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(54) **SAFETY BARRIER**

(52) **U.S. Cl.**

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(2013.01); *E01F 15/083* (2013.01)

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(57) **ABSTRACT**

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A safety barrier includes: a body installed on a road; a steel plate portion placed between the body and the road; and an anchor portion passing through the steel plate portion and having an upper part buried in the body and a lower part buried in the road, wherein a first space in which a middle part of the anchor portion other than the upper part and the lower part is placed, is formed between the body and the road, and when an impact is applied to the body, the body is moved while accompanying bending deformation of the middle part in the first space so that the impact is absorbed, and after bending deformation of the middle part occurs, the steel plate portion breaks the anchor portion to implement further movement of the body caused by the impact so that the impact is dispersed.

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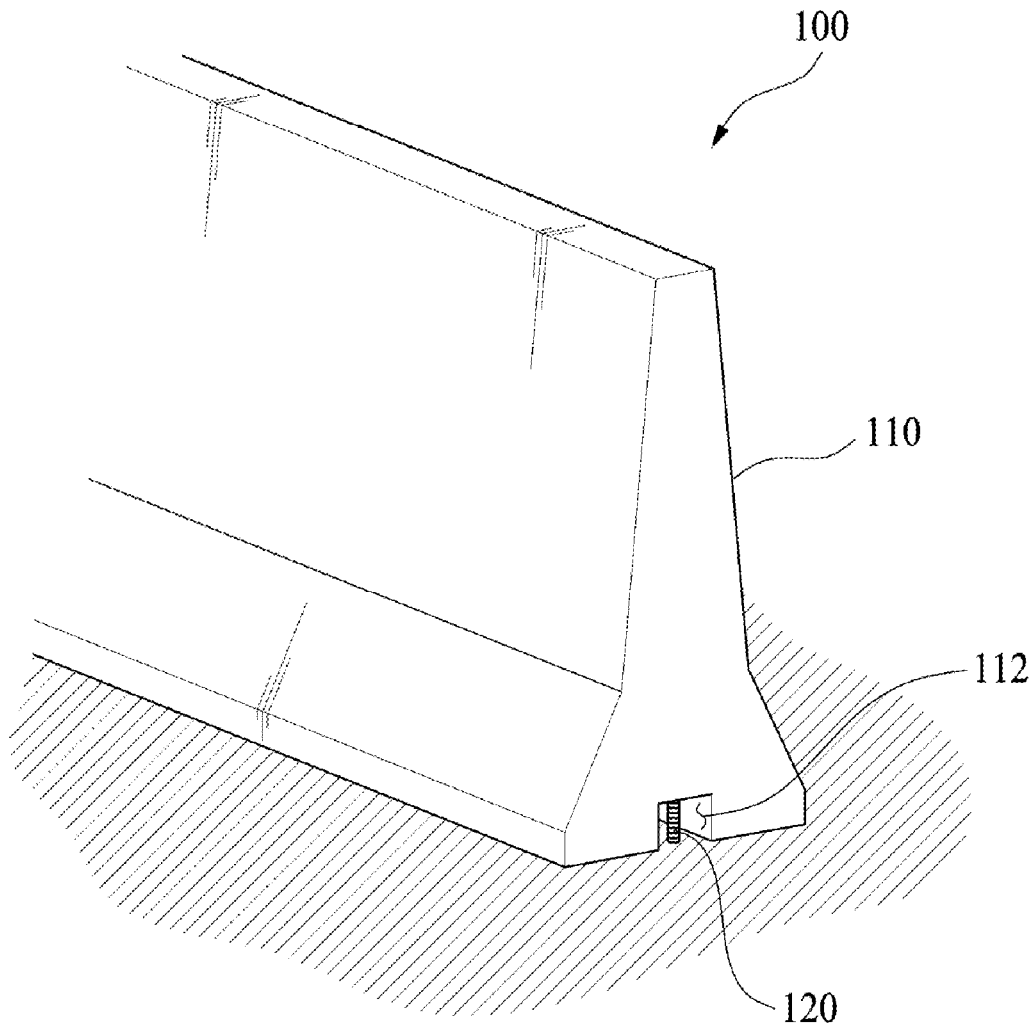


FIG.1

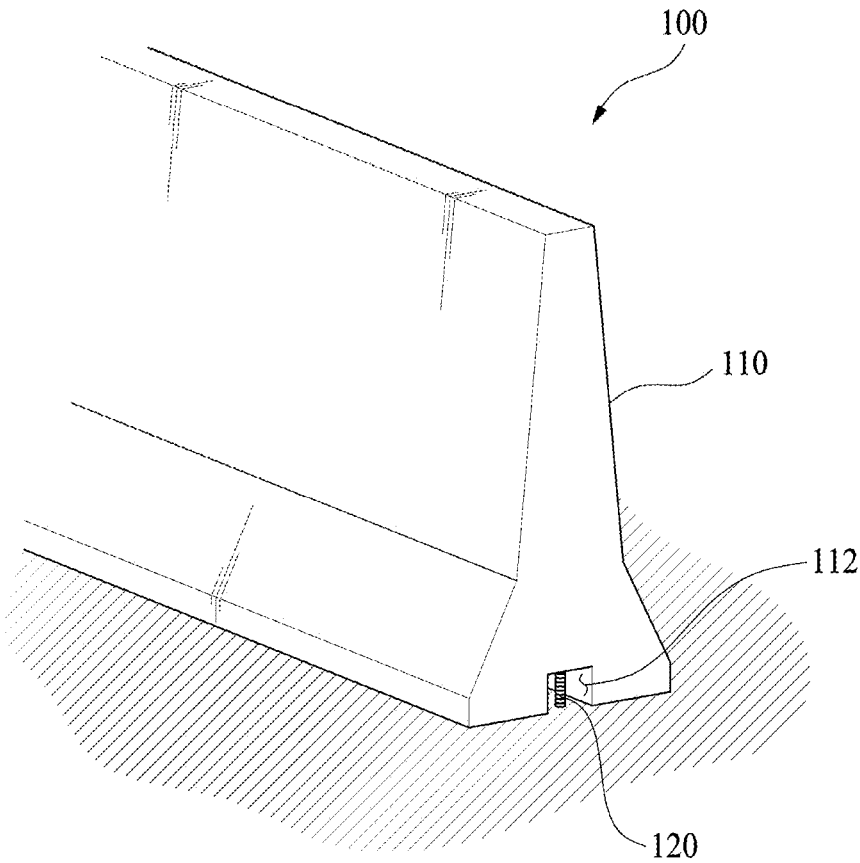


FIG.2

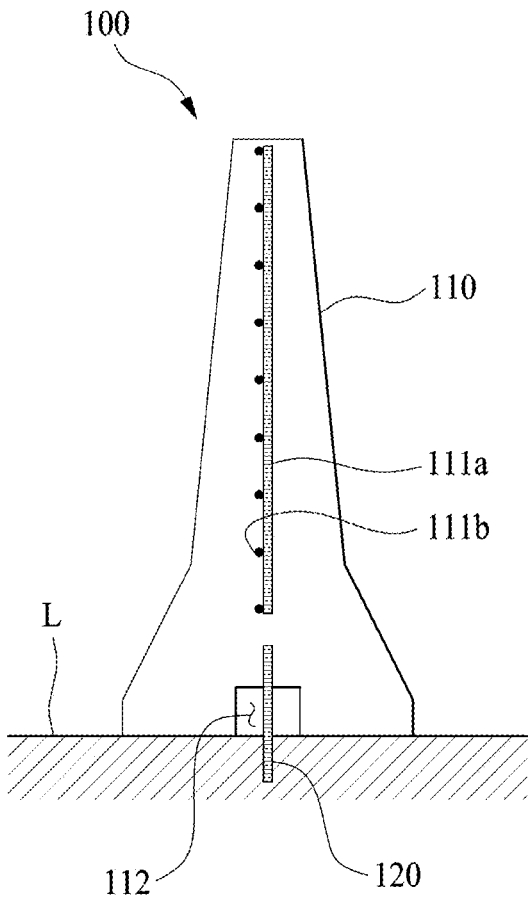


FIG.3

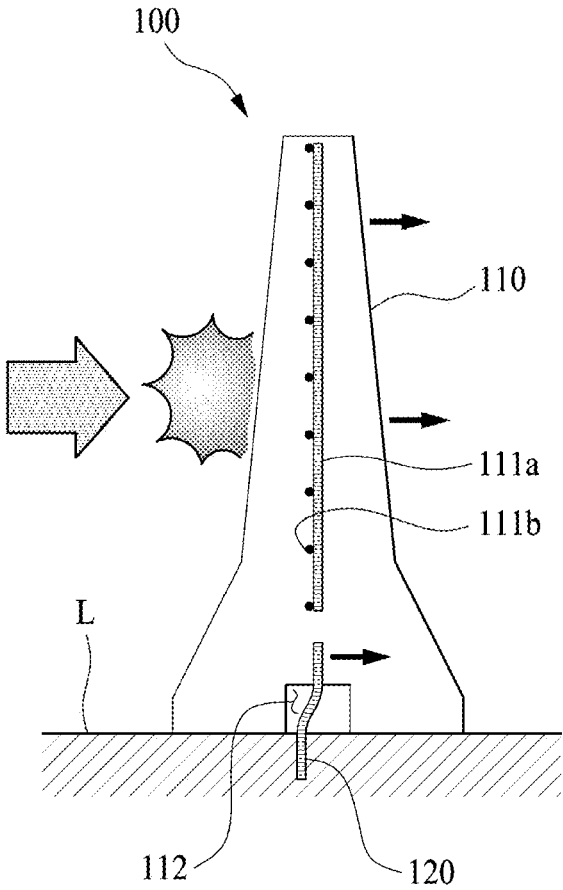


FIG.4

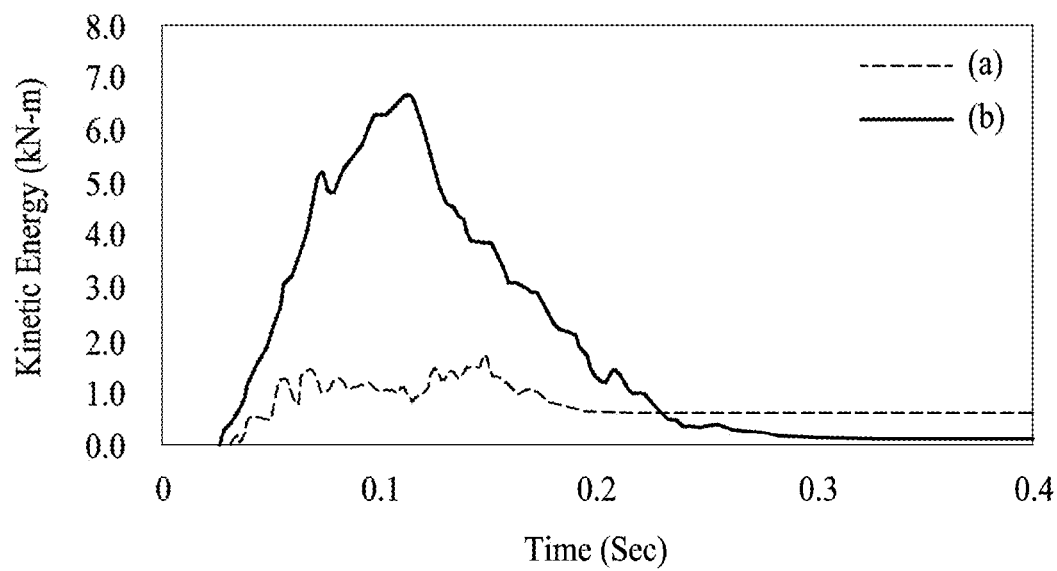


FIG.5

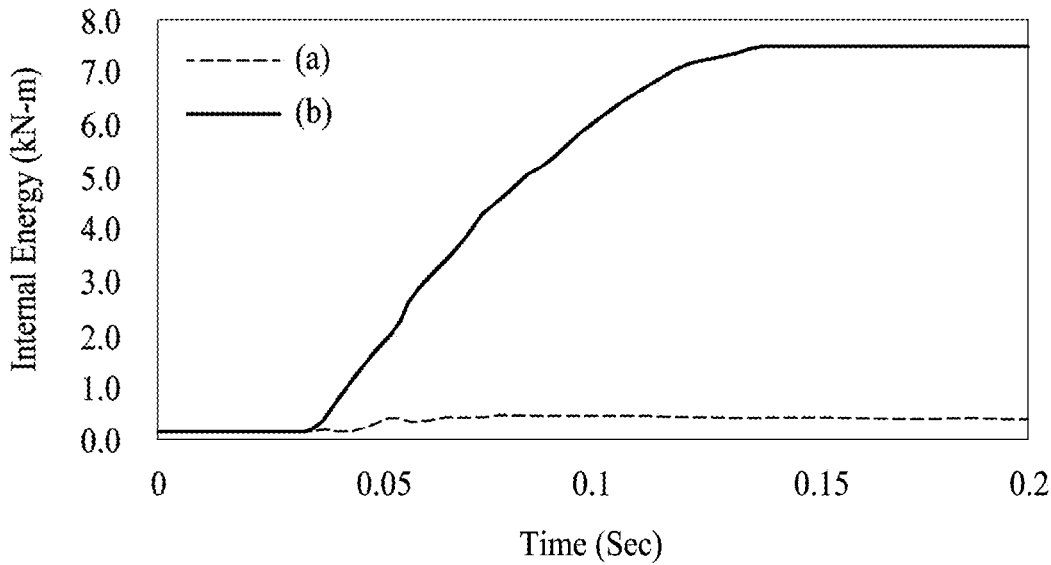
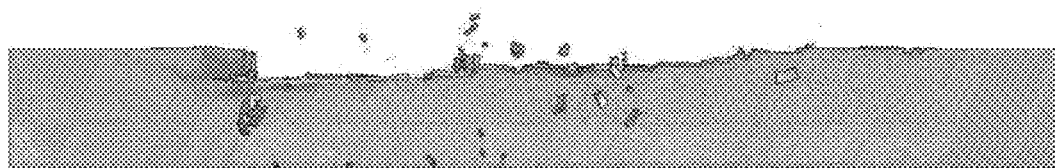
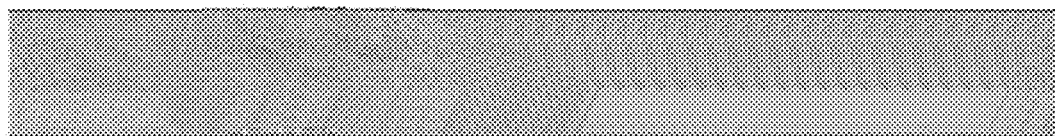


FIG.6



(a)



(b)

