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(54) **SAFETY BARRIER**

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(57) **ABSTRACT**

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.

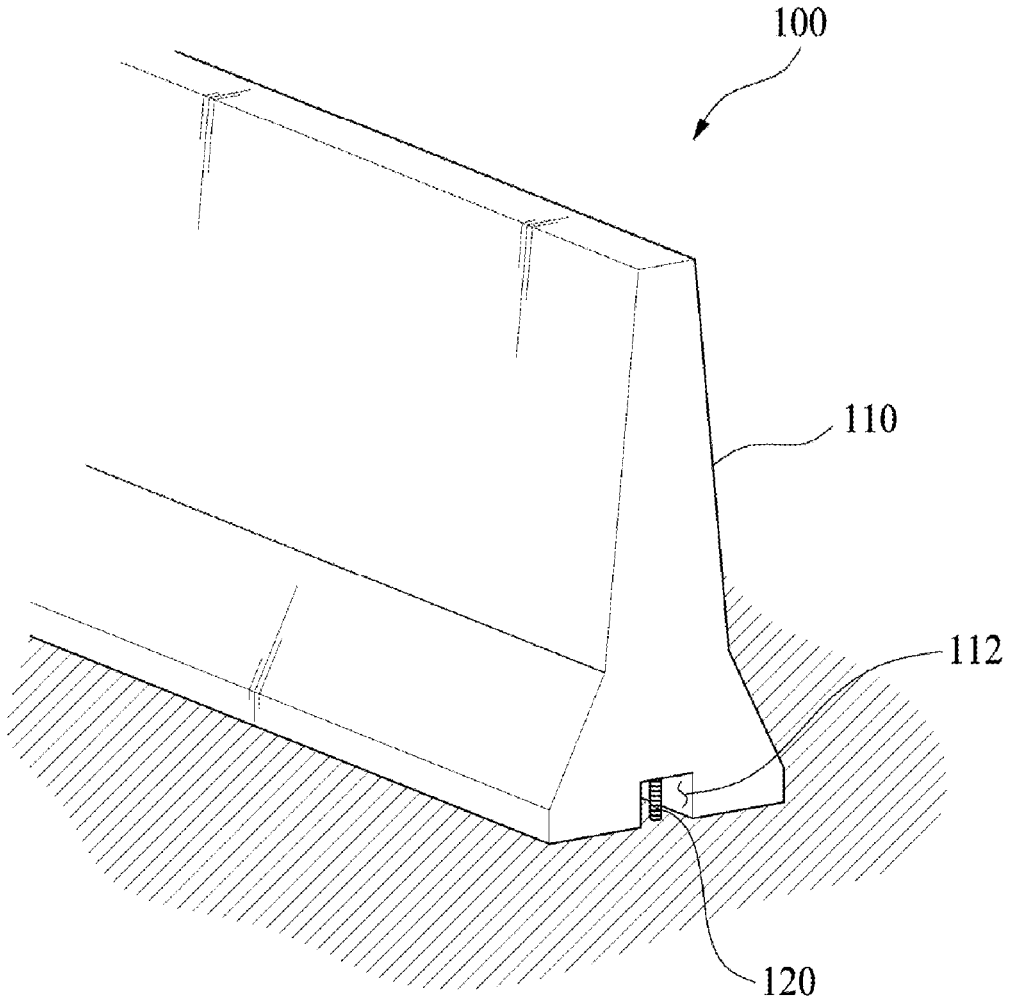


FIG.1

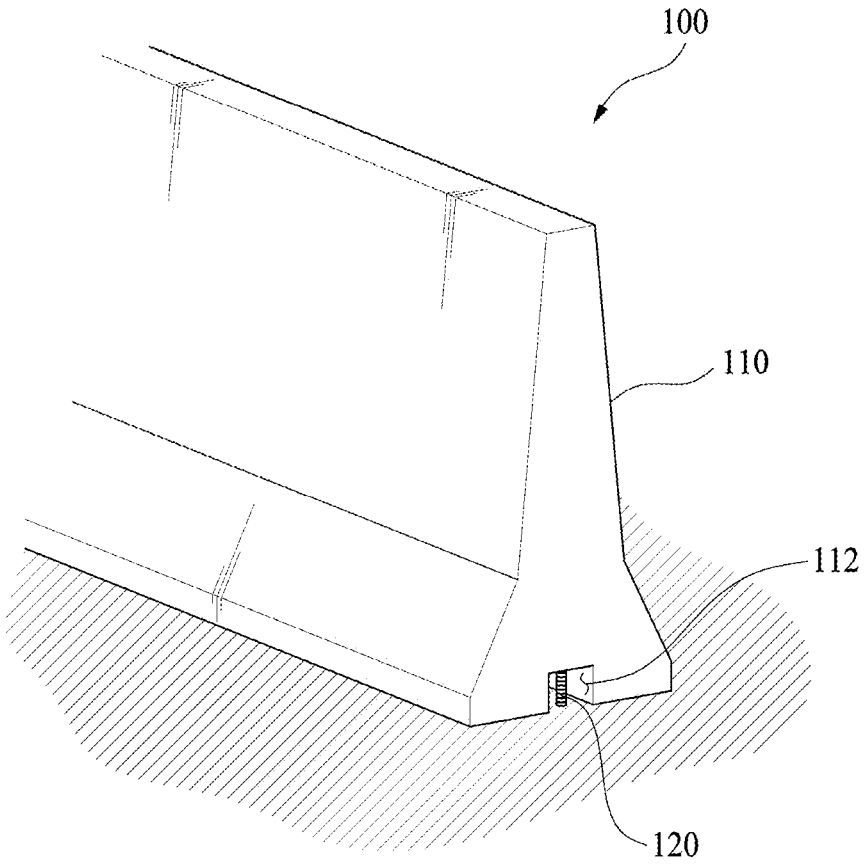


FIG.2

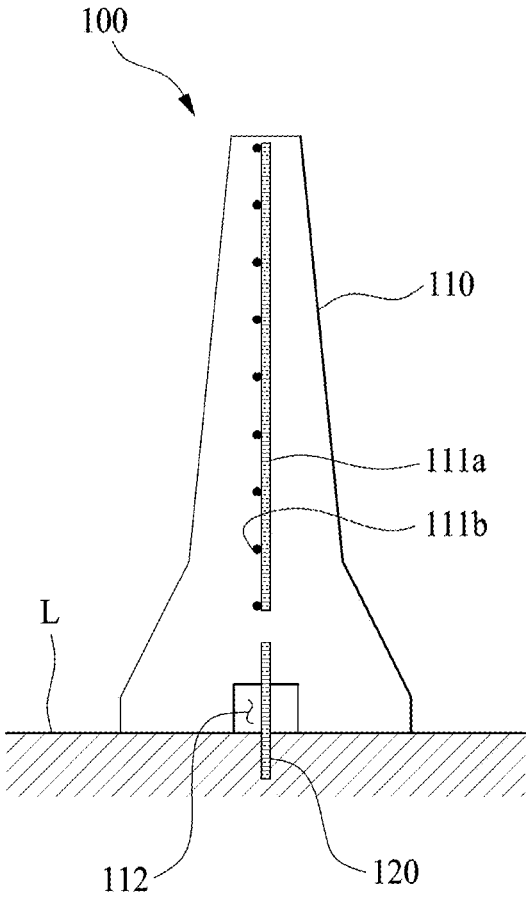


FIG.3

