch is actuated by the weight of a pedestrian standing on the cover.

**[0019]** Alternatively, the pedestrian protection device can comprise a control module, located inside the box and in communication with the vibration motor, the detector and the external element, making the cover vibrate when a pedestrian is standing on said cover and, simultaneously, there is an imminent risk of at least one vehicle passing. Additionally, said control module can be in communication with lights and the sound elements in order to activate them all at the simultaneously together with the vibration motor.

**[0020]** Preferably, the springs are arranged inside tubes that partially cover them, which can be joined to the cover or to the base in order to enable the movement of the springs exclusively in the vertical direction and in order to protect them from external agents. When the springs have height variations due to the weight of at least one pedestrian standing partially or completely on the upper platform, they will actuate the pressure switch-

es and activate the vibration motor and all of the additional alarm elements.

**[0021]** Thus, when a pedestrian attempts to cross at a dangerous time and steps on the platform, and the warning system indicates to the device - for example, a traffic light interconnected with the device - the device will begin to vibrate, warning the pedestrian about the risk of a possible imminent vehicle passing. As such, this vibration motor also warns blind or deaf pedestrians, or others with different disabilities, that they are entering the pedestrian crossing at a dangerous time, whatever the reasons may be.

**[0022]** The device is operatively in communication with the external warning element which warns about the imminent proximity or passing of vehicles, such that it preferably has a warning mode and a standby mode, depending on the signal of the external element, for example by means of the pedestrian traffic light, if it is red, yellow or green. This way, the warning elements (vibration, sound and light) are only powered when there is a risk of a vehicle passing and a pedestrian simultaneously steps on the cover of the device.

**[0023]** As such, the lights in the cover and the sound elements will activate approximately simultaneously as the vibration motor, warning the pedestrian about the imminent risk.

**[0024]** By means of any one of these alarm elements, not only will the reckless pedestrian be warned, but so will all of the pedestrians around them who may also be distracted or willing to follow the reckless pedestrian, such that they will also perceive the alarms and be duly notified about the risk.

**[0025]** The sound elements can be incorporated inside the box or incorporated in an area near it in order to prevent problems with the inlet of rainwater and for better sonority and perception of the sound. Either way, they are operatively connected to and/or in communication with the detector or switches and with the external warning element warning the pedestrian about the imminent risk of approaching vehicles.

**[0026]** It should be noted that the device can be used outside to protect pedestrians in areas with automobile traffic, operatively in communication with and/or connected to a traffic light, and can also be used on subway tracks, train tracks, tramway tracks, bicycle lanes, etc.

**[0027]** Preferably, for the case of protecting pedestrians in areas with automobile traffic, the device will be placed in the entrance area of the road of the pedestrian crossing, with a small construction being done in order to create the channel necessary for housing the box current necessary in order to activate the different alarm elements, said power being provided, for example, by the same grid to which the traffic light is connected. The device can show advertisements on the upper anti-slip platform, taking advantage of the space on the road.

**[0028]** The vibration motor is incorporated in a watertight box in order to prevent the inlet of water and/or moisture, etc.

**[0029]** Preferably, the device further comprises a drainage installation comprising openings on the lower face of the base, wherein said openings are connected to tubes anchored to the ground in order to drain water in the case of an undesired flooding of said base. As a result, the hermetic box will have different drainage outlets with tubes leading to the ground in order to drain the water in case of an undesired flooding of the same.

**[0030]** Preferably, the upper platform of the cover is the same colour as the road, or a regulatory colour based on application thereof and is an anti-slip design made of rubber in order to prevent pedestrians from slipping or accidentally falling.

**[0031]** Preferably, the elements joining the cover to the base have an anti-theft mechanism comprising screws and nuts that can only be removed with a specific keys especially designed for this particular device. Furthermore, the anti-theft mechanism can also have an internal chain which joins the outer cover to the ground, thereby preventing theft if someone is in fact able to disassemble the outer cover.

**[0032]** The opening system, although it is anti-theft, enables a quick opening or maintenance to be performed by authorised persons, who will be equipped with the suitable keys.

**[0033]** The base preferably comprises an electrical outlet intended to power the device by means of an interconnection to a nearby element, and a ground connection to prevent problems of electrical derivations.