FIG.7

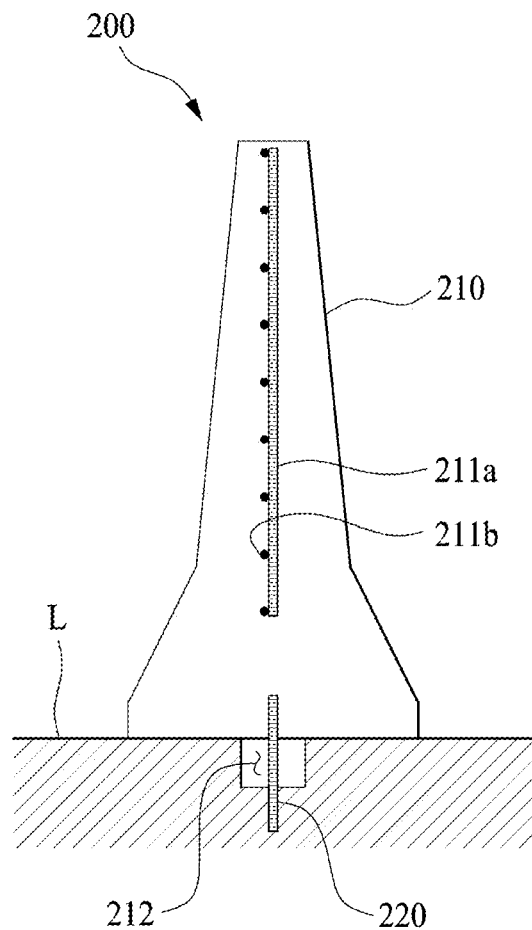


FIG.8

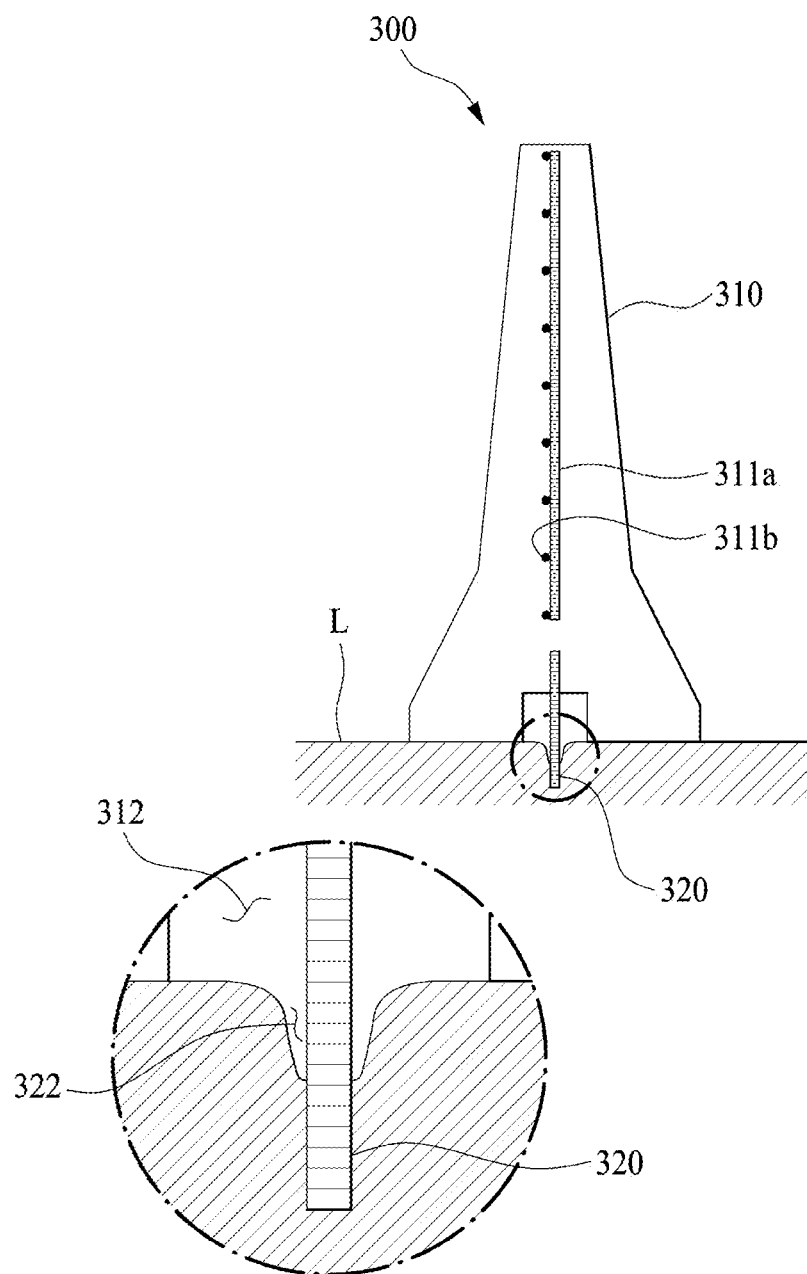


FIG.9

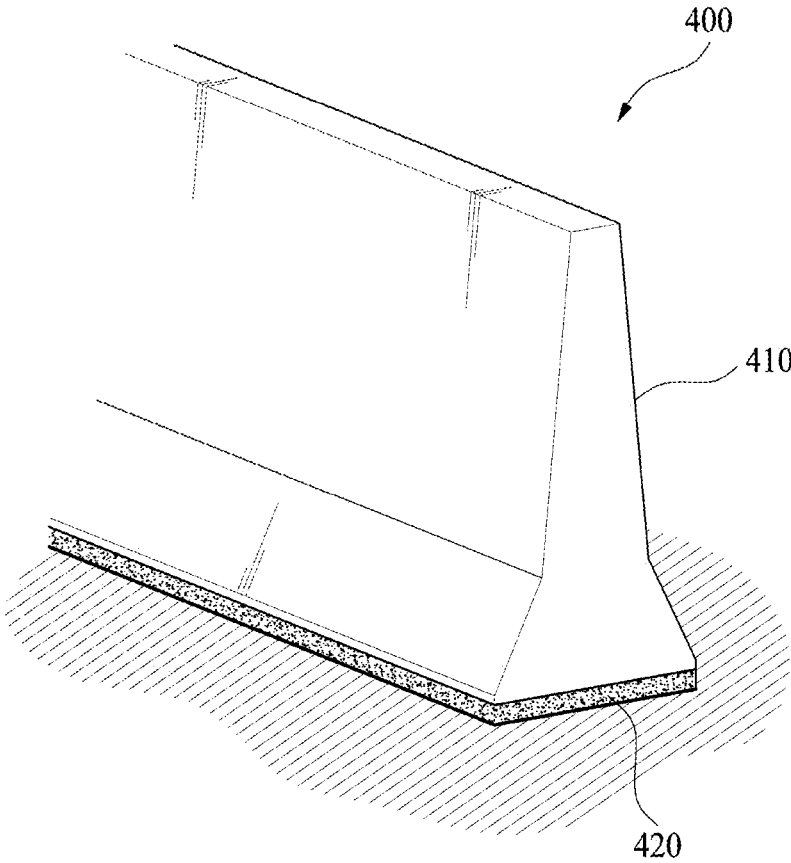


FIG.10

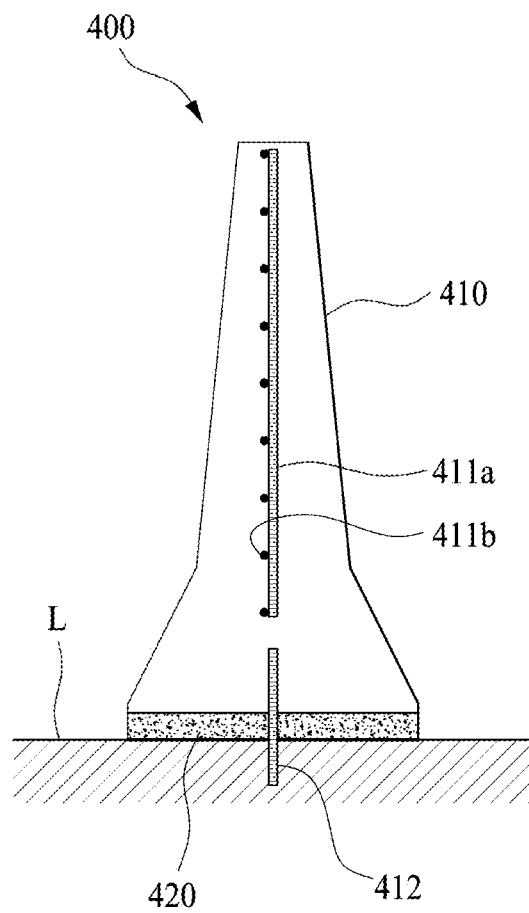


FIG.11

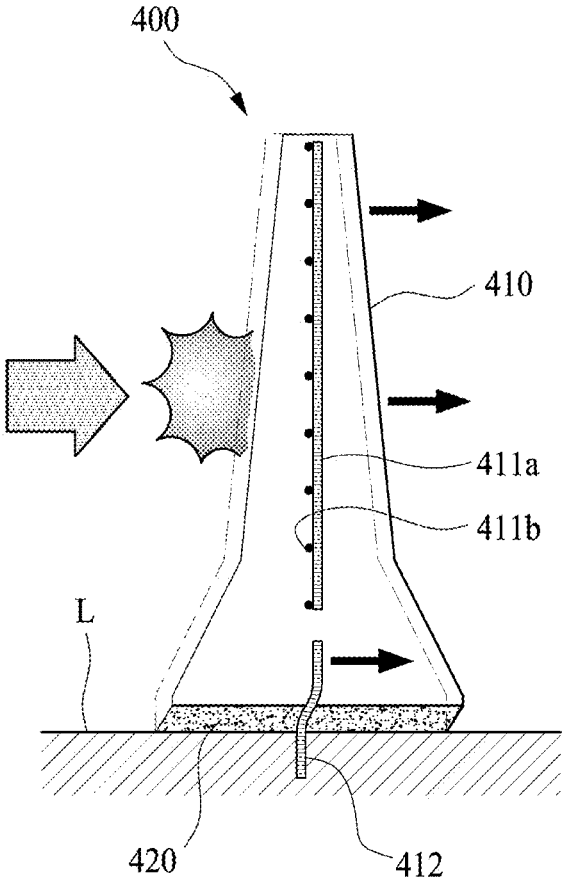


FIG.12

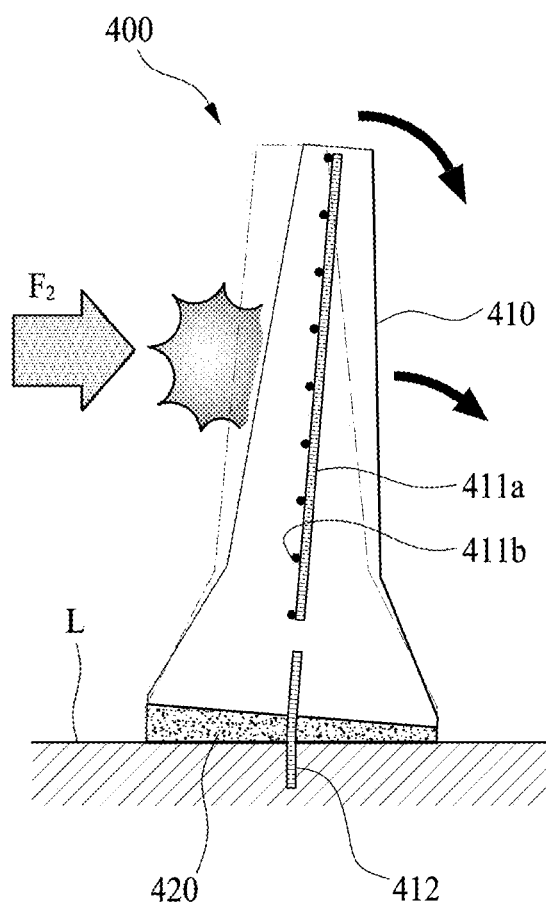


FIG.13

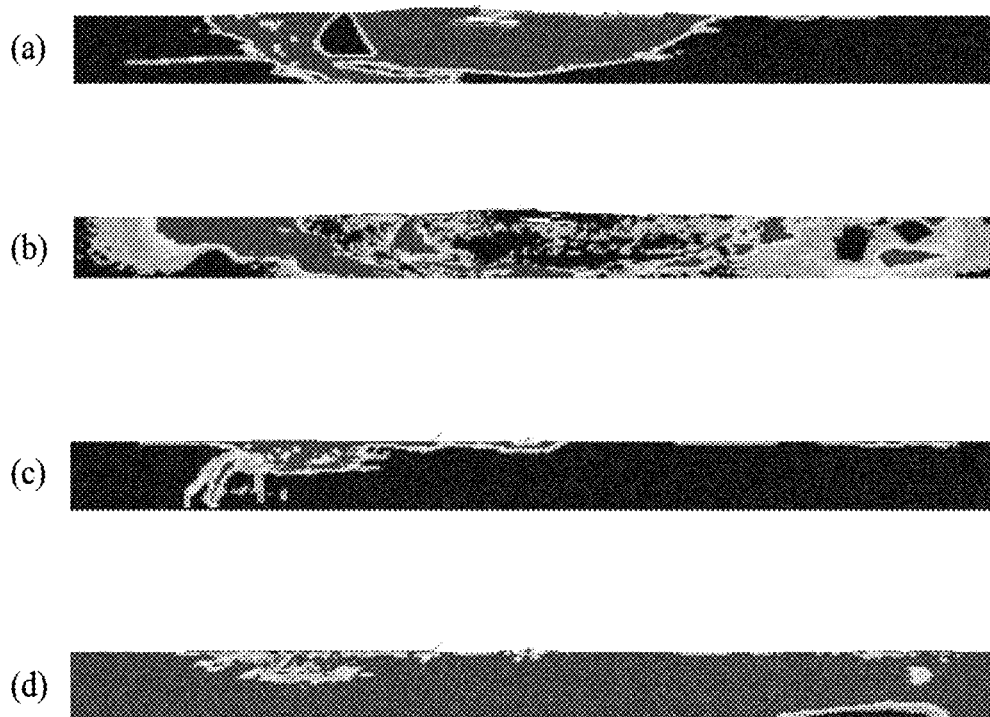


FIG.14

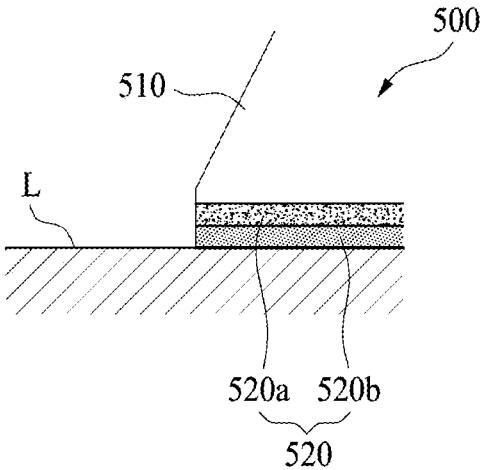


FIG.15

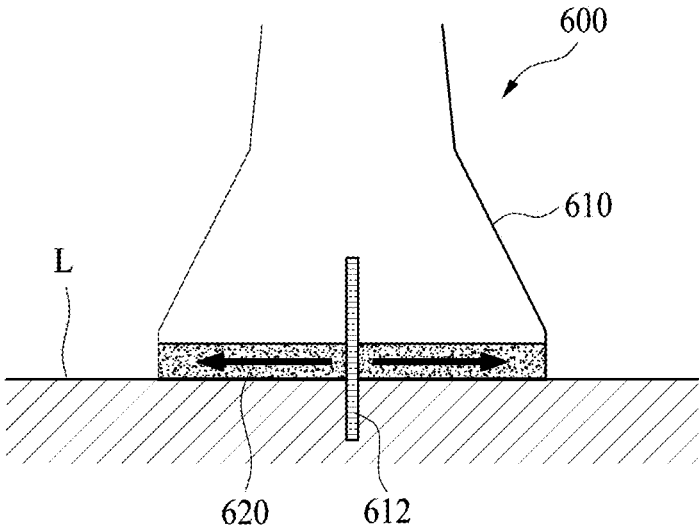


FIG.16

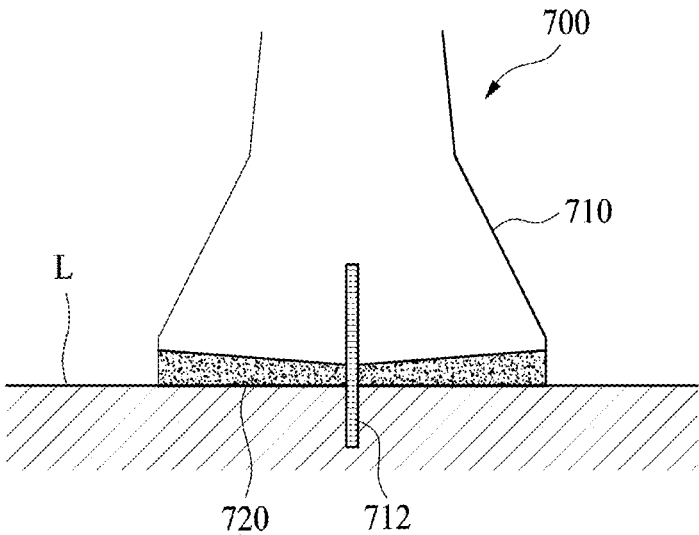


FIG.17

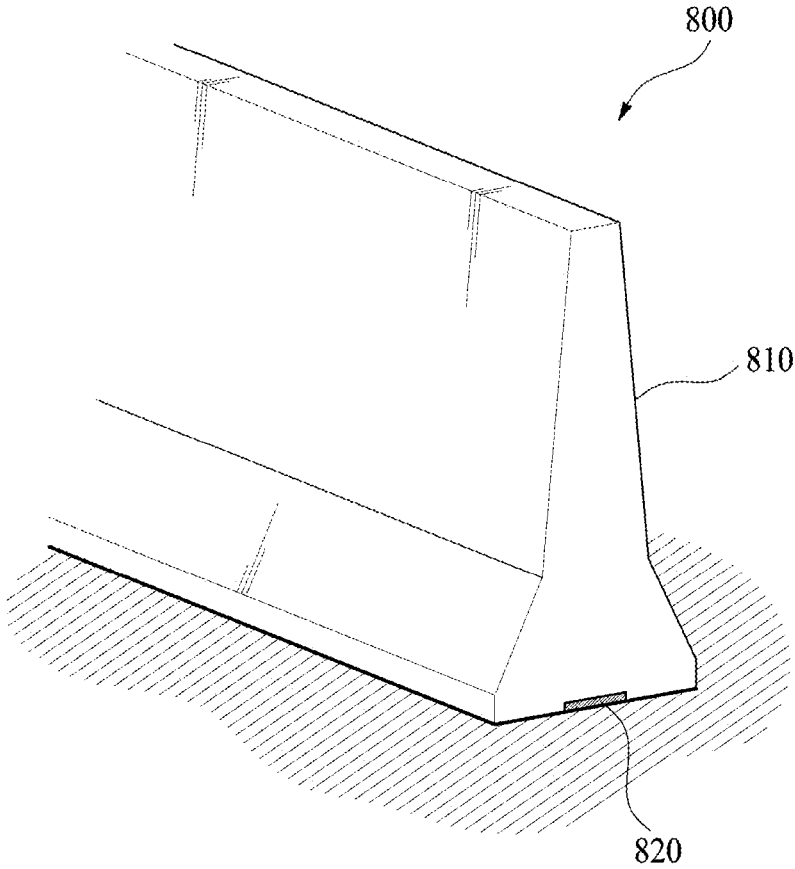


FIG.18

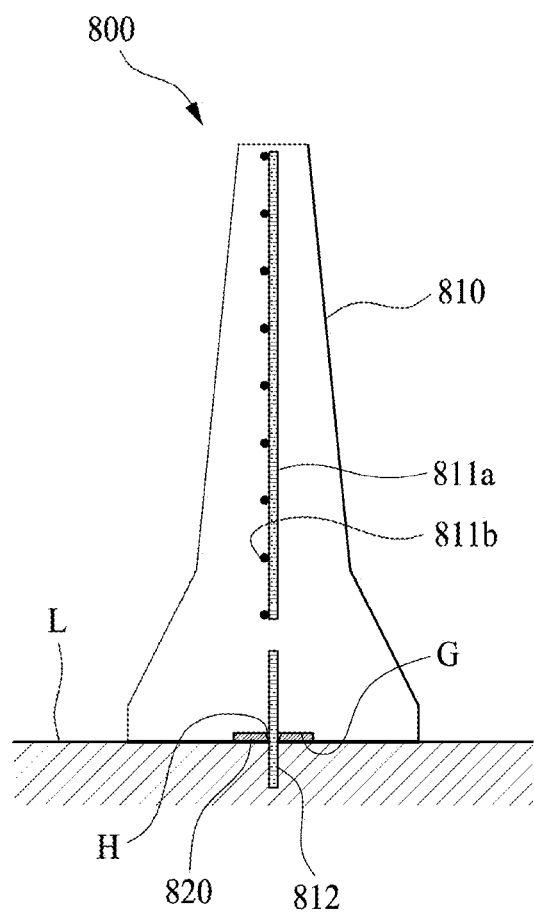


FIG.19

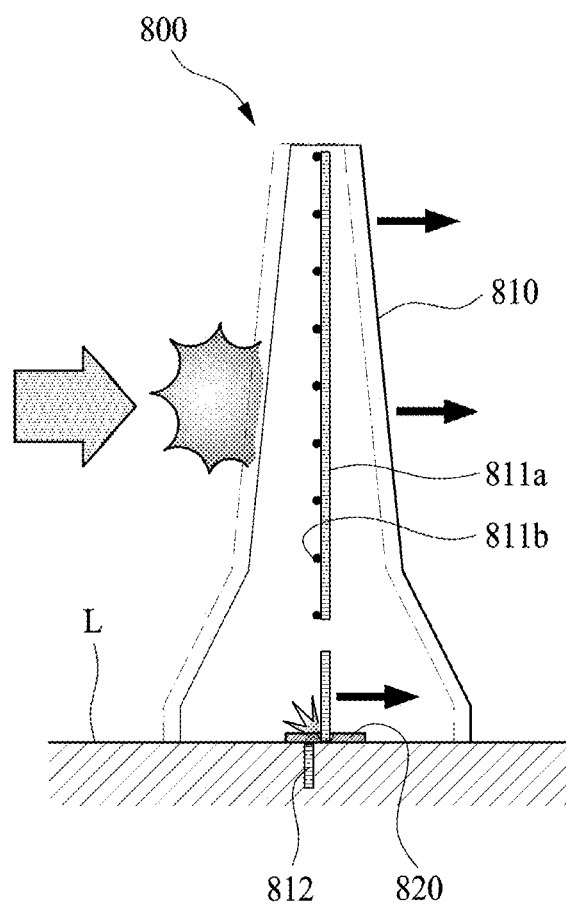


FIG.20

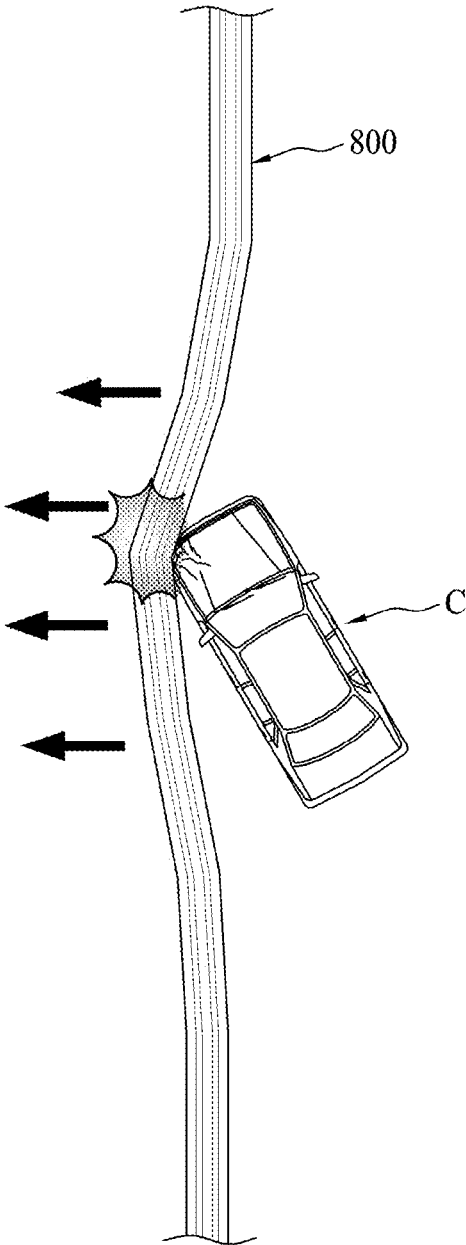


FIG.21

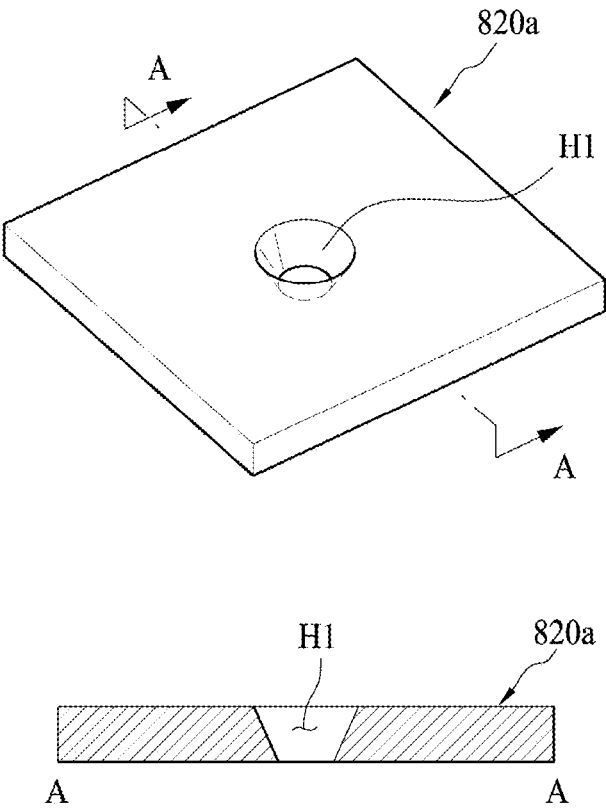


FIG.22

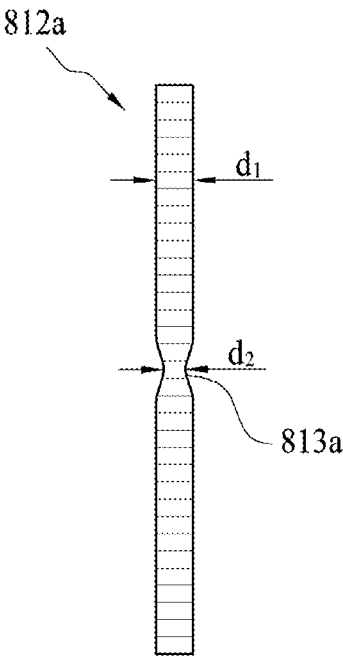


FIG.23

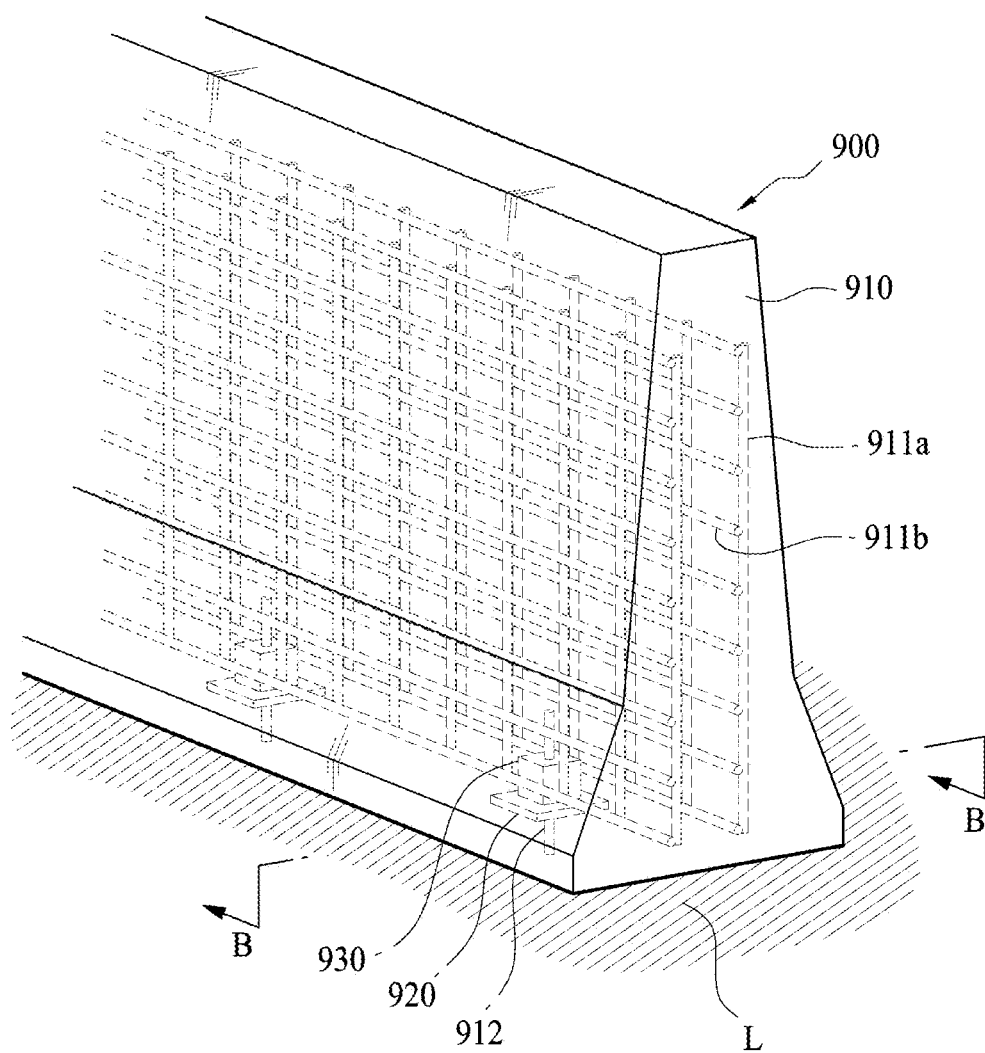


FIG.24

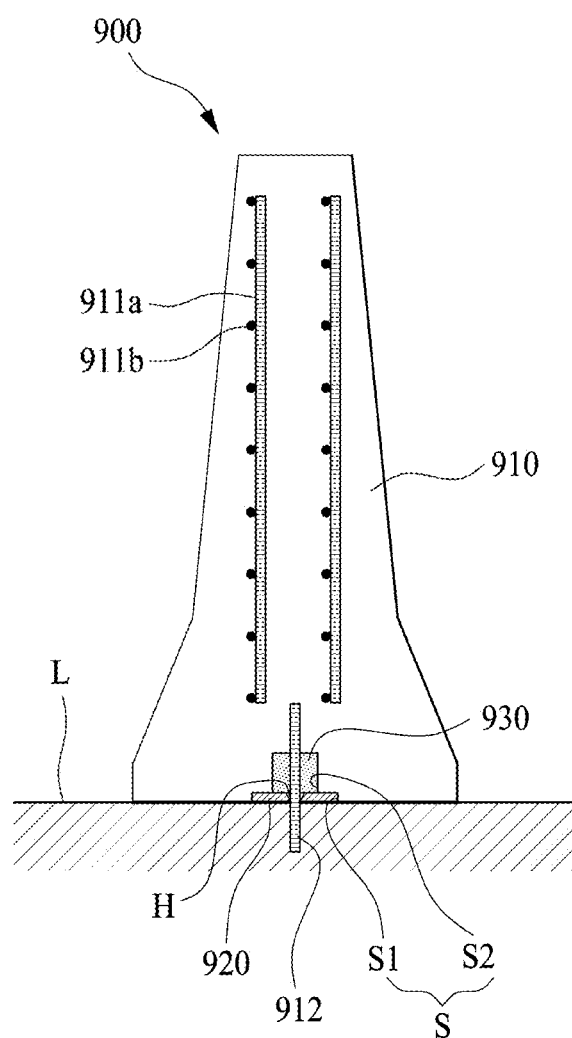


FIG.25

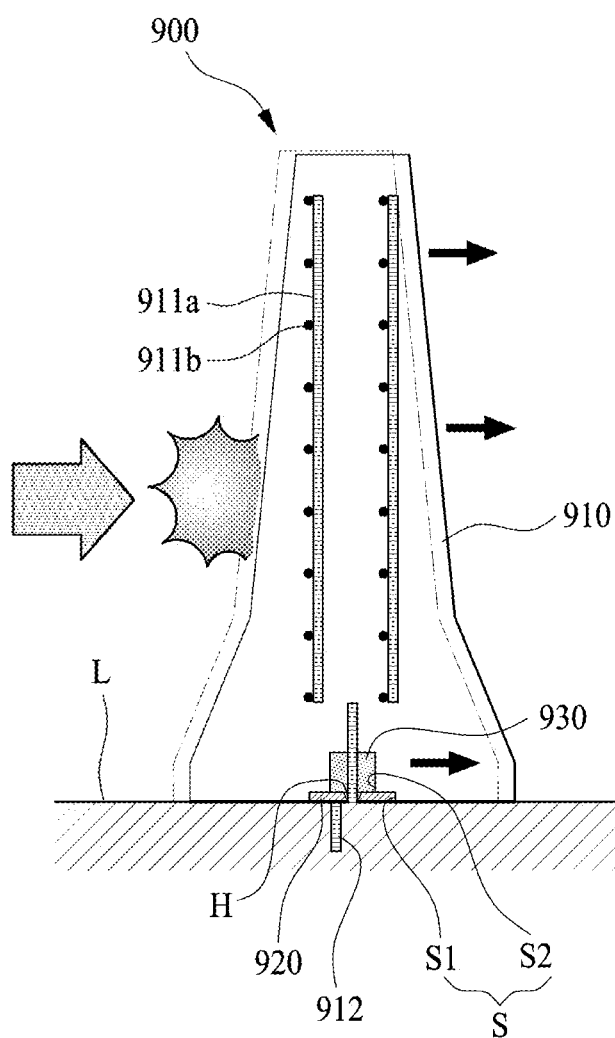


FIG.26

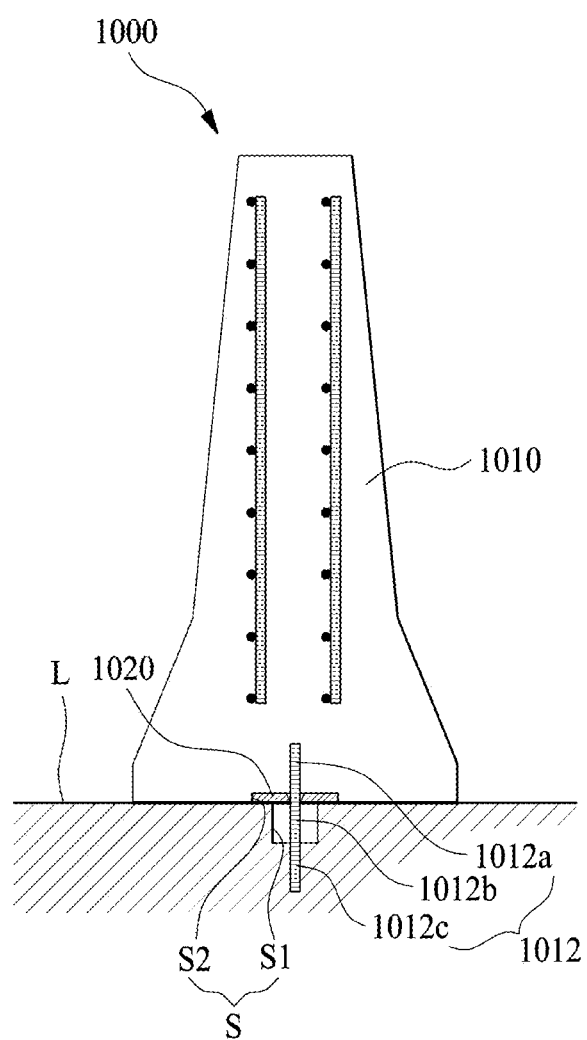


FIG.27

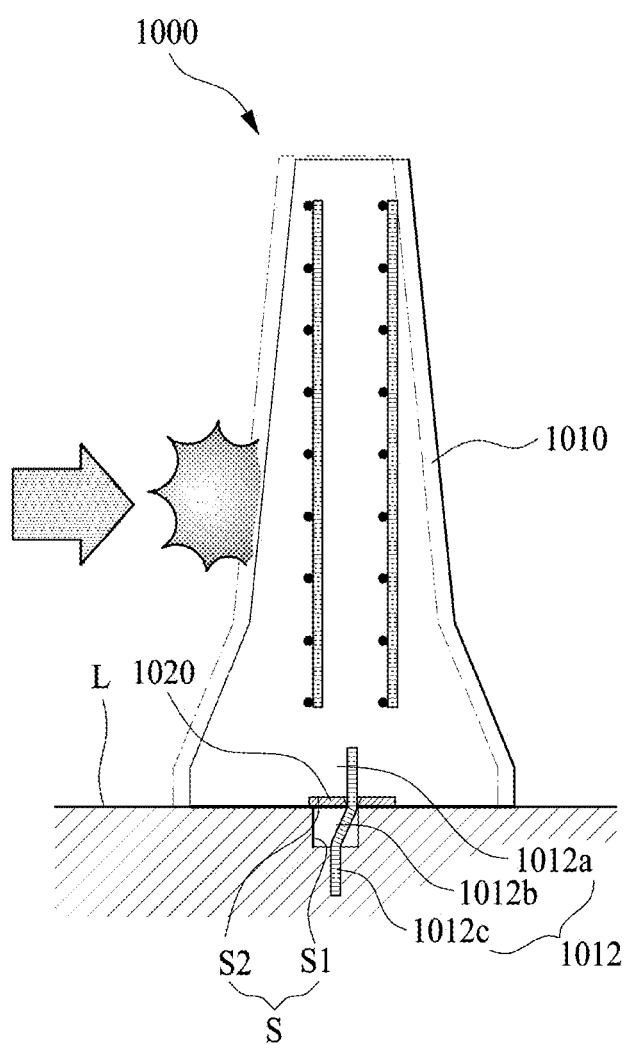


FIG.28

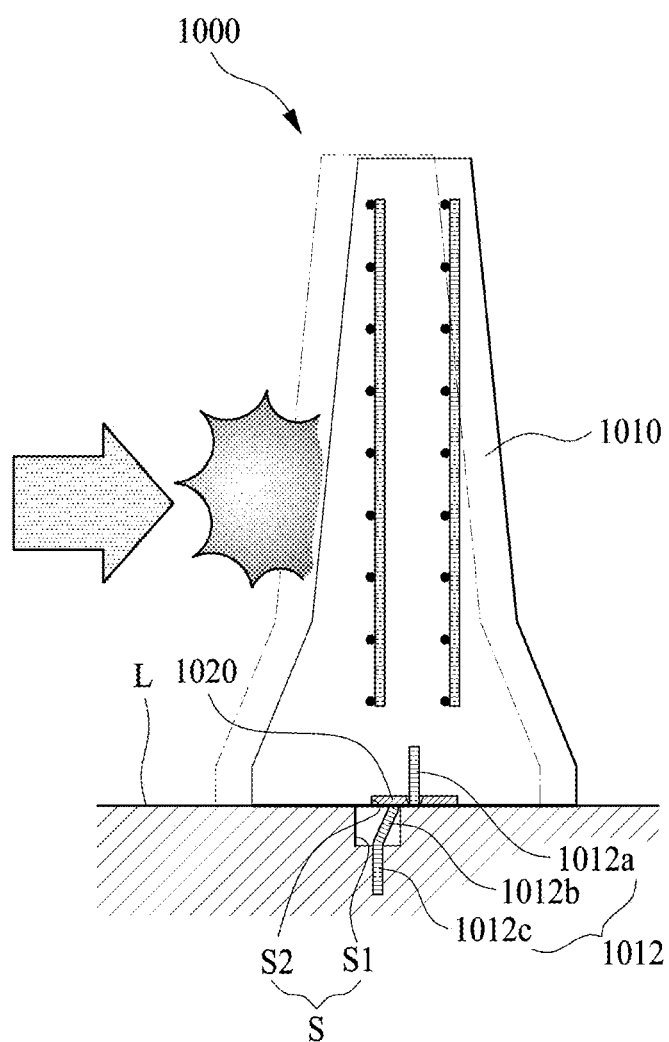


FIG.29

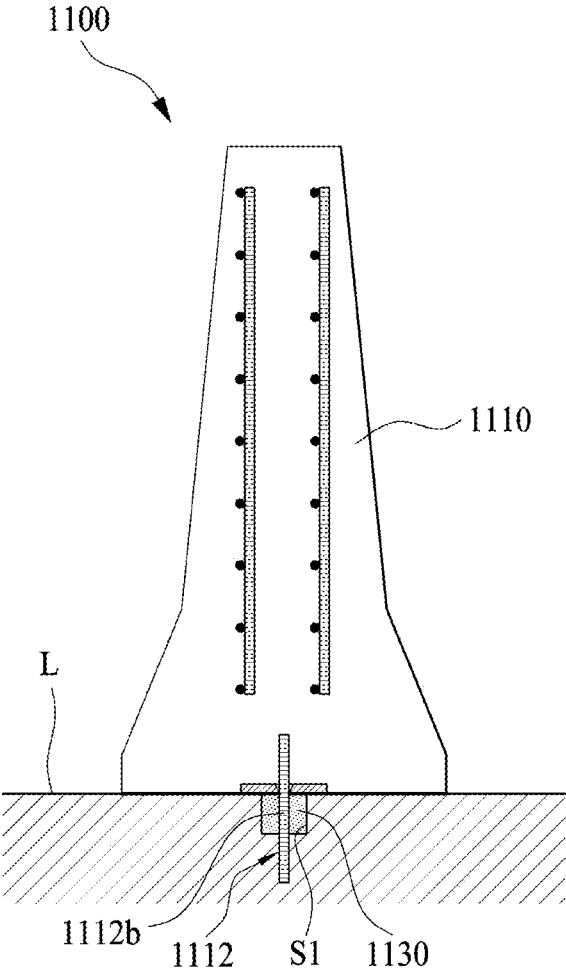


FIG.30

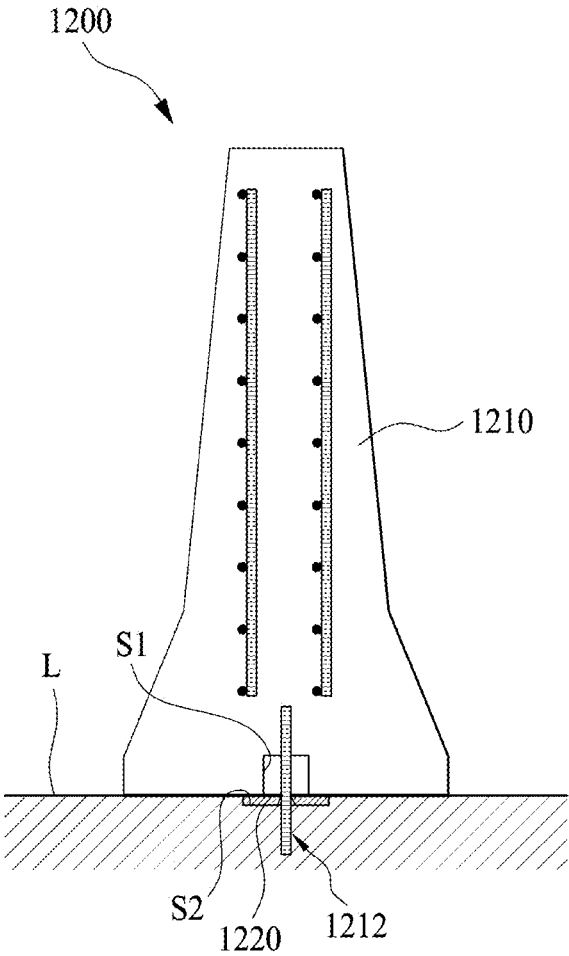


FIG.31

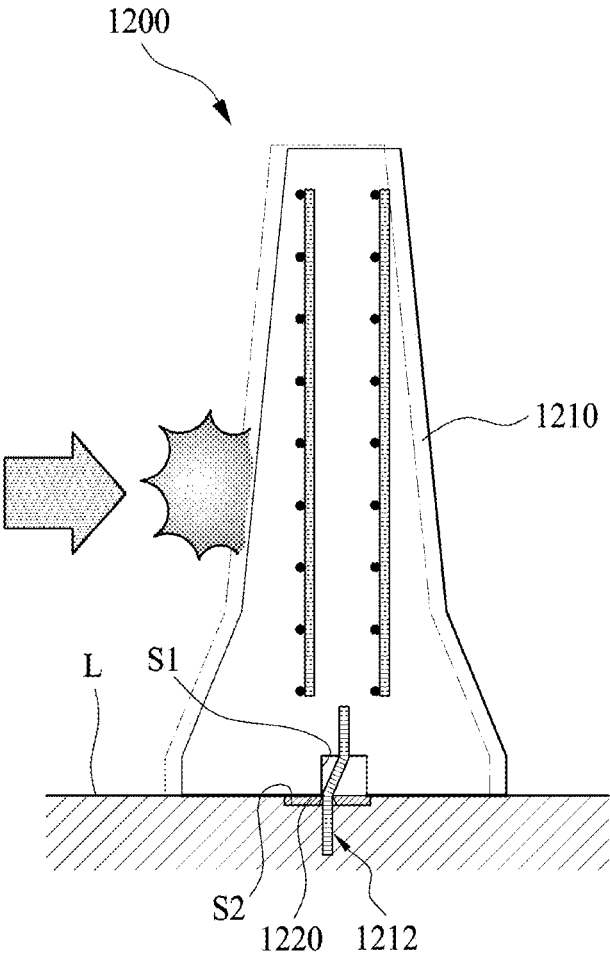


FIG.32

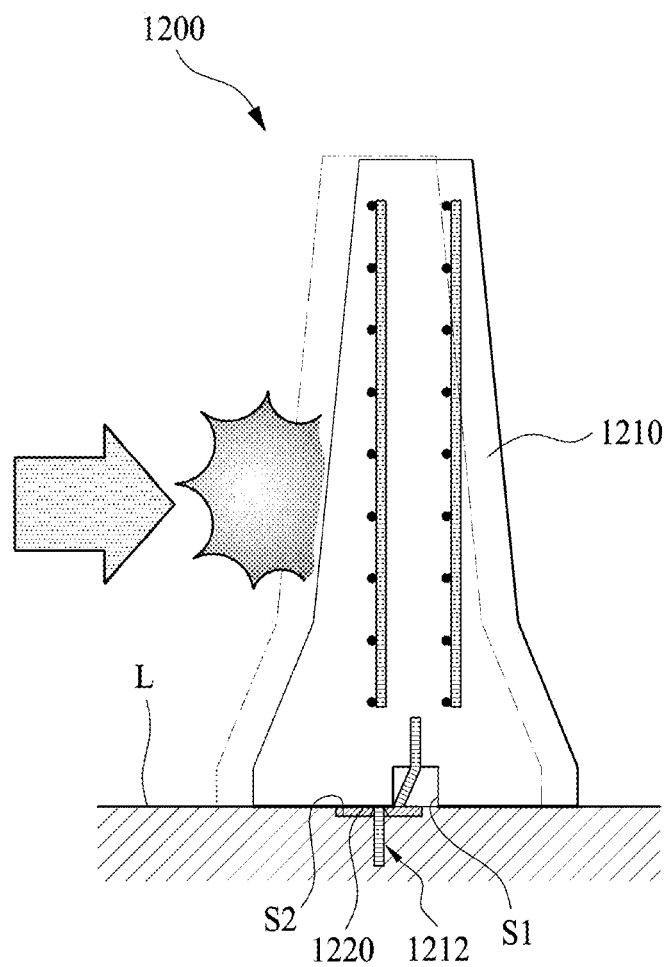


FIG.33

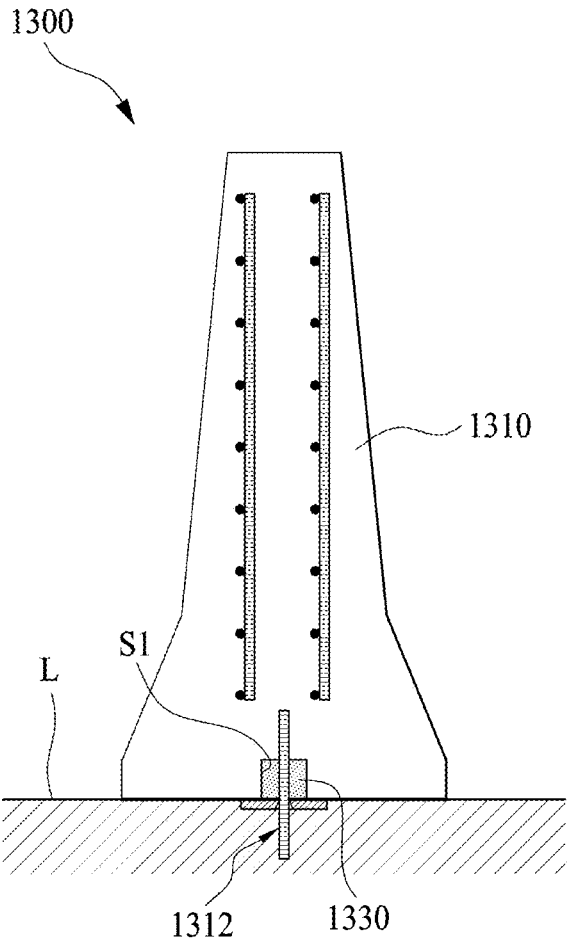


FIG.34

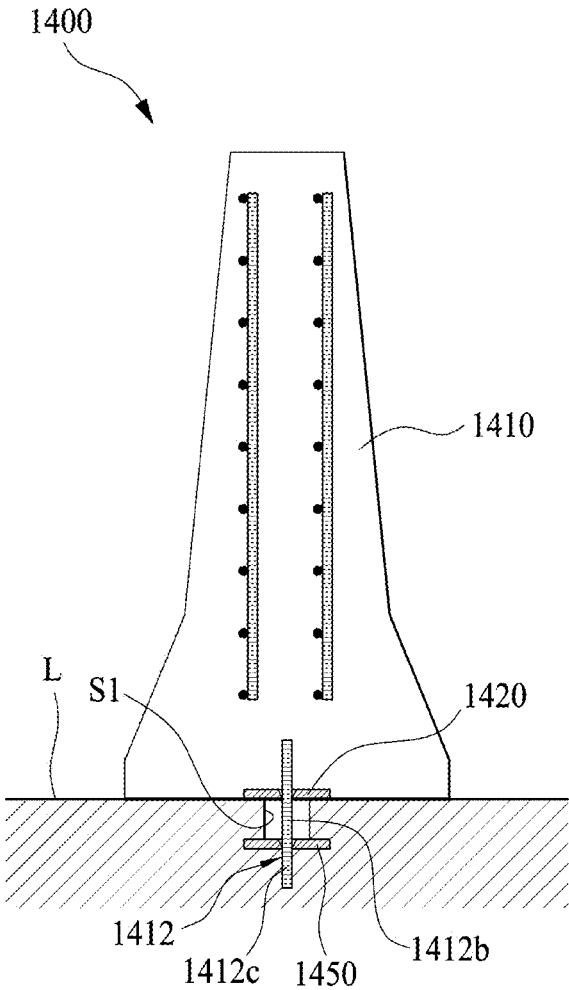


FIG.35

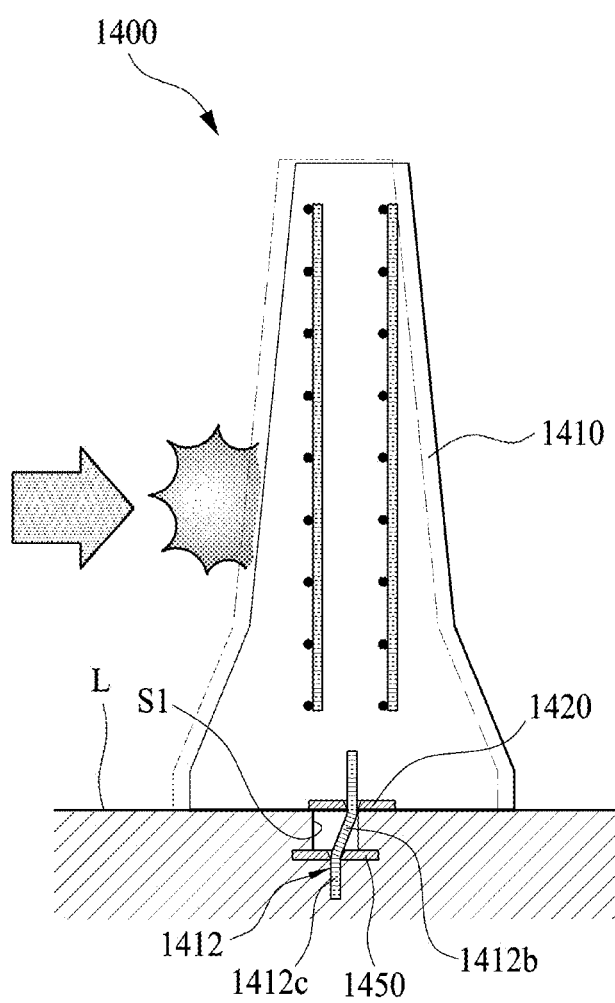


FIG.36

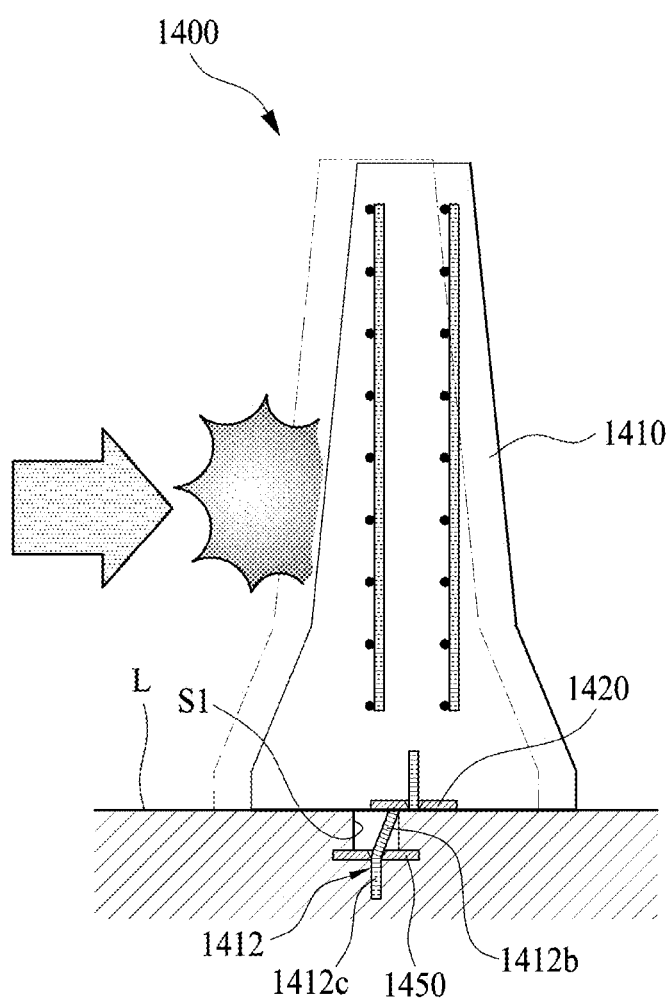


FIG.37

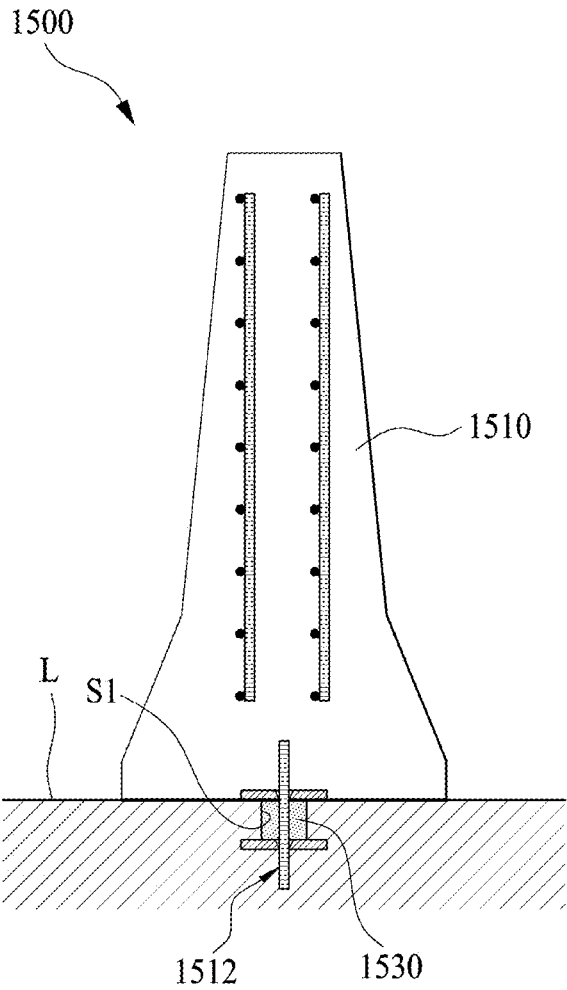


FIG.38

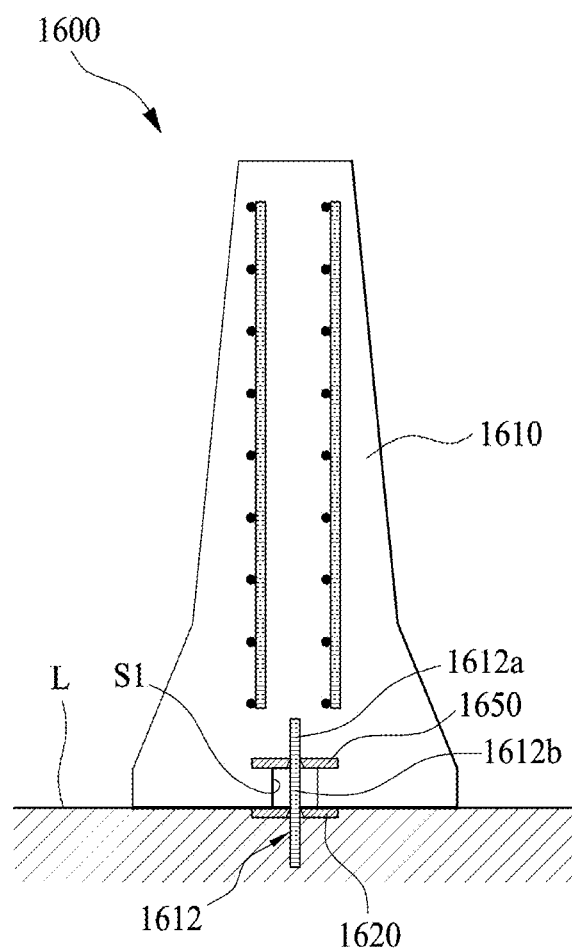


FIG.39

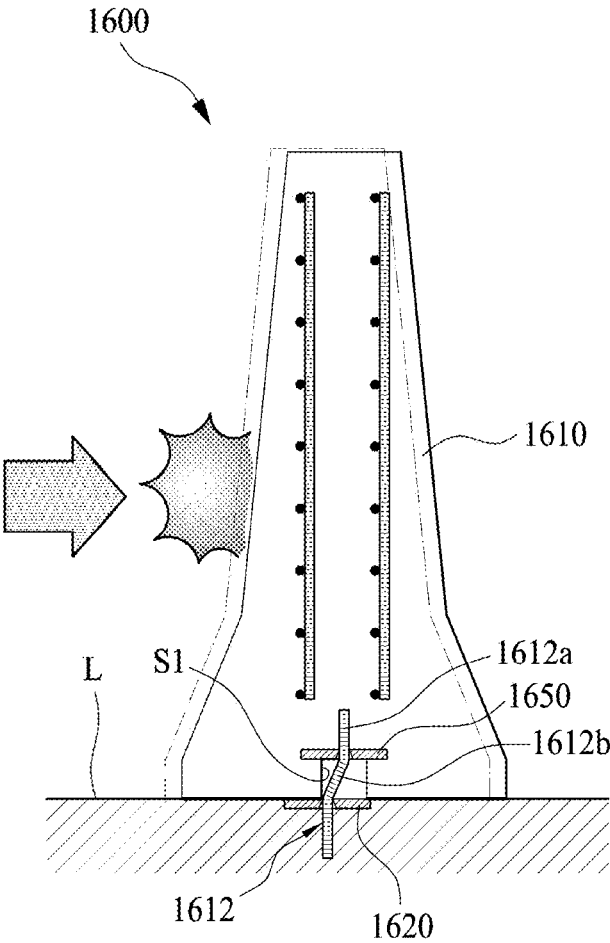


FIG.40

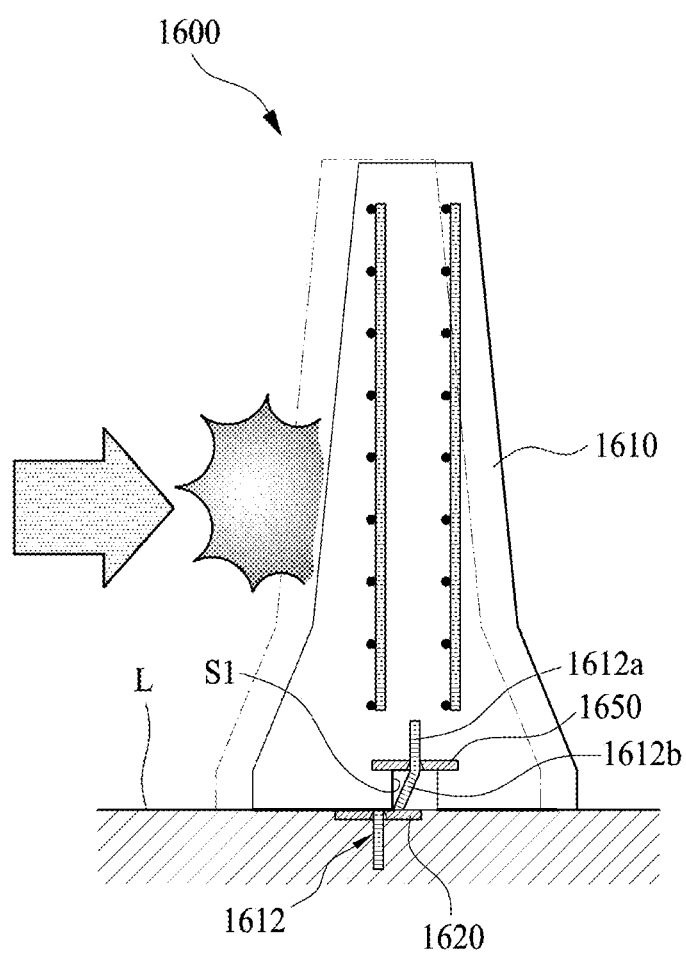
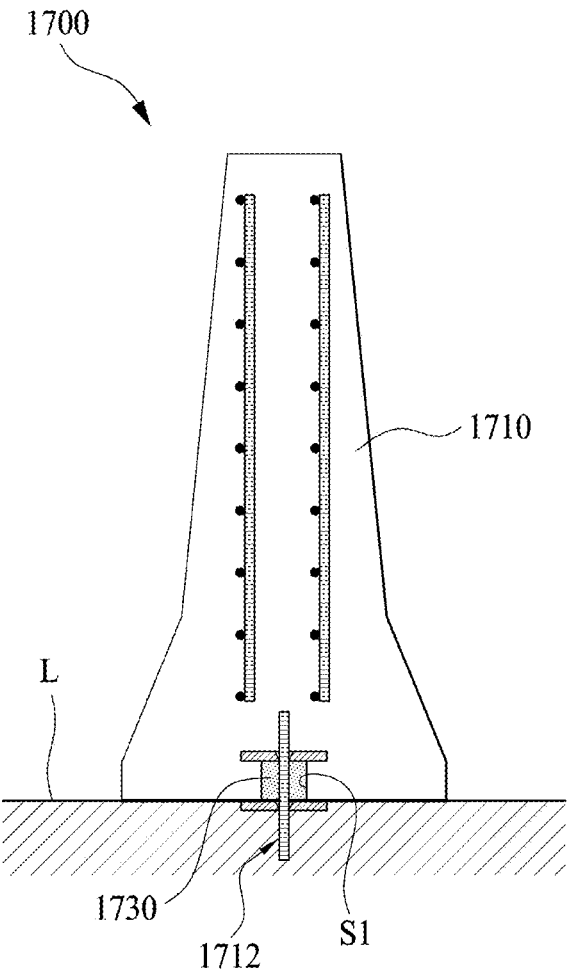


FIG.41



SAFETY BARRIER