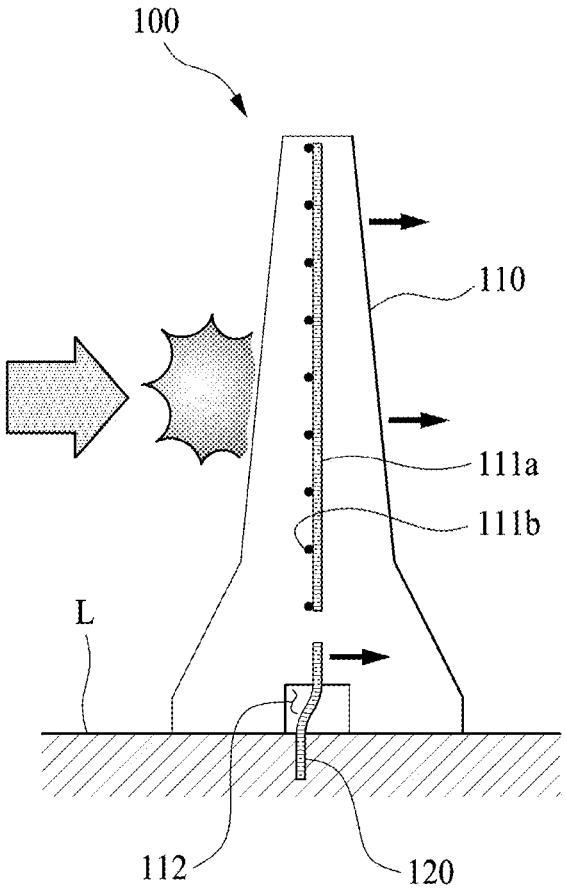


FIG.4

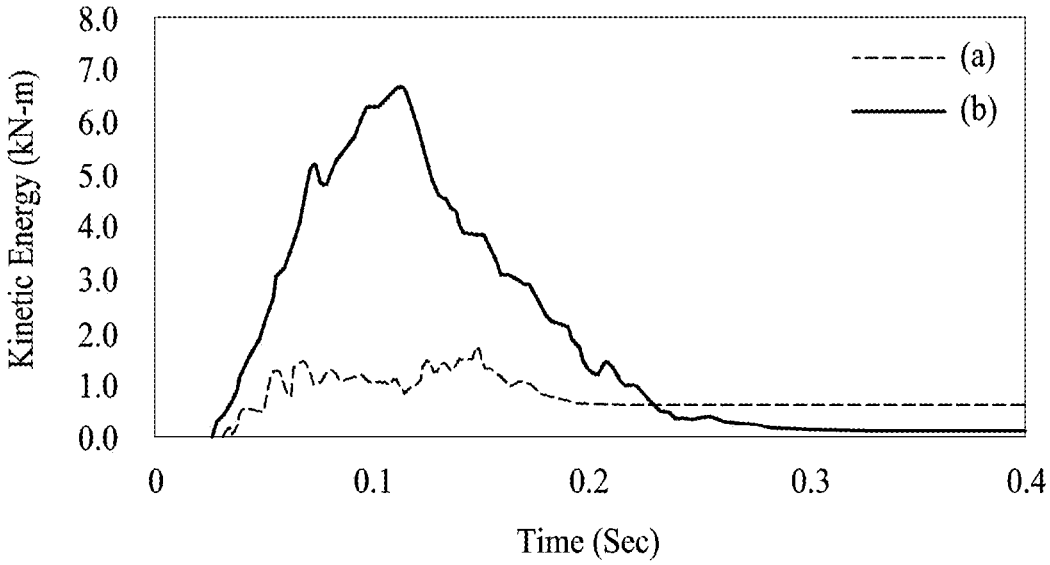

8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Kinetic Energy (kN-m)
0
0.1
0.2
0.3
0.4
Time (Sec)
(a)
(b)

FIG.5

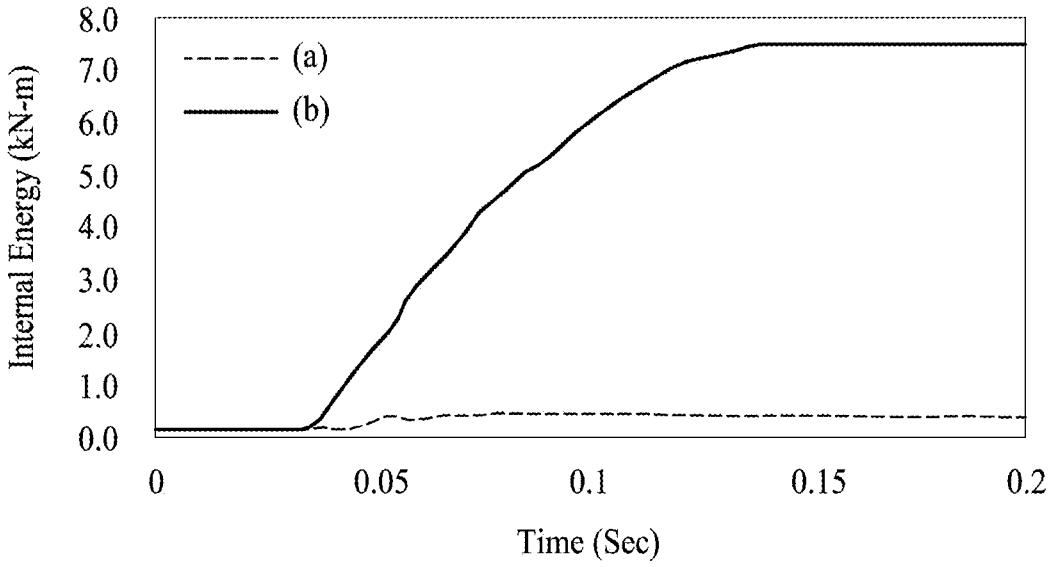

8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Internal Energy (kN-m)
(a)
(b)
0
0.05
0.1
0.15
0.2
Time (Sec)