**[0034]** The box can have a prismatic configuration, but can be designed exactly for the specific configuration of the road at the entrance of the pedestrian crossing, which may be curved, prismatic, square, etc.

**[0035]** The width of the hermetic box can be designed to be greater than the length of the step or stride of a pedestrian with the longest possible estimated step/stride. The length can vary based on the length of the entrance or access to the road of the pedestrian crossing in each particular case.

**[0036]** Preferably, the base is made of fibreglass in order to support heavy vehicles passing through the area for passing vehicles.

**[0037]** The structure must be rigid enough to resist the weight of trucks, buses and heavy vehicles passing by, which at some moments may pass over the same.

**[0038]** Thus, the base can further have internal partitions configured to support the weight of vehicles with a high tonnage.

**[0039]** The aim of this device is to reduce the rate of accidents that happen in pedestrian crossings due to a lack of attention, distractions, willingness to follow reckless pedestrians, etc, applied to roads for automobiles, as well as bicycle lanes, train tracks, subway tracks, tramway tracks, etc.

**[0040]** Due to factors such as weather, continued use and different external agents, the device is designed to be able to resist all of these external elements, in the aim of achieving the versatility and durability of the same.

**[0041]** It must be noted that, if there is no electric power, for any unexpected reason, the device will not constitute any risk whatsoever for users of the pedestrian crossing.

## DESCRIPTION OF THE DRAWINGS

**[0042]** As a complement to the description provided herein, and for the purpose of helping to make the features of the invention more readily understandable, in accordance with a preferred practical exemplary embodiment thereof, said description is accompanied by a set of drawings constituting an integral part of the same, which by way of illustration and not limitation, represent the following:

Figure 1 shows a perspective view according to a preferred embodiment of the pedestrian protection device applied to the area for passing automobiles, wherein the box is shown underground inside the road at the access to the pedestrian crossing, and a pedestrian standing on the device.

Figure 2 shows an upper perspective view according to the embodiment of figure 1, wherein the hermetic box, cover, base, anti-slip platform and drainage tubes are shown.

Figure 3 shows an exploded perspective view of the device in a preferred embodiment, wherein the vibration motor, springs and lights are shown.

Figure 4 shows a detail view of the preferred embodiment of figure 3, wherein the pressure switches are clearly shown.

## PREFERRED EMBODIMENT OF THE INVENTION

**[0043]** Figure 1 shows a preferred embodiment of the pedestrian protection device, wherein said device is shown underground in the road at the entrance of the access to the pedestrian crossing. More particularly, it is applied specifically to areas for passing automobiles to control pedestrians by means of a traffic light (S).

**[0044]** Figure 2 is an upper perspective view wherein it shows that the device comprises a hermetic box (1) which comprises a hollow prismatic base (2), adapted to the shape of the road at the entrance of a pedestrian crossing, and is coupled to a cover (3). Said cover (3) comprises on the upper face thereof an anti-slip platform (5) made of rubber to prevent pedestrians from falling.

**[0045]** Likewise, figure 3 shows an exploded perspective view of the device in the preferred embodiment described, wherein it shows a plurality of springs (8) between a lower face (9) of the base (2) and the cover (3) in order to cushion the relative movement between the cover (3) and the base (2) of the hermetic box (1) when a pedestrian is standing thereon and thus exerting pressure on said cover (3).

**[0046]** Furthermore, it shows a plurality of pressure detectors (4) in order to measure a pressure exerted on the

cover (3) when at least one pedestrian is standing on the cover (3).

[0047] Figure 3 also shows that the device comprises a vibration motor (6) incorporated below the cover (3) in a watertight box. Said vibration motor (6) is in communication with the traffic light (S) which warns pedestrians about the imminent risk of at least one vehicle and with the detector (4, 4'), such that it is activated when the detector (4, 4') detects a pedestrian on the cover (3) and the external element (S) simultaneously warns pedestrians about the imminent risk of at least one vehicle passing.

[0048] Figure 4 shows a detail view of figure 3, wherein it clearly shows that in a preferred embodiment the detectors (4) are a plurality of switches (4') arranged inside the box (1) close to the cover (3), such that at least one switch (4') is actuated by a push as a consequence of the relative movement of said cover (3) when a pedestrian is standing on said cover (3).