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and the benefit of Korean Patent Application No. 2018-0062706, filed on May 31, 2018, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

1. Field of the Invention

[0002] The present invention relates to a safety barrier installed on a road, and more particularly, to a safety barrier capable of promoting safety.

2. Discussion of Related Art

[0003] In general, a safety barrier is installed for the purpose of preventing collision between cars that move in opposite directions on a road on which a car is driven, in particular, an expressway on which high-speed driving is performed, or a vehicular road, for the purpose of preventing a vehicle that is driven in a wrong direction, from deviating from a road, entering an opposite lane, or the like, and for the purpose of minimizing a passenger's injury or damage of a vehicle.

[0004] A safety barrier according to the related art is usually made of concrete with reinforcing bars that provide high strength for the safety barrier to endure an external strong impact.

[0005] This may be an essential condition for protecting cars that are driven in opposite directions when a strong impact is generated.

[0006] However, due to such characteristics, there is a problem in that the safety barrier according to the related art has a very large amount of impact applied as a consequence of a car that directly collides with the safety barrier.

[0007] This causes a driver to be seriously injured, and in some cases, may cause death. Thus, protection of a colliding car is not suitably performed.

[0008] In addition, when a high load is instantaneously transferred to the safety barrier due to the car that collides with the safety barrier, fragments such as concrete occur. These fragments may also cause an injury to a driver of a car that is driven on an opposite road.