FIG.6

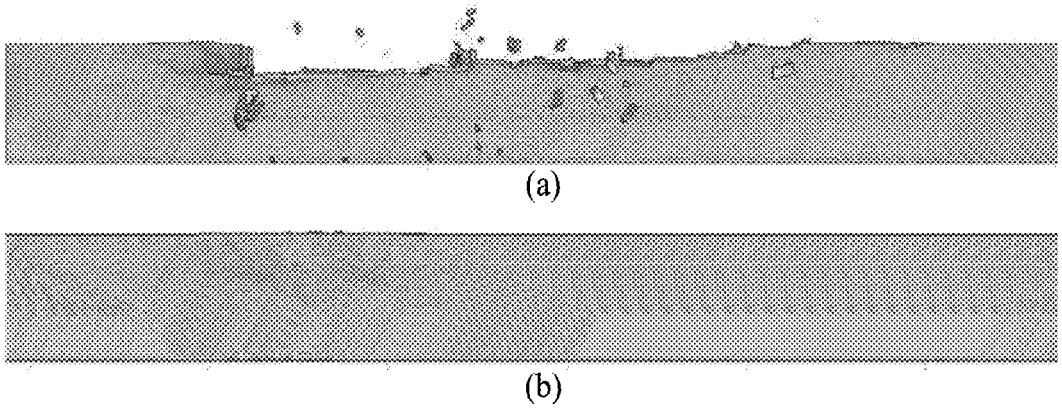


FIG.7

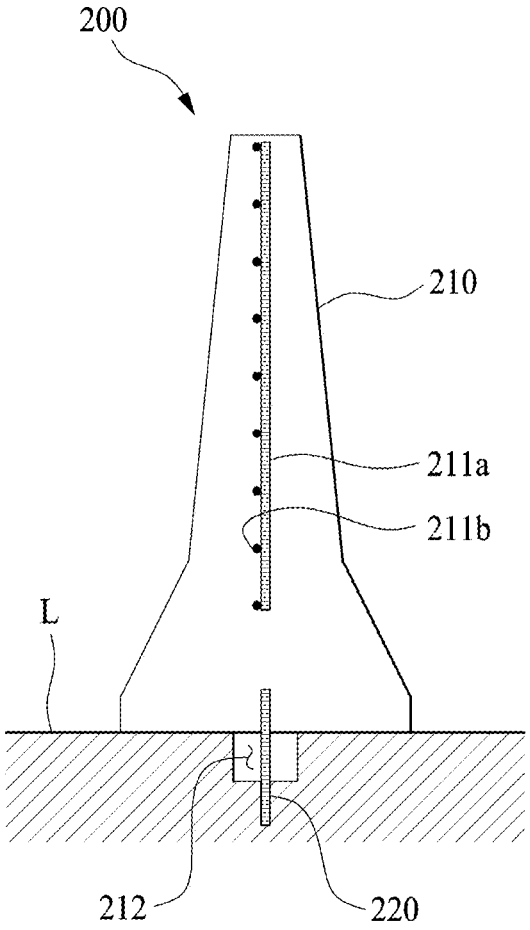


FIG.8

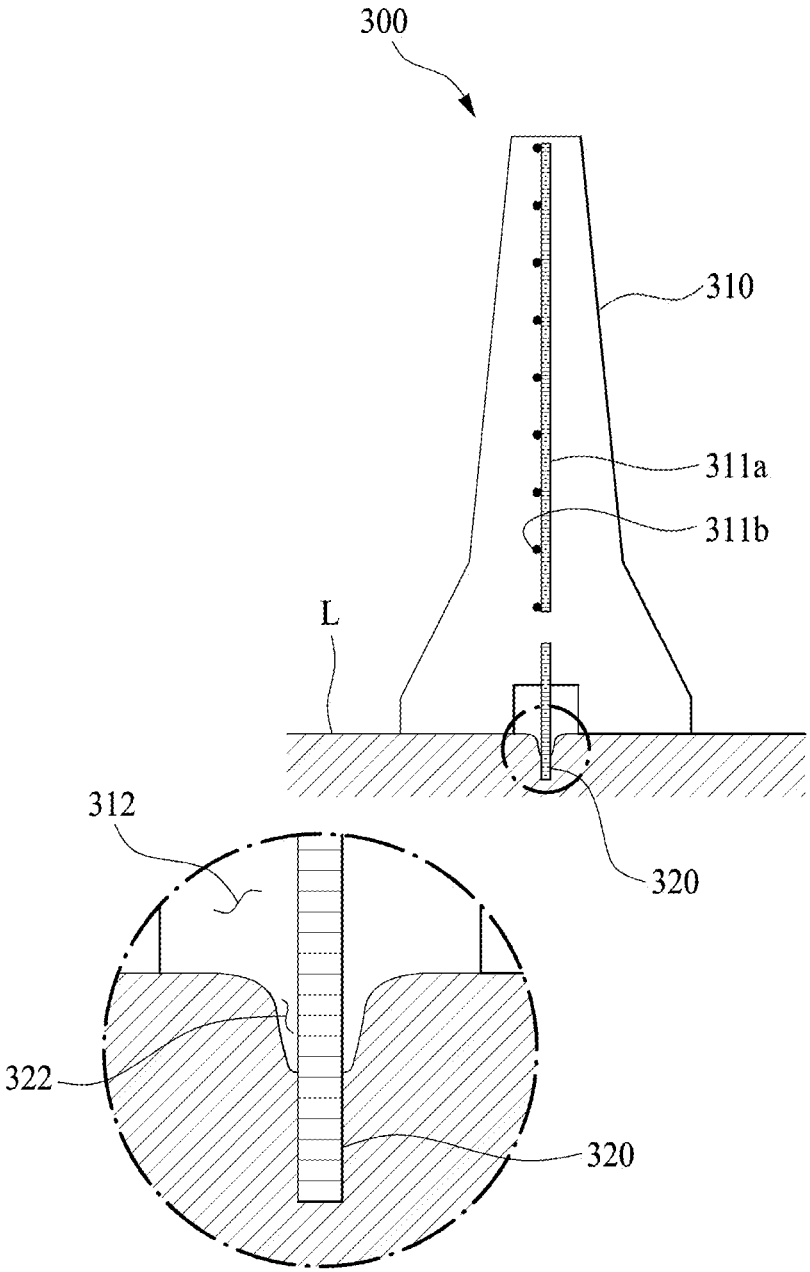


FIG.9

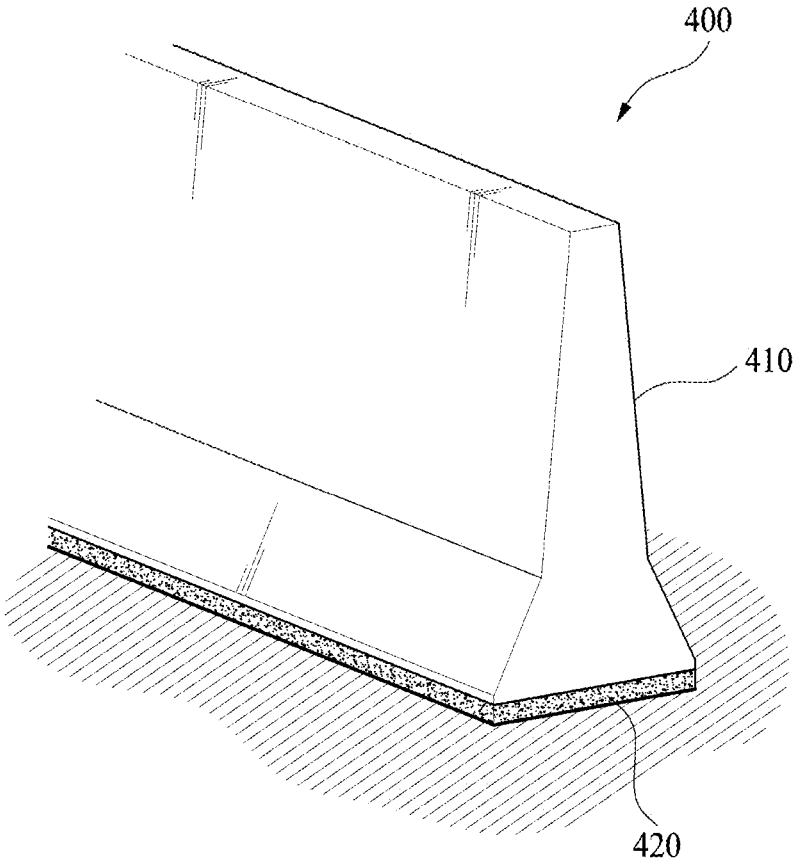