[0049] In the aforementioned preferred embodiment, the device is connected to the traffic light (1), such that it has a warning mode and a standby mode, depending on the signal of the traffic light (S), such that the device with the different warning elements is only powered when there is an imminent risk of at least one vehicle passing, and they will only be actuated and alert pedestrians when the pressure switches (4') simultaneously detect a pedestrian. In said preferred embodiment, the connections will be analogue and a control module will not be necessary.

[0050] Figure 4 also shows that in the aforementioned preferred embodiment, the cover (3) comprises a plurality of alarm lights (7) in communication with the traffic light (S), which warns pedestrians about the imminent risk of at least one vehicle passing and with the pressure switch (4'), in order to turn on and off when a pedestrian is standing on the cover and there is simultaneously an imminent risk of at least one vehicle passing.

[0051] In the same way, the device comprises sound elements (not shown) in communication with the traffic light (S) and with the pressure switch (4') in order to interactively turn on when a pedestrian is standing on the cover and there is simultaneously an imminent risk of at least one vehicle passing. Said sound alarm elements (not shown) would be arranged in the nearest traffic light, on a post nearby, or on any exterior element near the device.

[0052] Figure 3 also shows the drainage installation which comprises openings (13) on the lower face (9) of the base (2) and said openings (13) are connected to tubes (10) which are anchored to the ground in order to drain water in the case of an undesired flooding of the device.

[0053] Likewise, it shows that in a preferred embodiment the device has an electrical outlet (11) intended to power the device by means of an interconnection to the traffic light, and a ground connection (12) to prevent problems of electrical deviations.

[0054] It is important to point out that the device must

support the weight of vehicles with a high tonnage that are driven on the road, for which reason, in the preferred embodiment, the box (1) is made of fibreglass.

[0055] Additionally, the width of the hermetic box must be greater than the length of an average step or stride of a pedestrian that is relatively tall, in order to provide greater security.

## 10 Claims

1. A pedestrian protection device intended to be installed at an entrance of a pedestrian crossing in areas with vehicles passing, **characterised in that** it comprises:

- a hermetic box (1) arranged along an access to the pedestrian crossing comprising:

- an underground, hollow base (2) adapted to the shape of the entrance of the pedestrian crossing,
- a cover (3), firmly joined to the base (2) by joining elements (14) and adapted to the shape of said base (2),
- an elastic and watertight element arranged between the cover (3) and the base (2),

- at least one detector (4, 4') located inside the hermetic box (1) in order to measure the pressure exerted on the cover (3) when at least one pedestrian is standing on said cover (3),
- a vibration motor (6) incorporated below the cover (3) able to make the cover (3) vibrate, which is in communication with an external element (S) which warns pedestrians about the imminent risk of at least one vehicle, and in communication with the detector (4, 4'),

wherein said vibration motor (6) is activated when the detector (4, 4') detects a pedestrian on the cover (3) and the external element (S) simultaneously warns pedestrians about the imminent risk of at least one vehicle passing.

2. The pedestrian protection device of claim 1, wherein the cover (3) comprises a plurality of alarm lights (7) in communication with the external element (S), which warns pedestrians about the imminent risk of at least one vehicle passing, and in communication with the detector (4, 4'), in order to turn on and off when a pedestrian is standing on it and there is simultaneously an imminent risk of at least one vehicle passing.

3. The pedestrian protection device of claim 1, comprising sound elements in communication with the external element (S) which warns pedestrians about