[0009] Therefore, methods of solving these problems are required.

SUMMARY OF THE INVENTION

[0010] The present invention is directed to a safety barrier that is capable of preventing cars that are driven in both directions of a road from invading in opposite lanes and simultaneously minimizing damage of a colliding car and a driver's injury by effectively dispersing the amount of an impact generated by the colliding car when a collision between cars occurs.

[0011] The present invention is also directed to a safety barrier that is capable of minimizing a driver's injury of a car that is driven on an opposite road by minimizing the occurrence of fragments such as concrete caused by a colliding car.

[0012] According to an aspect of the present invention, there is provided a safety barrier including: a body installed

on a road; a steel plate portion placed between the body and the road; and an anchor portion passing through the steel plate portion and having an upper part buried in the body and a lower part buried in the road, wherein a first space in which a middle part of the anchor portion other than the upper part and the lower part are placed, is formed between the body and the road, and when an impact is applied to the body, the body is moved while accompanying bending deformation of the middle part in the first space so that the impact is absorbed, and after bending deformation occurs in the middle part, the steel plate portion breaks the anchor portion to implement further movement of the body caused by the impact so that the impact is dispersed.

[0013] The first space may be provided by the road, and the body may include a second space in which the steel plate portion is placed at a lower part, and the steel plate portion may be moved together with the body when the body moves as a result of the impact.

[0014] The steel plate portion may cover the first space before the impact is applied to the body.

[0015] The safety barrier may further include a damage prevention portion placed at a lower side of the first space, defining the lower side of the first space and preventing damage of the road due to the lower part when bending deformation occurs in the middle part.

[0016] The first space may be provided for the lower part of the body, and the steel plate portion may be accommodated in a second space provided by the road and may be implemented independently of movement of the body due to the impact. The steel plate portion may define the lower side of the first space before the impact is applied to the body.

[0017] The safety barrier may further include a damage prevention portion placed at an upper side of the first space, defining the upper side of the first space and preventing damage of the body due to the upper part when bending deformation occurs in the middle part.

[0018] The safety barrier may further include a connector placed around the middle part, allowing the first space when at least one of the road and the body is formed, to be formed and allowing connection of the road and the connector after the road and the body are formed.

[0019] The connector may be made of a material having a lower strength than a strength of at least one of the road and the body.

[0020] A plurality of first spaces may be spaced apart from each other in a longitudinal direction of the body or may be continuously formed in the longitudinal direction of the body.

[0021] The steel plate portion may include a through hole through which the anchor portion passes, and an inner surface, on which the through hole is defined, may be inclined so that fracture of the anchor portion due to the steel plate portion is easily performed.