FIG.10

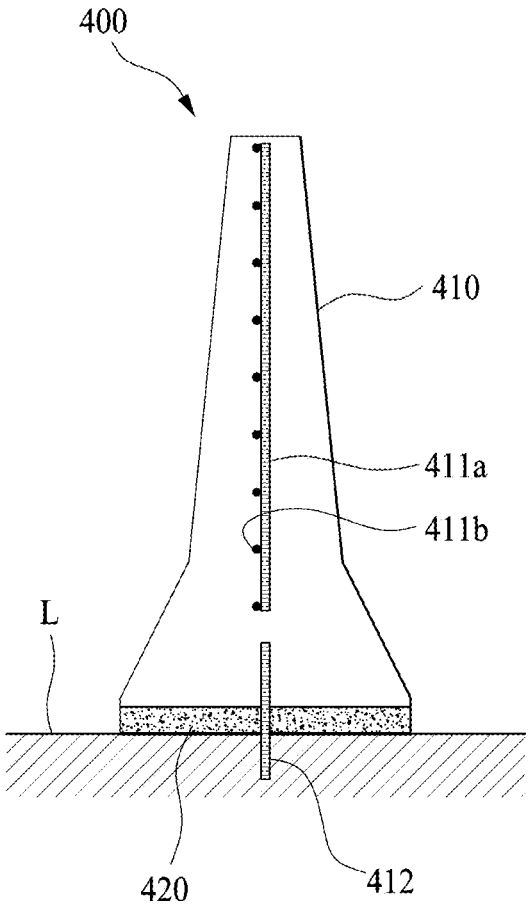


FIG.11

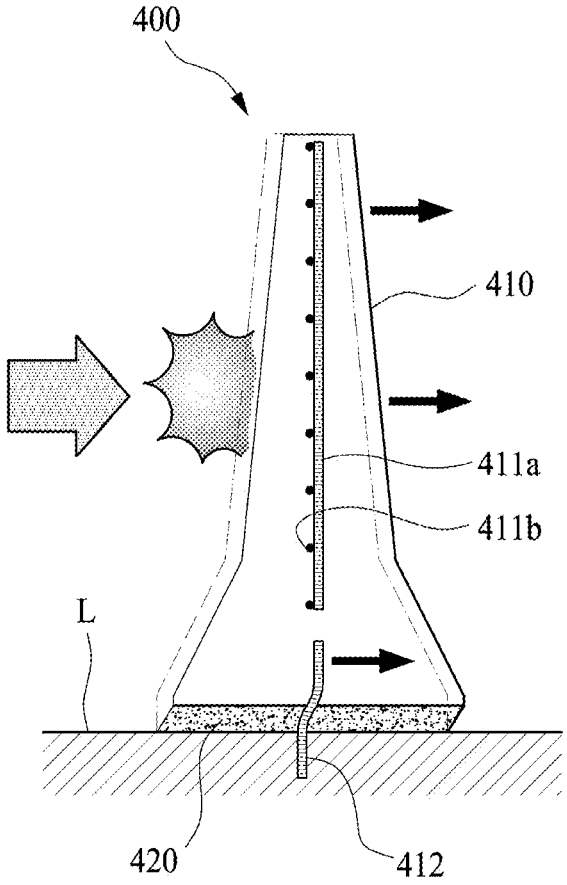


FIG.12

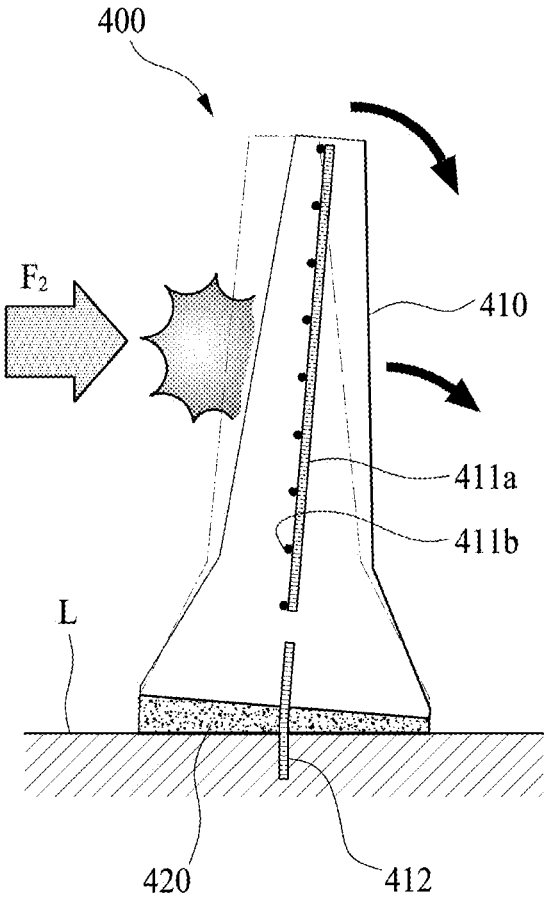


FIG.13

(a)



(b)



(c)



(d)