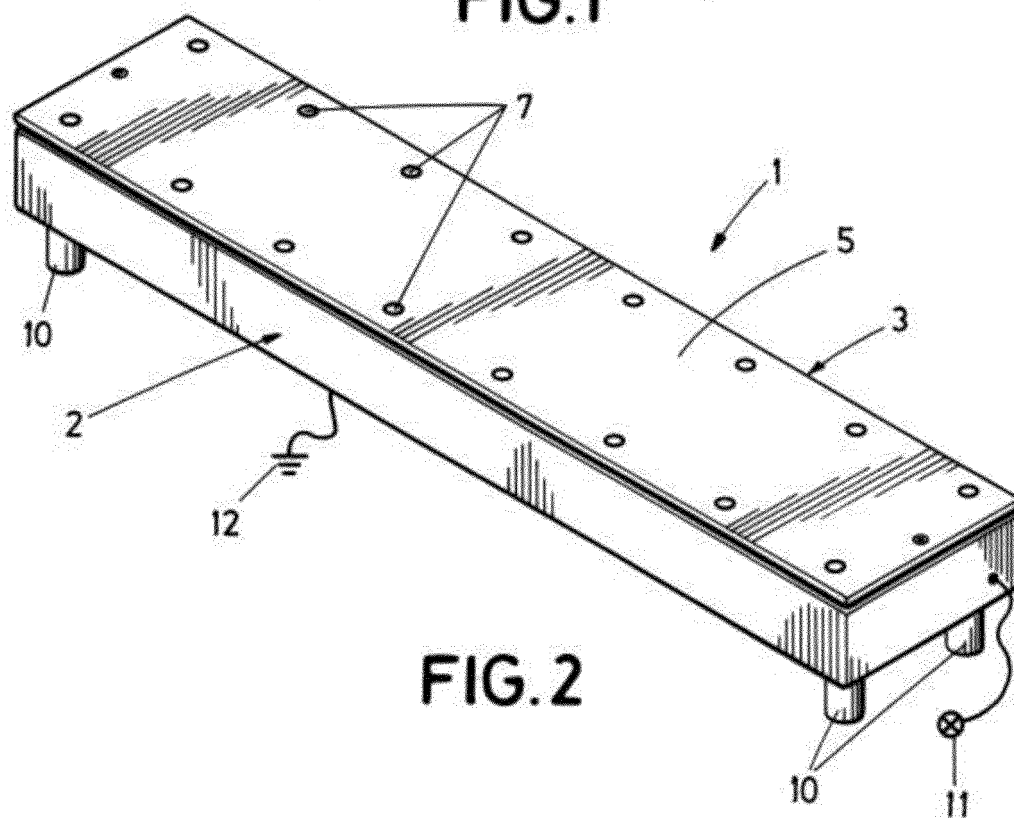
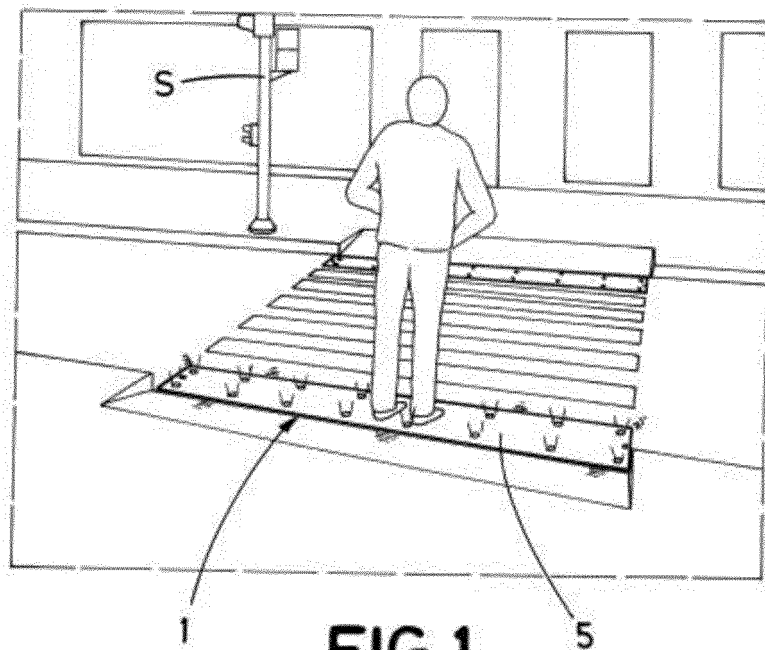
the imminent risk of at least one vehicle passing and with the detector (4, 4'), in order to interactively turn on when a pedestrian is standing on it and there is simultaneously an imminent risk of at least one vehicle passing.