[0022] The steel plate portion may include a through hole through which the anchor portion passes, and a diameter of a portion of the anchor portion that corresponds to the through hole may be relatively smaller than a diameter of the other portion of the anchor portion so that fracture of the anchor portion due to the steel plate portion is easily performed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The above and other objects, features and advantages of the present invention will become more apparent to

those of ordinary skill in the art by describing in detail exemplary embodiments thereof with reference to the accompanying drawings, in which:

[0024] FIG. 1 is a schematic perspective view of a safety barrier according to a first embodiment of the present invention;

[0025] FIG. 2 is a schematic cross-sectional view of the safety barrier according to the first embodiment of the present invention;

[0026] FIG. 3 is a schematic cross-sectional view for explaining a deformed situation of when an external impact is applied to the safety barrier according to the first embodiment of the present invention;

[0027] FIG. 4 is a graph for comparing a change of a kinetic energy generated in concrete that constitutes both of a body of the safety barrier according to the first embodiment and a safety barrier according to the related art;

[0028] FIG. 5 is a graph for comparing a change of an internal energy generated in both of a reinforcing bar embedded in the body of the safety barrier according to the first embodiment and the safety barrier according to the related art;

[0029] FIG. 6 is a view of a collision simulation model of each of the safety barrier according to the first embodiment and the safety barrier according to the related art;

[0030] FIG. 7 is a schematic cross-sectional view of a safety barrier according to a second embodiment of the present invention;

[0031] FIG. 8 is a schematic cross-sectional view of a safety barrier according to a third embodiment of the present invention;

[0032] FIG. 9 is a schematic perspective view of a safety barrier according to a fourth embodiment of the present invention;

[0033] FIG. 10 is a schematic cross-sectional view of the safety barrier according to the fourth embodiment of the present invention;

[0034] FIGS. 11 and 12 are schematic cross-sectional views for explaining a deformed situation of when an external impact is applied to the safety barrier according to the fourth embodiment of the present invention;

[0035] FIG. 13 is a view showing a computer simulation result of each of a safety barrier according to the related art and the safety barrier according to the fourth embodiment of the present invention;

[0036] FIG. 14 is a schematic cross-sectional view of a safety barrier according to a fifth embodiment of the present invention;

[0037] FIG. 15 is a schematic cross-sectional view of a safety barrier according to a sixth embodiment of the present invention;

[0038] FIG. 16 is a schematic cross-sectional view of a safety barrier according to a seventh embodiment of the present invention;

[0039] FIG. 17 is a schematic perspective view of a safety barrier according to an eighth embodiment of the present invention;

[0040] FIG. 18 is a schematic cross-sectional view of the safety barrier according to the eighth embodiment of the present invention;

[0041] FIGS. 19 and 20 are schematic cross-sectional views for explaining a deformed situation of when an external impact is applied to the safety barrier according to the eighth embodiment of the present invention;

[0042] FIG. 21 is a schematic perspective view of a deformed example of a steel plate portion provided to the safety barrier according to the eighth embodiment of the present invention;

[0043] FIG. 22 is a schematic perspective view of a deformed example of an anchor portion provided for the safety barrier according to the eighth embodiment of the present invention;

[0044] FIG. 23 is a schematic perspective view of a safety barrier according to a ninth embodiment of the present invention;

[0045] FIG. 24 is a schematic cross-sectional view taken along a line B-B of FIG. 23;

[0046] FIG. 25 is a schematic cross-sectional view taken along a line B-B of FIG. 23 for explaining a deformed situation of when an external impact is applied to the safety barrier according to the ninth embodiment of the present invention;

[0047] FIG. 26 is a schematic cross-sectional view of a safety barrier according to a tenth embodiment of the present invention;

[0048] FIGS. 27 and 28 are schematic cross-sectional views for explaining a situation of when an impact is applied to the safety barrier according to the tenth embodiment of the present invention;

[0049] FIG. 29 is a schematic cross-sectional view of a safety barrier according to an eleventh embodiment of the present invention;

[0050] FIG. 30 is a schematic cross-sectional view of a safety barrier according to a twelfth embodiment of the present invention;

[0051] FIGS. 31 and 32 are schematic cross-sectional views for explaining a situation of when an impact is applied to the safety barrier according to the twelfth embodiment of the present invention;

[0052] FIG. 33 is a schematic cross-sectional view of a safety barrier according to a thirteenth embodiment of the present invention;

[0053] FIG. 34 is a schematic cross-sectional view of a safety barrier according to a fourteenth embodiment of the present invention;

[0054] FIGS. 35 and 36 are schematic cross-sectional views for explaining a situation of when an impact is applied to the safety barrier according to the fourteenth embodiment of the present invention;

[0055] FIG. 37 is a schematic cross-sectional view of a safety barrier according to a fifteenth embodiment of the present invention;

[0056] FIG. 38 is a schematic cross-sectional view of a safety barrier according to a sixteenth embodiment of the present invention;

[0057] FIGS. 39 and 40 are schematic cross-sectional views for explaining a situation of when an impact is applied to the safety barrier according to the sixteenth embodiment of the present invention; and

[0058] FIG. 41 is a schematic cross-sectional view of a safety barrier according to a seventeenth embodiment of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0059] Hereinafter, exemplary embodiments of the present invention will be described in detail below with reference to the accompanying drawings. However, the spirit of the

present invention is not limited to suggested embodiments, and one skilled in the art who understands the spirit of the present invention may easily suggest other embodiments included in other retrogressive embodiments or the scope of the spirit of the present invention by adding, modifying, or deleting other components within the scope of the same spirit. However, it will be also understood that this will be included in the scope of the present invention.

[0060] Also, like reference numerals are used for like elements having the same functions within the scope of the same spirit illustrated in the drawings of embodiments.

First Embodiment

[0061] FIG. 1 is a schematic perspective view of a safety barrier according to a first embodiment of the present invention, FIG. 2 is a schematic cross-sectional view of the safety barrier according to the first embodiment of the present invention, and FIG. 3 is a schematic cross-sectional view for explaining a deformed situation of when an external impact is applied to the safety barrier according to the first embodiment of the present invention.

[0062] Referring to FIGS. 1 through 3, a safety barrier 100 according to the first embodiment of the present invention may include a body 110 installed on a road L, an accommodation space 112 formed inside the body 110, and an anchor portion 120 installed to pass through the accommodation space 112. The body 110 may be installed between lanes of the road L on which a car is driven in both directions, and in the present embodiment, the body 110 may be made of concrete, for example.

[0063] Also, in the present embodiment, the body 110 is formed to have a width that widens as it gets closer to a lower part of the body 110 from an upper part, and in particular, a width increment is further increased adjacent to a lower part of the body 110 so that the body 110 can be stably stood.

[0064] Reinforcing bars 111a and 111b for reinforcement may be installed inside the body 110.

[0065] The accommodation space 112 may be formed to be exposed to a contact surface between the body 110 and the road L and may be formed in at least one of the body 110 and the road L.

[0066] For example, the accommodation space 112 may be formed inside a lower part of the body 110, as illustrated in the drawing, and a bottom surface of the accommodation space 112 may be formed to be open in a direction of the road L.

[0067] The anchor portion 120 is provided to pass through the accommodation space 112 so that an upper part of the anchor portion 120 is installed at the body 110 and a lower part of the anchor portion 120 is installed at the road L.

[0068] The anchor portion 120 is formed to be deformed within the accommodation space 112 according to displacement of the body 110. Thus, when an external impact such as collision with the car is applied to the body 110, the body 110 may be moved by a predetermined distance as the anchor portion 120 is deformed within the accommodation space 110.

[0069] That is, as illustrated in FIG. 3, the anchor portion 120 is deformed during collision with the car, is formed to allow displacement of the body 110 so that impact-absorbing effects can be generated.

[0070] In this case, in the present embodiment, the contact surface between the body 110 and the road L is a flat surface so that friction caused by displacement of the body 110 can be minimized.

[0071] Also, the anchor portion 120 may be formed to have various shapes.

[0072] For example, a single elastic body may be also used as the anchor portion 120, and a restoration structure through combination of a plurality of members may be also used as the anchor portion 120. In the present embodiment, the anchor portion 120 is formed to have a reinforcing bar having elasticity and plasticity.

[0073] Meanwhile, the accommodation space 112 may be formed inside the lower part of the body 110 to be long in a longitudinal direction of the body 110. However, embodiments of the present invention are not limited thereto, and a plurality of accommodation spaces 112 may be formed to be spaced a predetermined distance apart from one another in the longitudinal direction so as to correspond to a place where the anchor portion 120 is installed.

[0074] FIG. 4 is a graph for comparing a change of a kinetic energy generated in concrete that constitutes both of a body of the safety barrier according to the first embodiment and a safety barrier according to the related art, and FIG. 5 is a graph for comparing a change of an internal energy generated in both of a reinforcing bar embedded in the body of the safety barrier according to the first embodiment and the safety barrier according to the related art.

[0075] Also, FIG. 6 is a view of a collision simulation model of each of the safety barrier according to the first embodiment and the safety barrier according to the related art.

[0076] (a) Indicated by a dotted line in the graph of FIG. 4 represents a kinetic energy generated in concrete of the safety barrier according to the related art, and (b) indicated by a solid line in the graph of FIG. 4 represents a kinetic energy generated in concrete of the safety barrier 100 according to the present invention.

[0077] As illustrated in the graph of FIG. 4, in the safety barrier 100 according to the present invention, an initial kinetic energy due to an external impact is rapidly increased compared to the safety barrier according to the related art, and the kinetic energy is further dispersed after a predetermined amount of time elapses, compared to the safety barrier according to the related art.

[0078] Even in FIG. 5, (a) indicated by a dotted line represents a change of an internal energy generated in reinforcing bars of the safety barrier according to the related art, and (b) indicated by a solid line represents a change of an internal energy generated in reinforcing bars of the safety barrier 100 according to the present invention.

[0079] As illustrated in the graph of FIG. 5, in the safety barrier 100 according to the present invention, a change of an internal energy of the reinforcing bars 111a and 111b caused by an external impact is greatly increased compared to the safety barrier according to the related art.

[0080] That is, as represented by the graphs of FIGS. 4 and 5, in the safety barrier 100 according to the present invention, the amount of impact, generated by a car that directly collides, which is caused by the external impact can be effectively dispersed, and damage of the colliding car can be minimized compared to the safety barrier according to the related art.

[0081] Even in FIG. 6, (a) represents a collision simulation model of the safety barrier according to the related, and (b) represents a collision simulation model of the safety barrier 100 according to the present invention.

[0082] Such a collision simulation model has experimental conditions on which a weight body of 38 tons collides with the safety barrier at a speed of 80 km/h and a collision angle of 15°.

[0083] The following [Table 1] represents a volume loss according to the result of simulation.

TABLE 1

	Safety barrier according to the related art	Present invention
Volume loss (%)	36	0
Volume loss (m ³)	1.71	0

[0084] As illustrated in FIG. 6 and [Table 1], the safety barrier according to the related art has a volume loss of 36 percent (%), whereas, in the safety barrier 100 according to the present invention, there is only a slight strain, and there is no damaged part.

[0085] Here, the volume loss refers to a ratio of a volume of a damaged safety barrier with respect to a volume of a safety barrier having a length of 1.2 meter (m).

Second Embodiment

[0086] FIG. 7 is a schematic cross-sectional view of a safety barrier according to a second embodiment of the present invention.

[0087] Referring to FIG. 7, a safety barrier 200 according to the second embodiment of the present invention has the same elements as those of the safety barrier 100 according to the first embodiment of the present invention described with reference to FIGS. 1 through 6 but is different from the safety barrier 100 according to the first embodiment of the present invention described with reference to FIGS. 1 through 6 in that an accommodation space 212 is formed not in a body 210 but in a road L.

[0088] In this way, even when the accommodation space 212 is formed in the road L, the external impact can be effectively dispersed through deformation of the anchor portion 220.

[0089] The accommodation space 212 may be formed in only one of the body 210 and the road L and may be also formed in both the body 210 and the road L.

Third Embodiment

[0090] FIG. 8 is a schematic cross-sectional view of a safety barrier according to a third embodiment of the present invention.

[0091] Referring to FIG. 8, a safety barrier 300 according to the third embodiment of the present invention is the same as the safety barrier 100 according to the first embodiment of the present invention described with reference to FIGS. 1 through 6 in that an accommodation space 312 is formed in a body 310 but is different from the safety barrier 100 according to the first embodiment of the present invention in that an auxiliary accommodation space 322 is formed in the road L.

[0092] The auxiliary accommodation space 322 may be formed at the other side of the body 310 and the road L in

which the accommodation space 312 is not formed. The auxiliary accommodation space 322 forms a room space around the anchor portion 320 so as to allow displacement caused by strain of the anchor portion 320.

[0093] That is, the auxiliary accommodation space 322 increases a displacement allowance amount of the anchor portion 320 to maximize impact-dispersion effects and simultaneously to deform the anchor portion 320 at a slighter angle so that stress generated in the anchor portion 320 can be minimized.

Fourth Embodiment

[0094] FIG. 9 is a schematic perspective view of a safety barrier according to a fourth embodiment of the present invention, and FIG. 10 is a schematic cross-sectional view of the safety barrier according to the fourth embodiment of the present invention.

[0095] Also, FIGS. 11 and 12 are schematic cross-sectional views for explaining a deformed situation of when an external impact is applied to the safety barrier according to the fourth embodiment of the present invention, and FIG. 13 is a view showing a computer simulation result of each of a safety barrier according to the related art and the safety barrier according to the fourth embodiment of the present invention.

[0096] First, referring to FIGS. 9 and 10, a safety barrier 400 according to the fourth embodiment of the present invention may include a body 410 installed on a road L, an elastic base portion 420 provided between the body 410 and the road L, and an anchor portion 412 that passes through the elastic base portion 420 and has both ends buried and fixed into the body 410 and the road L.

[0097] The body 410 may be installed between bi-directional driving lanes on the road L. In the present embodiment, the body 410 may be made of concrete, for example.

[0098] Also, in the present embodiment, the body 410 is formed to have a width that widens as it gets closer to a lower part of the body 410 from an upper part, and in particular, a width increment is further increased adjacent to a lower part of the body 110 so that the body 110 can be stably stood.

[0099] Reinforcing bars 411a and 411b for reinforcement may be installed inside the body 410.

[0100] The elastic base portion 420 is provided between the body 410 and the road L, as described above, and when an external impact is applied to the body 410, the elastic base portion 420 may be elastically deformed.

[0101] That is, the elastic base portion 420 may be formed of an elastic body having a predetermined elastic modulus and may be formed of any material without limitations. In the present embodiment, the elastic base portion 420 is formed of a rubber material. However, the material for the elastic base portion 420 is not limited thereto.

[0102] Also, in the present embodiment, a top surface of the elastic base portion 420 is formed to have an area corresponding to a bottom surface of the body 410 and is provided to be in contact with the bottom surface of the body 410.

[0103] In this case, the elastic base portion 420 may be also adhered to at least one of the body 410 and the road L.

[0104] However, unlike in the present embodiment, the elastic base portion 420 may be formed to have a different area from an area of the bottom surface of the body 410 but

may not be adhered to the body **410** and the road **L** but may be separated from the body **410** and the road **L**.

[0105] Also, although not shown, the elastic base portion **420** may be formed to have a width that widens or narrows as it gets closer to a lower part of the elastic base portion **420** so as to support the body **410**.

[0106] When the width of the elastic base portion **420** widens as it gets closer to the lower part of the elastic base portion **420**, lateral displacement may be decreased, and when the width of the elastic base portion **420** narrows, lateral displacement may be increased.

[0107] The anchor portion **412** is provided to pass through the elastic base portion **420** so that an upper part of the anchor portion **412** is installed at the body **410** and a lower part of the anchor portion **412** is installed at the road **L**.

[0108] The anchor portion **412** is formed to be deformed within the elastic base portion **420** according to displacement of the body **410**. Thus, when an external impact, such as collision with the car, is applied to the body **410**, displacement is generated in the body **410** as the anchor portion **412** is deformed to correspond to a change of the shape of the elastic base portion **420**.

[0109] That is, as illustrated in FIGS. **11** and **12**, the elastic base portion **420** and the anchor portion **412** may be deformed during collision with the car to allow displacement of the body **410** so that impact-absorbing effects can be generated.

[0110] In detail, in the safety barrier **400** according to the present embodiment, when the car collides with the safety barrier **400** at a high speed, i.e., when the external impact applied to the body **410** is at a predetermined reference level or higher, horizontal movement occurs in the body **410** through shear strain of the elastic base portion **420**, as illustrated in FIG. **11**.

[0111] Of course, the body **410** may also be horizontally moved by a slippage on the elastic base portion **420** according to the size of a shear attachment strength of the elastic base portion **420**.

[0112] This is because, when the external impact applied to the body **410** is at the predetermined reference level or higher, strain occurs uniformly in the entire area of the elastic base portion **420**. In this case, the anchor portion **412** is deformed in such a way that a portion inserted into the elastic base portion **420** corresponds to the strain shape of the elastic base portion **420**.

[0113] That is, in the safety barrier **400** according to the present embodiment, when an external impact applied to the body **410** is at a predetermined reference level or higher, a kinetic energy of the car may be converted into a strain energy through horizontal movement of the elastic base portion **420**, the body **410**, and the anchor portion **412** and thus may be dispersed.

[0114] In a safety barrier having a fixed lower part according to the related art, the kinetic energy of the car is concentrated on an impact surface due to the car. Thus, even the safety barrier having the same strength and having a fixed lower part can only absorb a low energy.

[0115] In addition, when the car collides with the safety barrier **400** according to the present embodiment at a low speed, that is, when the external impact applied to the body **410** is at the predetermined reference level or less and not shear strain but bending is predominant, the body **410** is rotated and inclined, as illustrated in FIG. **12**.

[0116] This is, when the external impact applied to the body **410** is at the predetermined reference level or less, strain occurs in the elastic base portion **420** in an opposite direction to a direction in which an impact is applied to the body **410**. Similarly, the anchor portion **412** is deformed in such a way that a portion inserted into the elastic base portion **420** corresponds to the strain shape of the elastic base portion **420**.

[0117] That is, in the safety barrier **400** according to the present embodiment, when the external impact applied to the body **410** is at the predetermined reference level or less, the amount of an impact may be converted into rotation of the body **410** and may be dispersed through strain of the elastic base portion **420** and the anchor portion **412**.

[0118] As described above, because, in the safety barrier **400** according to the fourth embodiment of the present invention, a portion of the kinetic energy of the car is converted into the strain energy of the safety barrier **400**, more kinetic energy may be dispersed compared to the safety barrier according to the related art so that the amount of the impact applied to the safety barrier **400** can be reduced.

[0119] In addition, because, in the safety barrier **400** according to the present invention, a portion that passes through the elastic base portion **420** is unconfined, a change of an internal energy of the body **410** and the anchor portion **412** may be greatly increased due to the external impact compared to the safety barrier according to the related art so that the kinetic energy can be more effectively dispersed.

[0120] That is, according to the present invention, the amount of the impact generated by a car that directly collides due to the external impact can be effectively dispersed compared to the safety barrier according to the related art, and damage of the colliding car can be minimized.