FIG.14

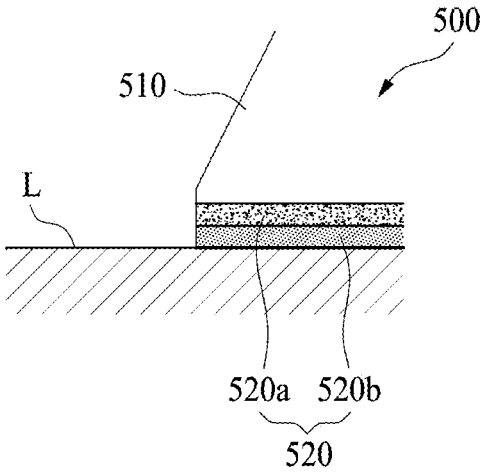


FIG.15

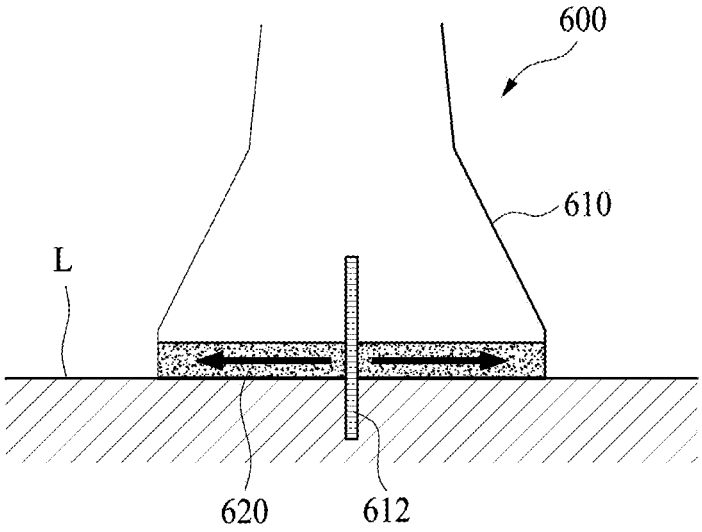


FIG.16

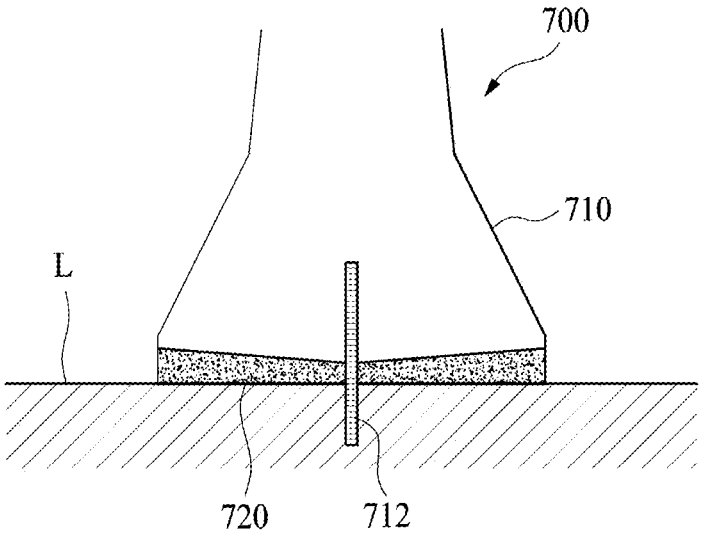


FIG.17

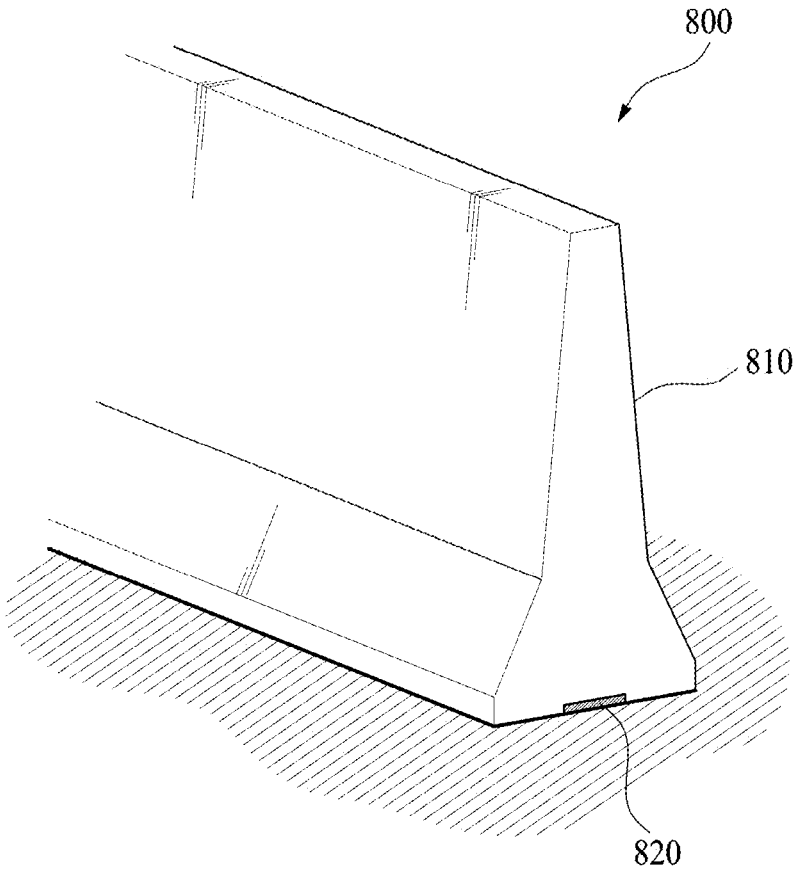


FIG.18