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4. The pedestrian protection device of claim 1, comprising, furthermore, a plurality of springs (8) between a lower face (9) of the base (2) and the cover (3) in order to cushion the relative movement between the cover (3) and the base (2) of the hermetic box (1) when pressure is exerted by a pedestrian standing on said cover (3). 10
5. The pedestrian protection device of claim 4, wherein the detector (4, 4') is a switch (4') connected to the motor (6) and which is actuated by a push as a consequence of the relative movement of said cover (3) when a pedestrian is standing on said cover (3), activating said vibration motor (6) which makes the cover vibrate. 15 20
6. The pedestrian protection device of claim 1, comprising, furthermore, a control module, in communication with the vibration motor (6), with the detector (4, 4') and with the external element (S), sending a signal to said vibration motor (6) which makes the cover (3) vibrate when a pedestrian is standing on said cover (3) and there is simultaneously an imminent risk of at least one vehicle passing by means of the control module. 25 30
7. The pedestrian protection device of claim 1, comprising a drainage installation which comprises openings (13) on the lower face (9) of the base (2) and tubes (10). 35
8. The pedestrian protection device of claim 1, wherein the box (1) is made of fibreglass in order to support the heavy vehicles passing. 40
9. The pedestrian protection device of claim 1, wherein the base (2) has internal partitions in order to support the weight of vehicles with a high tonnage. 45

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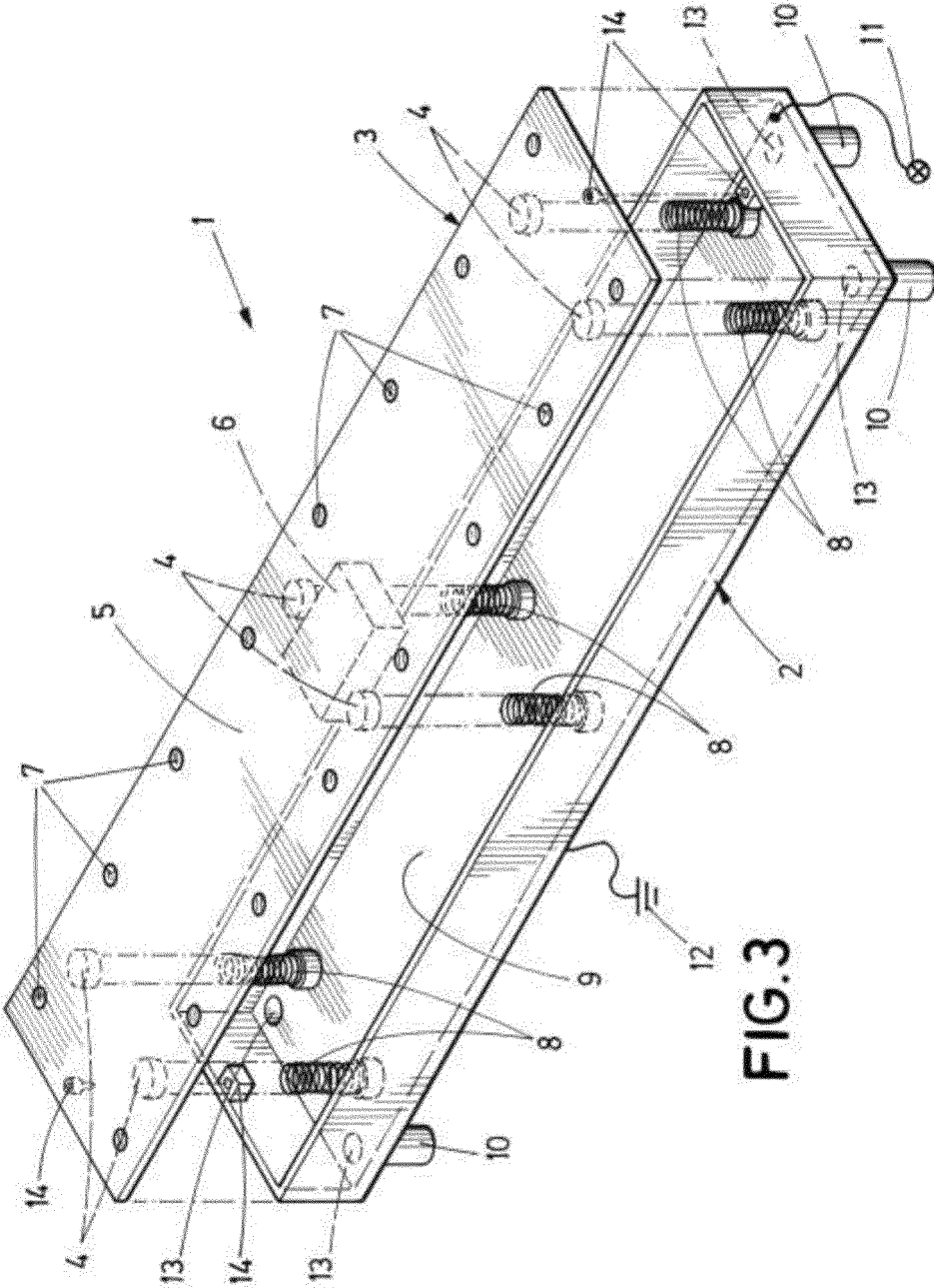