[0121] FIG. **13** is a view showing a computer simulation result of a safety barrier according to the related art and the safety barrier **400** according to the fourth embodiment of the present invention, respectively.

[0122] (a) of FIG. **13** represents a plastic strain level of the safety barrier according to the related art, and (b) of FIG. **13** represents an elastic strain level of the median strip according to the related art. Also, (c) of FIG. **13** represents a plastic strain level of the safety barrier **400** according to the fourth embodiment of the present invention, and (d) of FIG. **13** represents an elastic strain level of the safety barrier **400** according to the fourth embodiment of the present invention.

[0123] As illustrated in FIG. **13**, the safety barrier **400** according to the fourth embodiment of the present invention represents a uniform elastic strain level in the entire region. Thus, plastic strain can be minimized.

[0124] In contrast, in the safety barrier according to the related art, a wide plastic strain region is distributed in a collision point, and the strain region is surrounded by the elastic strain region.

[0125] Thus, because the wide plastic strain region is distributed compared to the elastic strain region which is relatively restorable, more damage occurs.

[0126] That is, in the safety barrier according to the related art, the elastic strain region (restorable strain when a load is removed) is small, whereas the plastic strain region (a section after elastic strain has occurred, in which permanent strain occurs) is relatively large. However, in the safety barrier **400** according to the fourth embodiment of the present invention, the plastic strain region is very small,

whereas elastic strain is generated and dispersed in a wide section so that damage of the safety barrier **400** can be minimized.

Fifth Embodiment

[0127] FIG. **14** is a schematic cross-sectional view of a safety barrier according to a fifth embodiment of the present invention.

[0128] Referring to FIG. **14**, a safety barrier **500** according to the fifth embodiment of the present invention has the same elements as those of the safety barrier **400** according to the fourth embodiment of the present invention described with reference to FIGS. **9** through **13**. However, the safety barrier **500** according to the fifth embodiment of the present invention is different from the safety barrier **400** according to the fourth embodiment of the present invention in that an elastic base portion **520** includes a plurality of layers **520a** and **520b** having different elastic modulus.

[0129] That is, in the present embodiment, the elastic base portion **520** is formed of a plurality of layers. The plurality of layers may be formed to have different elastic modulus using various methods, such as using different materials or having different densities.

[0130] In this case, the elastic base portion **520** may be configured to be suitable for operation characteristics of the road **L** having the safety barrier **500** installed therein by combining various elastic moduli of layers **520a** and **520b**.

[0131] Also, in the present embodiment, strain initially occurs in a layer having a relatively low elastic modulus and subsequently in a layer having a relatively high elastic modulus so that a multi-step impact-absorbing mechanism can be attained.

Sixth Embodiment

[0132] FIG. **15** is a schematic cross-sectional view of a safety barrier according to a sixth embodiment of the present invention.

[0133] Referring to FIG. **15**, a safety barrier **600** according to the sixth embodiment of the present invention has the same elements as those of the safety barrier **400** according to the fourth embodiment of the present invention described with reference to FIGS. **9** through **13**. However, in the present embodiment, the safety barrier **600** according to the sixth embodiment of the present invention is different from the safety barrier **400** according to the fourth embodiment of the present invention in that an elastic strain level of the elastic base portion **620** is gradually decreased from the center to an outside of the elastic base portion **620**.

[0134] That is, in the present embodiment, elastic strain, i.e., rotational strain may easily occur in the elastic base portion **620** from the center to the outside of the elastic base portion **620**. Thus, the body **610** may be rotated at a greater angle when an external impact is generated so that the amount of the impact can be reduced.

[0135] In particular, in the present embodiment, the elastic base portion **620** is formed of the same materials. However, the elastic base portion **620** is formed to have a density that decreases from the center to the outside of the elastic base portion **620** so that elastic strain can be differently formed according to positions of the elastic base portion **620**.

[0136] Meanwhile, unlike in the present embodiment, the elastic base portion **620** may also be formed to have an

elastic strain level that gradually increases from the center to the outside of the elastic base portion **620**.

[0137] In this case, an elastic modulus inside the elastic base portion **620** is smaller than an elastic module outside the elastic base portion **620** so that shear strain of the anchor portion **612** can be increased.

Seventh Embodiment

[0138] FIG. **16** is a schematic cross-sectional view of a safety barrier according to a seventh embodiment of the present invention.

[0139] Referring to FIG. **16**, in a safety barrier **700** according to the seventh embodiment of the present invention, like in the safety barrier **600** according to the sixth embodiment of the present invention described with reference to FIG. **15**, an elastic strain level may be gradually increased from the center to an outside of the elastic base portion **120**.

[0140] However, in the sixth embodiment of the present invention, the density of the elastic base portion **620** is changed. However, in the seventh embodiment of the present invention, a change of elastic strain according to positions has been realized through a change of thickness of the elastic base portion **720**.

[0141] That is, in the present embodiment, a top surface of the elastic base portion **720** is formed to be inclined upwards from the center to the outside of the elastic base portion **720**. Thus, as the elastic base portion **720** has a thickness increasing gradually from the center to the outside of the elastic base portion **720**, rotational strain can be increased.

[0142] In this way, the elastic base portion **720** may realize a change of elastic strains using various methods.

[0143] Meanwhile, unlike in the present embodiment, the elastic base portion may also have a thickness decreasing gradually from the center to the outside of the elastic base portion **720**. In this case, an elastic modulus inside the elastic base portion **720** is smaller than an elastic modulus outside the elastic base portion **720** so that shear strain of the anchor portion **712** can be increased.

Eighth Embodiment

[0144] FIG. **17** is a schematic perspective view of a safety barrier according to an eighth embodiment of the present invention, and FIG. **18** is a schematic cross-sectional view of the safety barrier according to the eighth embodiment of the present invention.

[0145] Also, FIGS. **19** and **20** are schematic cross-sectional views for explaining a deformed situation of when an external impact is applied to the safety barrier according to the eighth embodiment of the present invention.

[0146] First, referring to FIGS. **17** and **18**, the safety barrier **800** according to the eighth embodiment of the present invention may include a body **810** installed on the road **L**, a steel plate portion **820** provided at a lower part of the body **810**, and an anchor portion **812** installed to pass through the steel plate portion **820**.

[0147] The body **810** may be installed on the road **L**, and in the present embodiment, the body **810** is formed of concrete, for example.

[0148] In addition, in the present embodiment, the body **810** is formed to have a width that widens as it gets closer to a lower part of the body **810** from an upper part, and in

particular, a width increment is further increased adjacent to a lower part of the body **810** so that the body **810** can be stably stood.

[0149] Reinforcing bars **811a** and **811b** for reinforcement may be installed inside the body **810**.

[0150] The steel plate portion **820** is provided at a lower part of the body **810** and has a through hole **H** formed therein, as described above.

[0151] In the present embodiment, the steel plate portion **820** is made of a metallic material having high strength. However, the steel plate portion **820** may also be formed of other various materials.

[0152] In the present embodiment, a recessed groove **G** having a shape corresponding to the steel plate portion **820** is formed in a bottom surface of the body **810**. Thus, the steel plate portion **820** is inserted into the recessed groove **G**.

[0153] In this case, the area of the steel plate portion **820** is smaller than a total area of the bottom surface of the body **810**. However, the area of the steel plate portion **820** may be greater than or equal to the area of the bottom surface of the steel plate portion **820**.

[0154] In the present embodiment, the recessed groove **G** may be formed in the body **810**. However, embodiments of the present invention are not limited thereto. The recessed groove **G** may also be formed in a top surface of the road **L**.

[0155] Also, the steel plate portion **820** may be adhered to at least one of the body **810** and the road **L**. Alternatively, the steel plate portion **820** may not be adhered to the body **810** and the road **L** but may be separated therefrom.

[0156] The anchor portion **812** is provided to pass through the through hole **H** of the steel plate portion **820** in such a way that an upper part of the anchor portion **812** is installed at the body **810** and a lower part of the anchor portion **812** is installed at the road **L**.

[0157] When a predetermined external impact is applied to the body **810**, the anchor portion **812** is broken by the steel plate portion **820** so that the upper part and lower part of the anchor portion **812** are separated from each other, as illustrated in FIG. 19.

[0158] That is, when an external impact such as collision with the car is applied to the body **810**, the anchor portion **812** is broken, and displacement in a horizontal direction perpendicular to a longitudinal direction (lateral direction) or vertical direction of the safety barrier **800** occurs in the body **810**. Thus, the effect of dispersing an impact may be generated.

[0159] In detail, when, in the safety barrier **800** according to the present embodiment, the car collides with the safety barrier **800** at a low speed, i.e., when an external impact applied to the body **810** is at a predetermined reference level or less, the anchor portion **812** is not broken and is sustainable with the performance of concrete that constitutes the body **810**. When the car collides with the safety barrier **800** at a high speed, i.e., when the external impact applied to the body **810** is at a predetermined reference level or higher, due to fracture of the anchor portion **812**, the body **810** may be horizontally moved.

[0160] In particular, as illustrated in FIG. 20, when a car **C** collides with the safety barrier **800**, there is the greatest amount of displacement of the safety barrier **800** located at a collision point. Because the farther away from the collision point, the smaller effect of an impact, displacement of the safety barrier **800** is gradually decreased.

[0161] When the amount of the impact is at the predetermined reference level or less, fracture of the anchor portion **812** does not occur so that displacement does not occur.

[0162] As described above, in the safety barrier **800** according to the eighth embodiment of the present invention, a kinetic energy of the car is converted into a strain energy of the safety barrier compared to the safety barrier according to the related art so that more kinetic energy can be dispersed compared to the safety barrier according to the related art.

[0163] That is, in the safety barrier **800** according to the eighth embodiment of the present invention, when an external impact at a reference level or higher is applied to the safety barrier **800**, the anchor portion **812** is broken by the steel plate portion **820** so that the body **810** is converted to be unconfined. Thus, a change of an internal energy of the body **810** due to an external impact is greatly increased compared to the safety barrier according to the related art so that the kinetic energy can be more effectively dispersed.

[0164] That is, in the safety barrier **800** according to the eighth embodiment of the present invention, the amount of an impact generated by a car that directly collides due to the external impact can be effectively dispersed compared to the safety barrier according to the related art and damage of the colliding car can be minimized.

[0165] In particular, according to the present invention, a similar performance to that of the safety barrier having improved performance by simply increasing the amount of iron bars without an increase in a cross-sectional area can be shown.

[0166] However, in the safety barrier according to the related art, due to several limitation conditions such as site conditions, cost, and safety, no further width increase is possible, whereas, in the safety barrier according to the present invention, the performance of the safety barrier can be improved without these limitations.

[0167] Also, according to the present invention, lateral displacement of the safety barrier does not occur with respect to frequently-occurring light collision with the car, and when a large impact is applied to the safety barrier, lateral displacement occurs so that the performance of the safety barrier can be maximized.

[0168] FIG. 21 is a schematic perspective view of a deformed example of a steel plate portion provided to the safety barrier according to the eighth embodiment of the present invention.

[0169] Referring to FIG. 21, a through hole **H1** through which the anchor portion **812** passes, may be formed inside a steel plate portion **820a**, and an inner circumferential surface of the through hole **H1** may be inclined.

[0170] Thus, the anchor portion **812** may be more easily broken by the steel plate portion **820a** compared to the cases of FIGS. 17 through 20.

[0171] That is, the inner circumferential surface of the through hole **H1** is inclined so that an inwardly-protruding portion can be formed in the through hole **H1**. Thus, the steel plate portion **820a** and the anchor portion **812** are in line contact with each other along the circumference of the anchor portion **812** so that the anchor portion **812** can be more easily broken by the steel plate portion **820a**.

[0172] Meanwhile, the through hole **H1** is formed in such a way that a diameter of the through hole **H1** is decreased as it goes downwards. However, contrary to this, the through

hole H1 may also be formed in such a way that the diameter of the through hole H1 is decreased as it goes upwards.

[0173] Alternatively, the inner circumferential surface of the through hole H1 may also be formed to be highly uneven.

[0174] FIG. 22 is a schematic cross-sectional view of a deformed example of an anchor portion provided for the safety barrier according to the eighth embodiment of the present invention.

[0175] Referring to FIG. 22, a diameter d_2 of a portion 813a of the anchor portion 812a that corresponds to the through hole H of the steel plate portion 820 may be relatively smaller than a diameter d_1 of the other portion of the anchor portion 812a.

[0176] That is, because the portion 813a of the anchor portion 812a that corresponds to the through hole H of the steel plate portion 820 has an inwardly-concave recessed shape and the anchor portion 812a is made of the same material, a strength of the portion 813a of the anchor portion 812a that corresponds to the through hole H of the steel plate portion 820 is lower than the strength of the other portion of the anchor portion 812a.

[0177] Thus, the anchor portion 812a may be more easily broken by the steel plate portion 820a compared to the cases of FIGS. 17 through 20, like in the description with reference to FIG. 21.

[0178] Of course, the anchor portion 812a may also be applied to the steel plate portion 820a described with reference to FIG. 21.

[0179] Meanwhile, unlike in the present case where a portion of the anchor portion 812a is recessed, the portion of the anchor portion 812a may be formed of a different material, or post processing is performed in a corresponding point so that the strength of the anchor portion 812a may be lowered.

Ninth Embodiment

[0180] FIG. 23 is a schematic perspective view of a safety barrier according to a ninth embodiment of the present invention, FIG. 24 is a schematic cross-sectional view taken along a line B-B of FIG. 23, and FIG. 25 is a schematic cross-sectional view taken along a line B-B of FIG. 23 for explaining a deformed situation of when an external impact is applied to the safety barrier according to the ninth embodiment of the present invention.

[0181] First, referring to FIGS. 23 and 24, a safety barrier 900 according to the ninth embodiment of the present invention may include a body 910 installed on a road L, a steel plate portion 920, an impact-absorbing portion 930, and an anchor portion 912.

[0182] The body 910 may be installed between bi-directional driving lanes on the road L, and an accommodation space S may be formed between the body 910 and the road L.

[0183] The body 910 may be implemented by installation and curing of concrete, for example, and reinforcing bars 911a and 911b for reinforcement may be installed inside the body 910.

[0184] Here, the reinforcing bars 911a and 911b may be implemented in the form of meshes, and a plurality of reinforcing bars may be kept upright in the longitudinal direction. However, embodiments of the present invention are not limited thereto, and the reinforcing bars 911a and 911b may be implemented in the form of a single mesh and

may be placed inside the body 910 to be inclined at a predetermined angle based on the road L.

[0185] When the body 910 is moved by an external impact applied thereto, for example, an impact of the car, the steel plate portion 920 may be placed in the accommodation space S to be moved together with the body 910 and may include a through hole H through which the anchor portion 912 passes.

[0186] The steel plate portion 920 may be made of a metal material having high strength. However, embodiments of the present invention are not limited thereto, and the steel plate portion 920 may be made of any material that has predetermined strength and is capable of fracturing the anchor portion 912.

[0187] The impact-absorbing portion 920 may have elasticity so as to absorb an impact caused by the external impact applied to the body 910 and may be placed in the accommodation space S.

[0188] The impact-absorbing portion 930 may be made of material including Styrofoam, non-woven fabric, urethane, or the like.

[0189] Meanwhile, the accommodation space S may be recessed into a lower part of the body 910 and may include a first accommodation space S1 for accommodating the steel plate portion 920 and a second accommodation space S2 for accommodating the impact-absorbing portion 930.

[0190] Here, the first accommodation space S1 and the second accommodation space S2 may have sizes corresponding to the steel plate portion 920 and the impact-absorbing portion 930, respectively, and the first accommodation space S1 may be placed in a lower position than the second accommodation space S2.

[0191] The steel plate portion 920 may have a wider area than the impact-absorbing portion 930 and may be formed to be smaller than the area of a bottom surface of the body 910.

[0192] However, the area of the steel plate portion 920 does not need to be smaller than the area of the bottom surface of the body 910 and may also be greater than or equal to the area of the bottom surface of the body 910.

[0193] Also, the steel plate portion 920 may be adhered to at least one of the body 910 and the road L, and embodiments of the present invention are not limited thereto, and the steel plate portion 920 may not be adhered to the body 910 and the road L but may also be separated therefrom.

[0194] The anchor portion 912 is provided to pass through the through hole H and the impact-absorbing portion 930, and when an upper part of the anchor portion 912 is buried in the body 910 and a lower part of the anchor portion 912 is buried in the road L and the body 910 is moved by an external impact at a predetermined level or higher applied to the body 910, the anchor portion 912 may be broken by the steel plate portion 920 to be moved together with the body 910 so that the upper part and the lower part of the anchor portion 912 can be separated from each other, as illustrated in FIG. 25.

[0195] A plurality of accommodation spaces S may be spaced apart from each other in the longitudinal direction of the body 910, and the steel plate portion 920, the impact-absorbing portion 930, and the anchor portion 912 may be placed in each of the plurality of accommodation spaces S.

[0196] However, a plurality of accommodation spaces S do not need to be spaced apart from each other and may be continuously formed in the longitudinal direction of the body 910.

[0197] In this case, the steel plate portion 920 and the impact-absorbing portion 930 may be placed to correspond to the accommodation spaces S continuously formed. However, embodiments of the present invention are not limited thereto, and the steel plate portion 920 and the impact-absorbing portion 930 may be placed only in at least a portion of the accommodation spaces S.