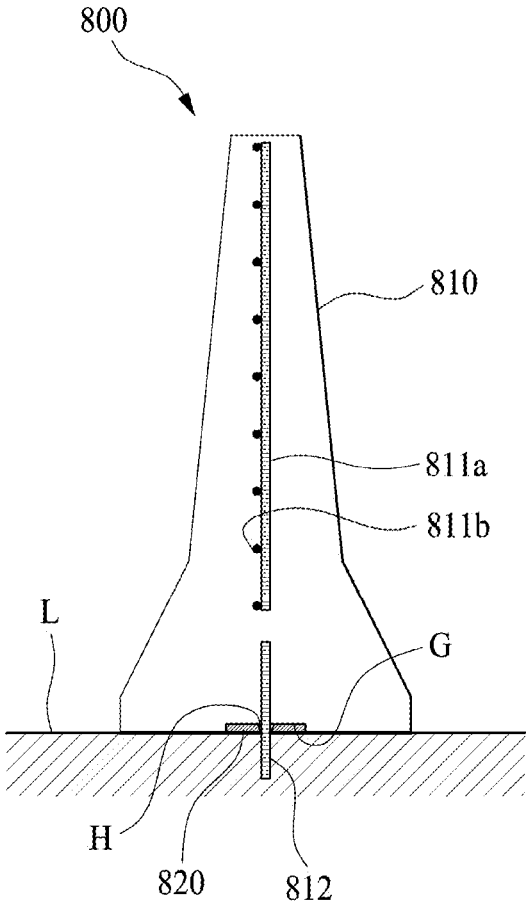


FIG.19

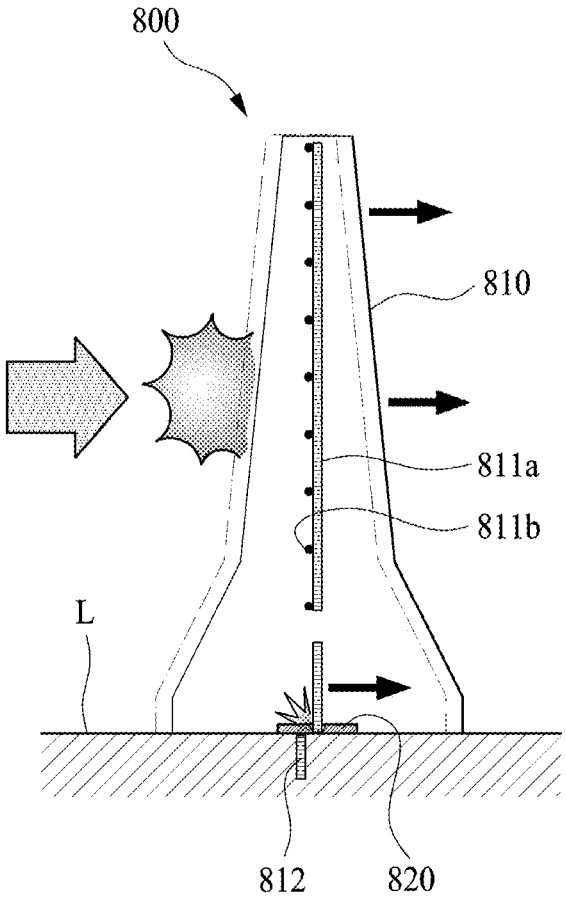


FIG.20

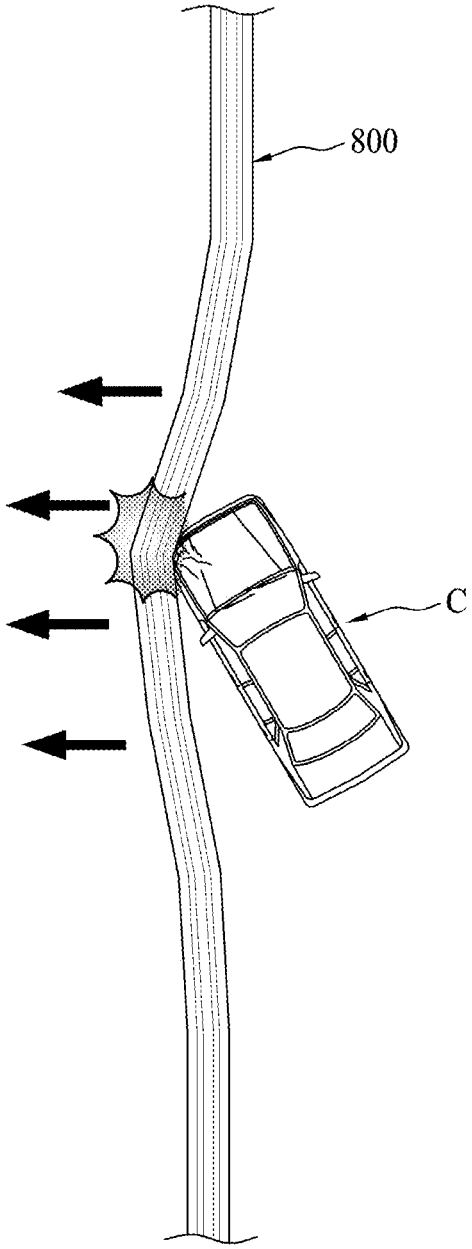


FIG.21

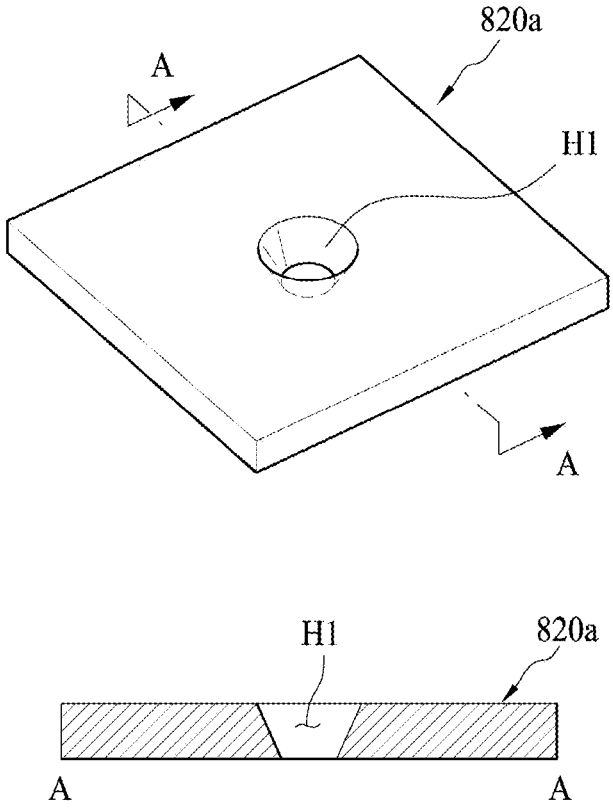


FIG.22

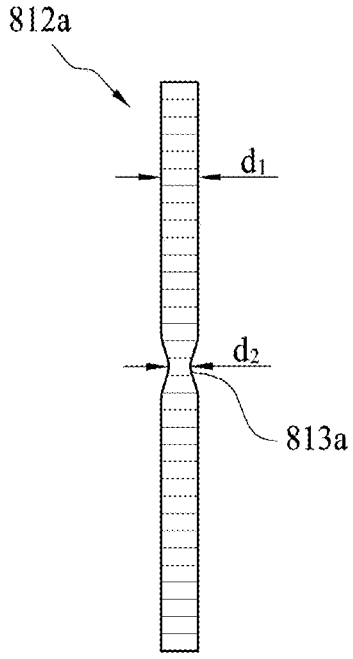