FIG.3



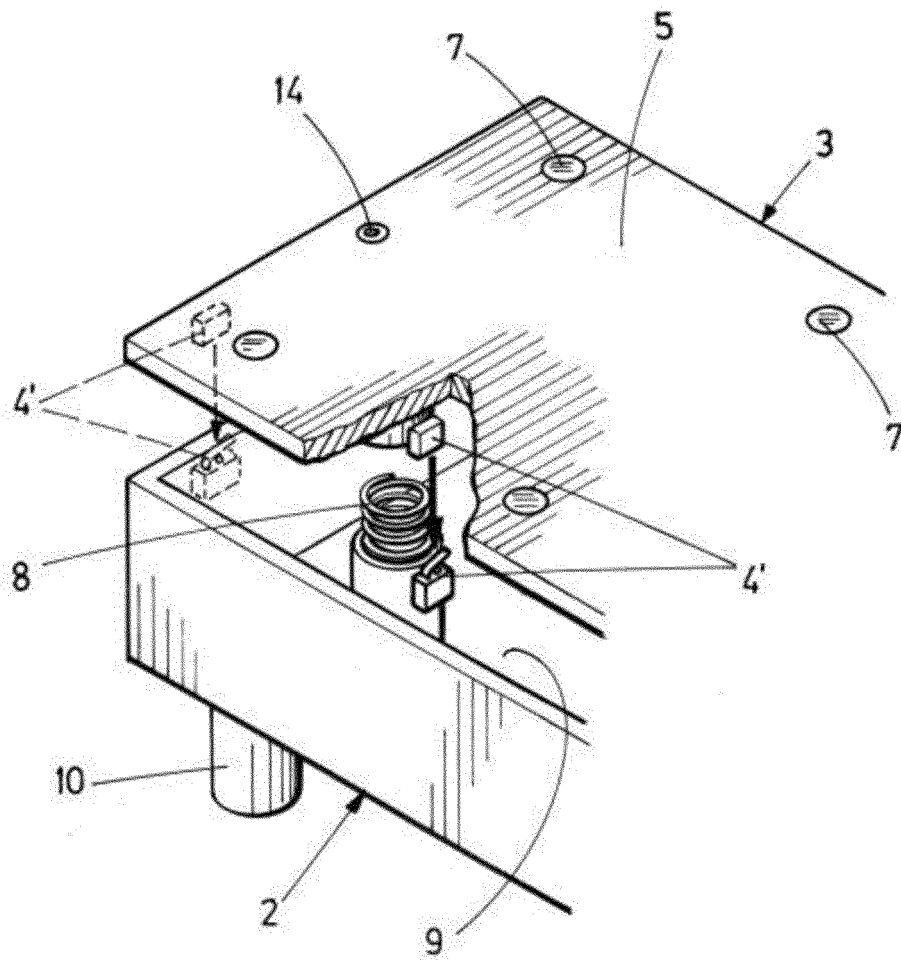


FIG.4

## INTERNATIONAL SEARCH REPORT

International application No

PCT/ES2020/070422

## A. CLASSIFICATION OF SUBJECT MATTER

INV. E01F9/529 G08G1/005 E01F9/582  
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)

E01F G08G

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)

EP0-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents :

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Date of the actual completion of the international search

5 November 2020

Date of mailing of the international search report

16/11/2020

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Giannakou, Evangelia

## INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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