[0198] Referring to FIG. 25, when an external impact such as collision with the car, is applied to the body 910, the anchor portion 912 is broken, and displacement in a horizontal direction perpendicular to the longitudinal direction of the safety barrier 900 occurs. Thus, the effect of dispersing an impact may be generated.

[0199] In the safety barrier 900 according to the ninth embodiment of the present invention, when the car collides with the safety barrier 900 at a low speed, i.e., when the external impact applied to the body 910 is at a predetermined reference level or less, the anchor portion 912 is not broken and is sustainable with the performance of concrete that constitutes the body 910. In this case, the impact-absorbing portion 930 may absorb an impact caused by car collision.

[0200] Meanwhile, when the car collides with the safety barrier 900 at a high speed, i.e., when the external impact applied to the body 910 is at the predetermined reference level or higher, the anchor portion 912 is broken by the steel plate portion 930 to be moved together with the body 910 due to the external impact applied to the body 910. The impact-absorbing portion 930 absorbs an impact caused by car collision.

[0201] Consequently, because the body 910 is horizontally moved and is converted to be unconfined, a change of the internal energy of the body 910 caused by an external impact is greatly increased compared to the safety barrier according to the related art so that the kinetic energy can be more effectively dispersed.

[0202] Meanwhile, the steel plate portion 820 and the anchor portion 812 described with reference to FIGS. 21 and 22 may be used in the safety barrier 900 according to the ninth embodiment of the present invention.

[0203] That is, on an inner surface on which the through hole H is defined, when the body 910 is moved by an external impact at the predetermined level or higher applied to the body 910, the anchor portion 912 may be broken by the steel plate portion 920 to be moved together with the body 910 and may be inclined so that the upper part and the lower part of the anchor portion 912 can be easily broken.

[0204] In addition, when the body 910 is moved by the external impact at the predetermined level or higher applied to the body 910, the anchor portion 912 is broken by the steel plate portion 920 to be moved together with the body 910, and a diameter of a portion of the anchor portion 912 corresponding to the through hole H may be relatively smaller than a diameter of the other portion of the anchor portion 912 so that the upper part and the lower part of the anchor portion 912 can be easily broken.

Tenth Embodiment

[0205] FIG. 26 is a schematic cross-sectional view of a safety barrier according to a tenth embodiment of the present invention, and FIGS. 27 and 28 are schematic cross-sectional views for explaining a situation of when an impact is applied to the safety barrier according to the tenth embodiment of the present invention.

[0206] Hereinafter, when describing a safety barrier 1000 according to the tenth embodiment of the present invention, differences between the safety barrier 1000 according to the tenth embodiment of the present invention and the safety barrier 900 according to the ninth embodiment of the present invention described with reference to FIGS. 23 through 25 will be described, and the same points thereof will be omitted.

[0207] First, referring to FIG. 26, the safety barrier 1000 according to the tenth embodiment of the present invention may include a body 1010 installed on the road L, a steel plate portion 1020 placed between the body 1010 and the road L, and an anchor portion 1012 that passes through the steel plate portion 1020 and has an upper part 1012a buried in the body 1010 and a lower part 1012c buried in the road L.

[0208] Here, a first space S1 in which a middle part 1012b of the anchor portion 1012 other than the upper part 1012a and the lower part 1012c is placed, may be formed between the body 1010 and the road L.

[0209] The first space S1 may be provided by the road L. In detail, the first space S1 may be a space recessed from a top surface of the road L.

[0210] The body 1010 may have a second space S2 in which the steel plate portion 1020 is placed in the lower part 1012c of the anchor portion 1012, and the steel plate portion 1020 may be accommodated in the second space S2 while being adhered to the body 1010. However, embodiments of the present invention are not limited thereto, and the body 1010 having a separable shape may be accommodated in the second space S2 in such a way that the body 1010.

[0211] The steel plate portion 1020 has an area of the first space S1 before an impact is applied to the body 1010 so that the steel plate portion 1020 can be prevented in advance from being deviated from the first space S1.

[0212] A plurality of first spaces S1 may be spaced apart from each other in the longitudinal direction of the body 1010. In this case, the steel plate portion 1020 and the anchor portion 1012 may be placed in the plurality of first spaces S1, respectively.

[0213] However, a plurality of first spaces S1 do not need to be spaced apart from each other and may also be consecutively formed in the longitudinal direction of the body 1010.

[0214] In this case, the steel plate portion 1020 may be formed to be long in the longitudinal direction of the body 1010 to correspond to the first spaces S1 continuously formed. However, a plurality of steel plate portions 1020 may be spaced apart from each other.

[0215] Referring to FIGS. 27 and 28, when an impact such as collision with the car is applied to the body 1010, the body 1010 is moved while accompanying bending deformation of the middle part 1012b in the first spaces S1 so that the impact can be absorbed.

[0216] Here, the steel plate portion 1020 may be moved together with the body 1010 when the body 1010 moves as a result of the impact, and after bending deformation of the middle part 1012b occurs, the anchor portion 1012 may be broken to implement further movement of the body 1010 caused by the impact so that the impact can be dispersed.

[0217] That is, in the safety barrier 1000 according to the tenth embodiment of the present invention, with respect to an impact having a predetermined size, the body 1010 is moved while accompanying bending deformation of the anchor portion 1012 so that the impact can be absorbed, as

illustrated in FIG. 27. Thereafter, the internal energy of the body 1010 is maximized by further movement of the body 1010 that accompanies fracture of the anchor portion 1012, as illustrated in FIG. 28, so that an impact energy can be converted into the internal energy and the impact can be effectively dispersed.

[0218] Meanwhile, the steel plate portion 820 and the anchor portion 812 described with reference to FIGS. 21 and 22 may be used in the safety barrier 1000 according to the tenth embodiment of the present invention.

Eleventh Embodiment

[0219] FIG. 29 is a schematic cross-sectional view of a safety barrier according to an eleventh embodiment of the present invention.

[0220] Referring to FIG. 29, a safety barrier 1100 according to the eleventh embodiment of the present invention has the same configuration and effects as those of the safety barrier 1000 according to the tenth embodiment of the present invention described with reference to FIGS. 26 through 28 except for a connector 1130. Thus, descriptions other than that of the connector 1130 will be omitted.

[0221] The connector 1130 is placed around the middle part 1112b of the anchor portion 1112 so that the first space S1 can be formed while at least one of the road L and the body 1110 is formed.

[0222] The connector 1130 may be used to connect the road L to the body 1110 after the road L and the body 1110 are formed.

[0223] In detail, the connector 1130 may be an element that, when concrete or the like is placed so as to form the road L, is placed in a state where an anchor portion 1112 is inserted, and that simultaneously allows the first space S1 to be naturally formed. Thus, a process of forming the first space S1 may be simplified.

[0224] The connector 1130 may be formed of a material having a smaller strength than a strength of at least of the road L and the body 1110 and may be formed of Styrofoam, urethane, non-woven fabric, plastics, and an empty can having a relatively weak strength compared to the concrete, for example.

[0225] The connector 1130 may absorb an impact when an impact is applied to the body 1110. Thus, in the safety barrier 1100 according to the present invention, the effect of impact-absorbing and dispersion can be maximized.

Twelfth Embodiment

[0226] FIG. 30 is a schematic cross-sectional view of a safety barrier according to a twelfth embodiment of the present invention, and FIGS. 31 and 32 are schematic cross-sectional views for explaining a situation of when an impact is applied to the safety barrier according to the twelfth embodiment of the present invention.

[0227] Referring to FIGS. 30 through 32, a safety barrier 1200 according to the twelfth embodiment of the present invention has the same configuration and effects as those of the safety barrier 1000 according to the tenth embodiment of the present invention described with reference to FIGS. 26 through 28 except for positions of the first space S1 and the second space S2 and the position of the steel plate portion 1220 caused thereby. Thus, descriptions other than those of

the positions of the first space S1 and the second space S2 and the position of the steel plate portion 1220 caused thereby will be omitted.

[0228] The first space S1 may be provided for a lower part of the body 1210, and in detail, may be a space recessed from the bottom surface of the body 1210 upwards.

[0229] The road L may include a second space S2 in which the steel plate portion 1220 is placed at an upper part of the road L. The steel plate portion 1220 may be accommodated in the second space S2 and may be placed independently of movement of the body 1210 caused by an impact.

[0230] That is, the steel plate portion 1220 may be placed in the second space S2 provided to the road L so that the position of the body 1210 can be maintained to be fixed even when the body 1210 is moved by the impact, and the steel plate portion 1220 may define a lower side of the first space S1 before the impact is applied to the steel plate portion 1220.

[0231] Meanwhile, the movement of the body 1210 and bending deformation and fracture of the anchor portion 1212 due to an impact such as collision with the car with the body 1210 have been described above and thus, a detailed description thereof will be omitted.

Thirteenth Embodiment

[0232] FIG. 33 is a schematic cross-sectional view of a safety barrier according to a thirteenth embodiment of the present invention.

[0233] Referring to FIG. 33, a safety barrier 1300 according to the thirteenth embodiment of the present invention has the same configuration and effects as those of the safety barrier 1200 according to the twelfth embodiment of the present invention described with reference to FIGS. 30 through 32 except for the connector 1330 and thus, descriptions other than that of the connector 1330 will be omitted.

[0234] The connector 1330 may be an element that, when concrete or the like is placed so as to form the body 1310, is placed in a state where an anchor portion 1312 is inserted, and that simultaneously allows the first space S1 to be naturally formed. Thus, a process of forming the first space S1 may be simplified.

[0235] The material and effect of the connector 1330 have been described above. Thus, a detailed description thereof will be omitted.

Fourteenth Embodiment

[0236] FIG. 34 is a schematic cross-sectional view of a safety barrier according to a fourteenth embodiment of the present invention, and FIGS. 35 and 36 are schematic cross-sectional views for explaining a situation of when an impact is applied to the safety barrier according to the fourteenth embodiment of the present invention.

[0237] Referring to FIGS. 34 through 36, a safety barrier 1400 according to the fourteenth embodiment of the present invention has the same configuration and effects as those of the safety barrier 1000 according to the tenth embodiment of the present invention described with reference to FIGS. 26 through 28 except for a damage prevention portion 1450. Thus, descriptions other than that of the damage prevention portion 1450 will be omitted.

[0238] The damage prevention portion 1450 may be an element that is placed at a lower side of the first space S1, defines the lower side of the first space S1 and prevents

damage of the road L due to the lower part **1412c** of the anchor portion **1412** when bending deformation of the middle part **1412b** of the anchor portion **1412** occurs.

[0239] The damage prevention portion **1450** may be made of the same material as that of the steel plate portion **1420**. However, embodiments of the present invention are not limited thereto.

[0240] Meanwhile, movement of the body **1410** caused by an impact such as collision with the car and bending deformation and fracture of the anchor portion **1412** have been described above. Thus, a detailed description thereof will be omitted.

Fifteenth Embodiment

[0241] FIG. 37 is a schematic cross-sectional view of a safety barrier according to a fifteenth embodiment of the present invention.

[0242] Referring to FIG. 37, a safety barrier **1500** according to the fifteenth embodiment of the present invention has the same configuration and effects as those of the safety barrier **1400** according to the fourteenth embodiment of the present invention described with reference to FIGS. 34 through 36. Thus, descriptions other than that of a connector **1530** will be omitted.

[0243] The connector **1530** may be an element that, when concrete or the like is placed to form the road L, is placed in a state where an anchor portion **1512** is inserted and simultaneously allows the first space S1 to be naturally formed. Thus, a process of forming the first space S1 may be simplified.

[0244] The material and effect of the connector **1530** have been described above. Thus, a detailed description thereof will be omitted.

Sixteenth Embodiment

[0245] FIG. 38 is a schematic cross-sectional view of a safety barrier according to a sixteenth embodiment of the present invention, and FIGS. 39 and 40 are schematic cross-sectional views for explaining a situation of when an impact is applied to the safety barrier according to the sixteenth embodiment of the present invention.

[0246] Referring to FIGS. 38 through 40, a safety barrier **1600** according to the sixteenth embodiment of the present invention has the same configuration and effects as those of the safety barrier **1200** according to the twelfth embodiment of the present invention described with reference to FIGS. 30 through 32 except for a damage prevention portion **1650**. Thus, descriptions other than that of the damage prevention portion **1650** will be omitted.

[0247] The damage prevention portion **1650** may be an element that is placed at an upper side of the first space S1, defines the upper side of the first space S1 and prevents damage of a body **1610** due to an upper part **1612a** of the anchor portion **1612** when bending deformation of a middle part **1612b** of the anchor portion **1612** occurs.

[0248] The damage prevention portion **1650** may be made of the same material as that of the steel plate portion **1620**. However, embodiments of the present invention are not limited thereto.

[0249] Meanwhile, movement of the body **1610** due to an impact such as collision with the car and bending deforma-

tion and fracture of the anchor portion **1612** have been described above. Thus, a detailed description thereof will be omitted.

Seventeenth Embodiment

[0250] FIG. 41 is a schematic cross-sectional view of a safety barrier according to a seventeenth embodiment of the present invention.

[0251] Referring to FIG. 41, a safety barrier **1700** according to the seventeenth embodiment of the present invention has the same configuration and effects as those of the safety barrier **1600** according to the sixteenth embodiment of the present invention described with reference to FIGS. 38 through 40. Thus, descriptions other than that of a connector **1730** will be omitted.

[0252] The connector **1730** may be an element that, when concrete or the like is placed to form a body **1710**, is placed in a state where an anchor portion **1720** is inserted, and simultaneously allows the first space S1 to be naturally formed. Thus, a process of forming the first space S1 may be simplified.

[0253] The material and effect of the connector **1730** have been described above. Thus, a detailed description thereof will be omitted.

[0254] As described above, in a safety barrier according to the present invention, cars that are driven in both directions of a road can be prevented from entering opposite lanes.

[0255] In addition, the amount of an impact generated by a colliding car is effectively dispersed so that damage of the colliding car and a driver's injury can be minimized.

[0256] In addition, an installation cost is low compared to a safety barrier in which an additional member for dispersing the amount of an impact is installed, and a level of difficulty of construction is low.

[0257] In addition, damage of the safety barrier itself is minimized so that maintenance and repair can be rapidly and easily performed.

[0258] In addition, because lateral displacement does not occur in a light collision or graze phenomenon of a car, maintenance can be conveniently performed.

[0259] It will be apparent to those skilled in the art that various modifications can be made to the above-described exemplary embodiments of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention covers all such modifications provided they come within the scope of the appended claims and their equivalents.

[0260] In addition, each of first through seventeenth embodiments described above can be simultaneously applied within the scope in which they are not contradictory to one another.

What is claimed is:

1. A safety barrier comprising:

- a body installed on a road;
- a steel plate portion placed between the body and the road; and
- an anchor portion passing through the steel plate portion and having an upper part buried in the body and a lower part buried in the road,

wherein a first space, in which a middle part of the anchor portion other than the upper part and the lower part are placed, is formed between the body and the road, and

when an impact is applied to the body, the body is moved while accompanying bending deformation of the middle part in the first space so that the impact is absorbed, and

after bending deformation deformation occurs in the middle part, the steel plate portion breaks the anchor portion to implement further movement of the body caused by the impact so that the impact is dispersed.

2. The safety barrier of claim 1, wherein the first space is provided by the road and the body includes a second space in which the steel plate portion is placed at a lower part, and the steel plate portion is moved together with the body when the body moves as a result of the impact.

3. The safety barrier of claim 2, wherein the steel plate portion covers the first space before the impact is applied to the body.

4. The safety barrier of claim 2, further comprising a damage prevention portion placed at a lower side of the first space, defining the lower side of the first space and preventing damage of the road due to the lower part when bending deformation occurs in the middle part.

5. The safety barrier of claim 1, wherein the first space is provided for the lower part of the body, and the steel plate portion is accommodated in a second space provided by the road and is implemented independently of movement of the body due to the impact.

6. The safety barrier of claim 5, wherein the steel plate portion defines the lower side of the first space before the impact is applied to the body.

7. The safety barrier of claim 5, further comprising a damage prevention portion placed at an upper side of the first space, defining the upper side of the first space and preventing damage of the body due to the upper part when bending deformation occurs in the middle part.

8. The safety barrier of claim 1, further comprising a connector placed around the middle part, allowing the first space when at least one of the road and the body is formed, to be formed and allowing connection of the road and the connector after the road and the body are formed.

9. The safety barrier of claim 8, wherein the connector is made of a material having a lower strength than a strength of at least one of the road and the body.

10. The safety barrier of claim 1, wherein a plurality of first spaces are spaced apart from each other in a longitudinal direction of the body or are continuously formed in the longitudinal direction of the body.

11. The safety barrier of claim 1, wherein the steel plate portion includes a through hole through which the anchor portion passes, and an inner surface, on which the through hole is defined, is inclined so that fracture of the anchor portion due to the steel plate portion is easily performed.

12. The safety barrier of claim 1, wherein the steel plate portion includes a through hole through which the anchor portion passes, and a diameter of a portion of the anchor portion that corresponds to the through hole is relatively smaller than a diameter of the other portion of the anchor portion so that fracture of the anchor portion due to the steel plate portion is easily performed.

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