FIG.23

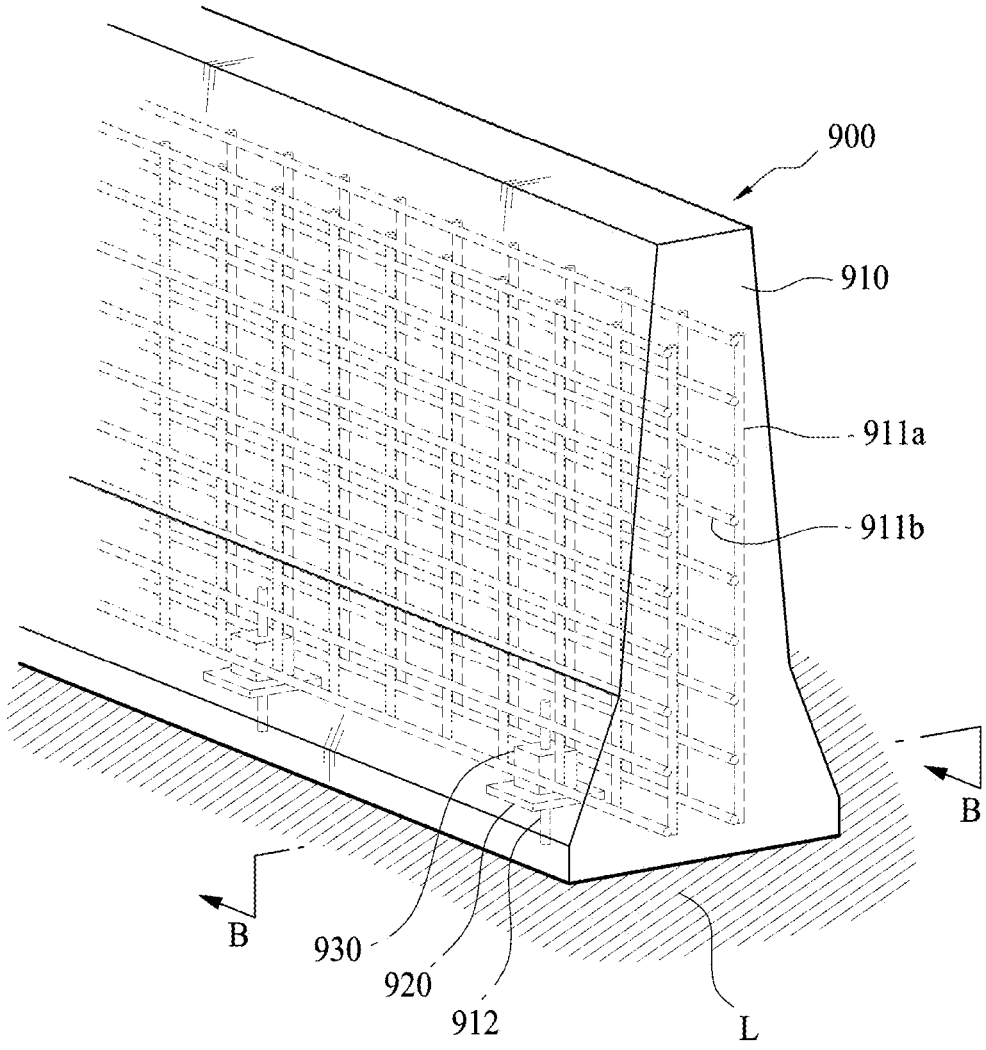


FIG.24

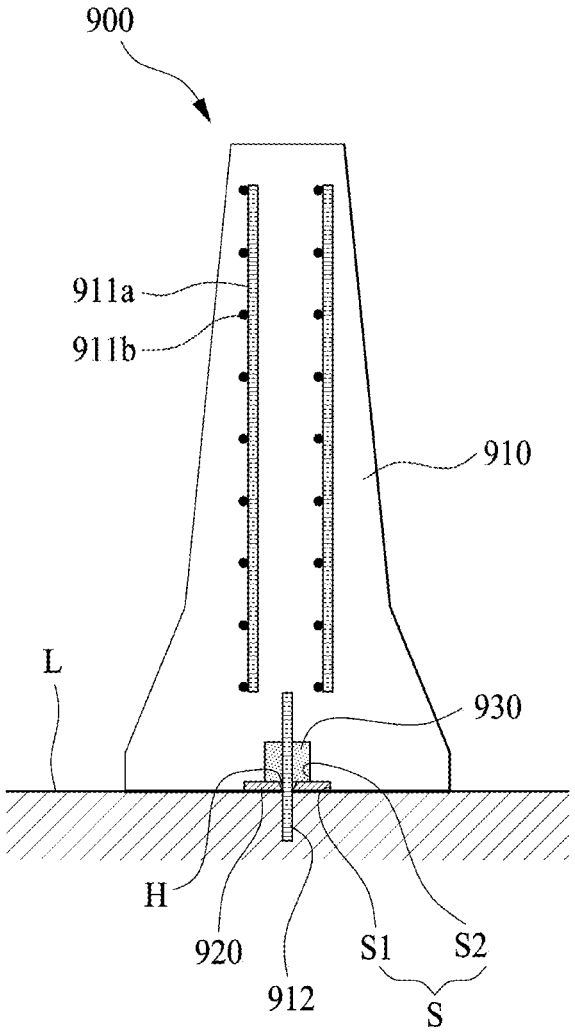


FIG.25

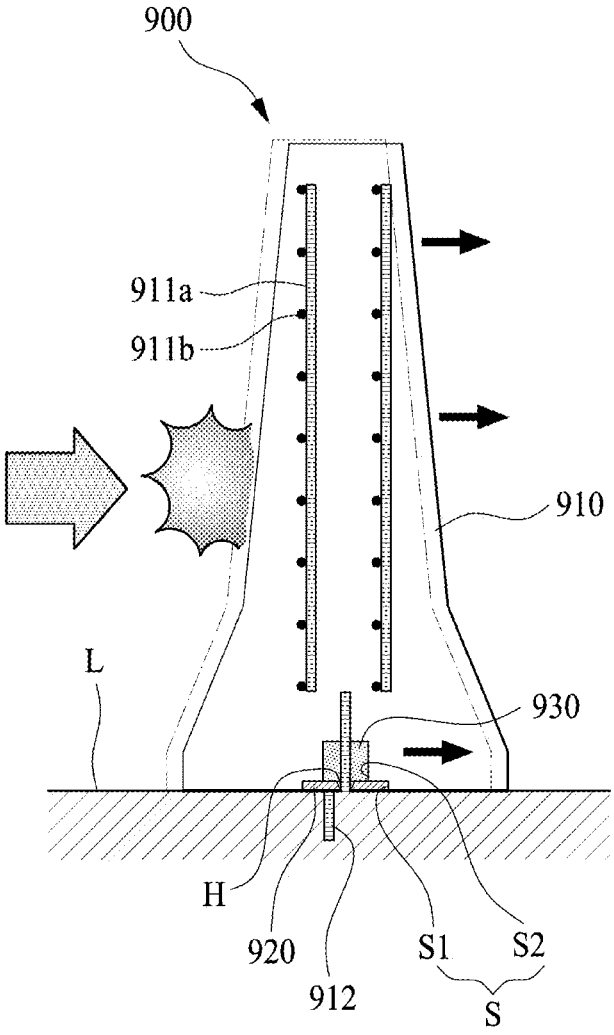


FIG.26

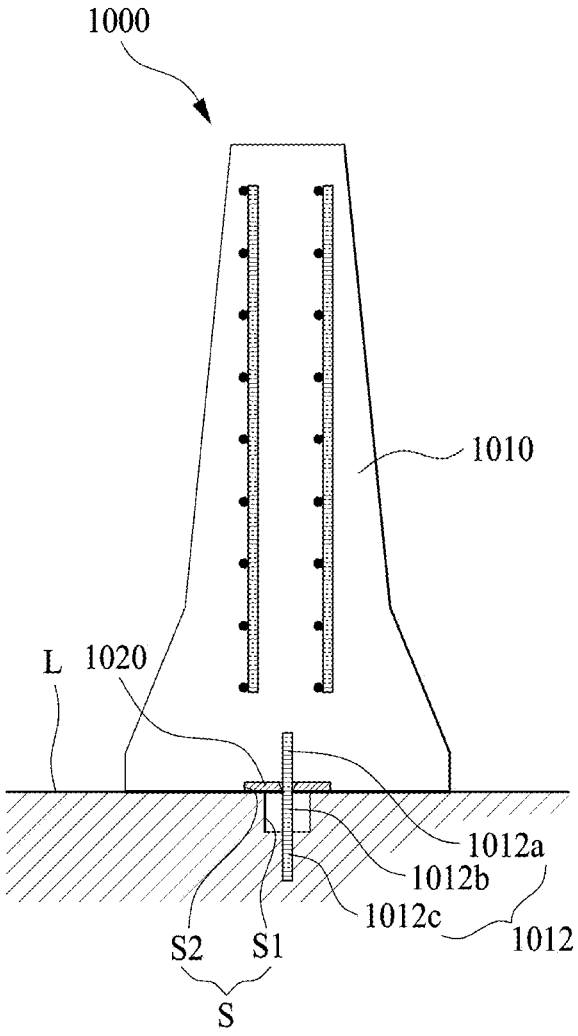


FIG.27

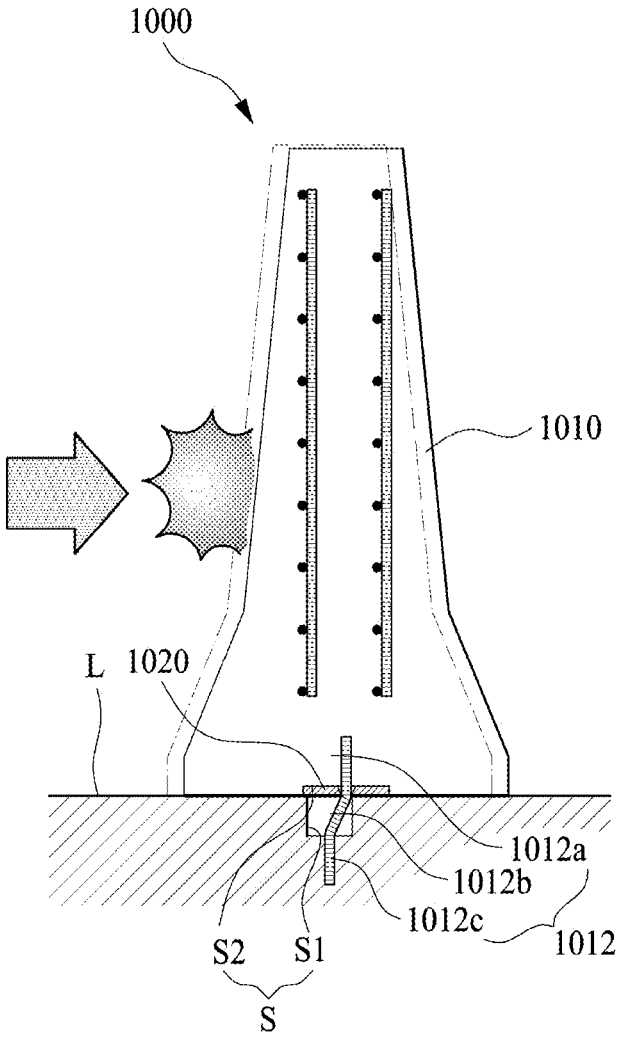


FIG.28

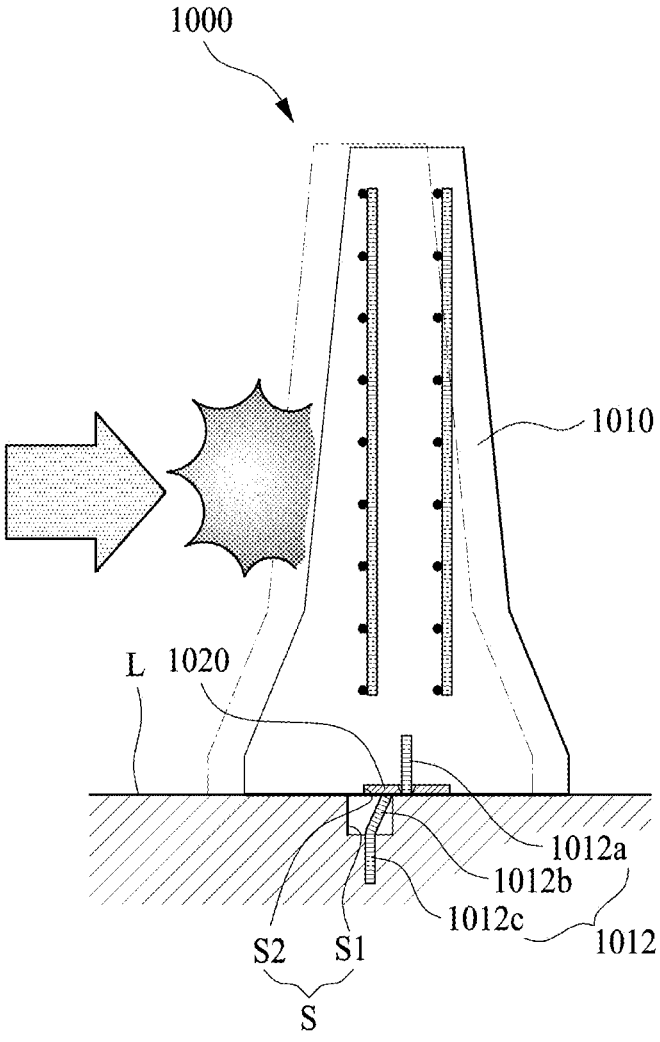


FIG.29

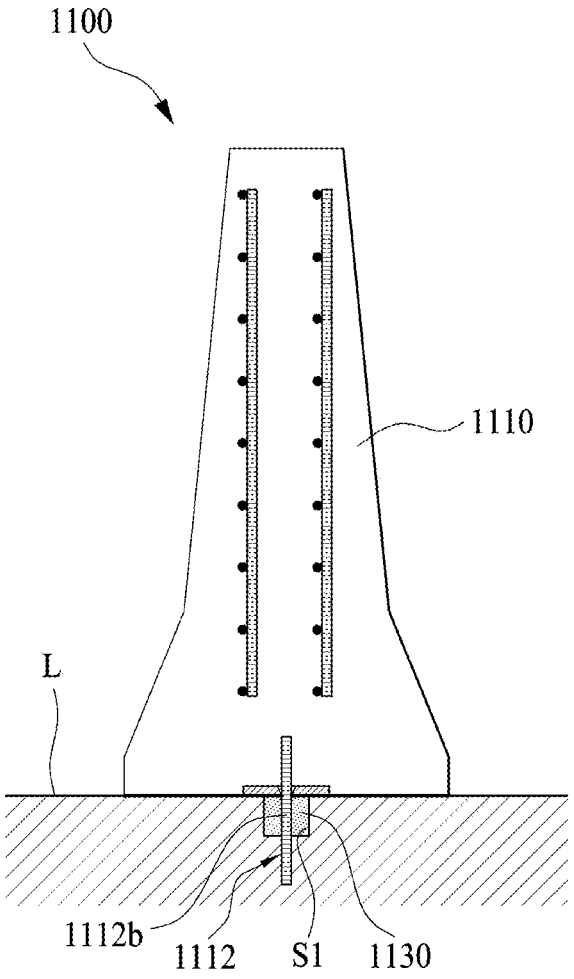


FIG.30

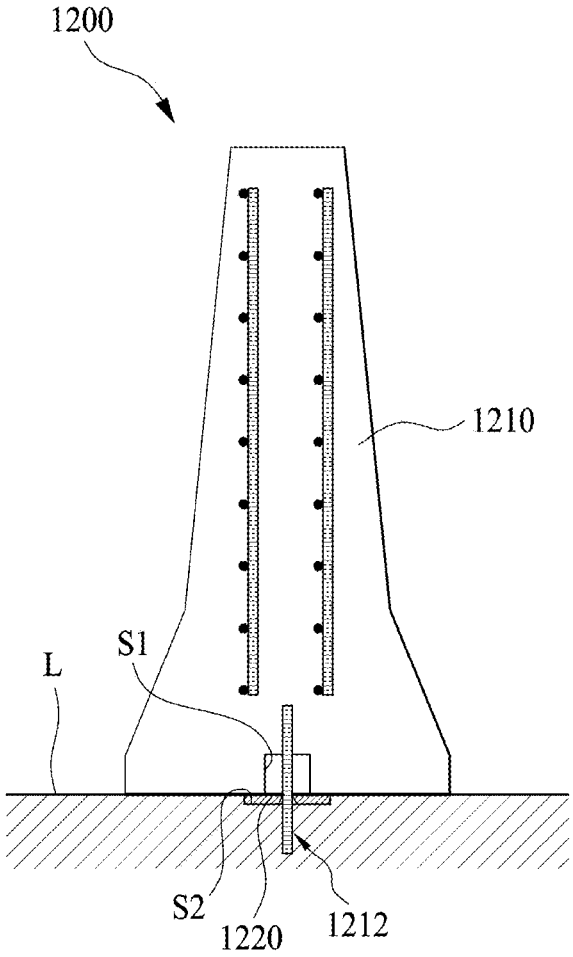


FIG.31

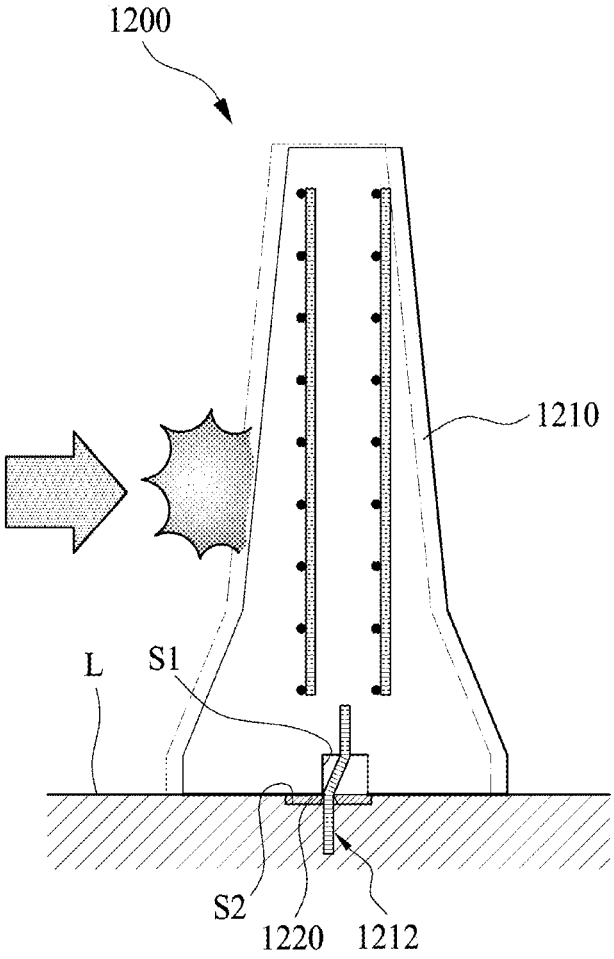


FIG.32

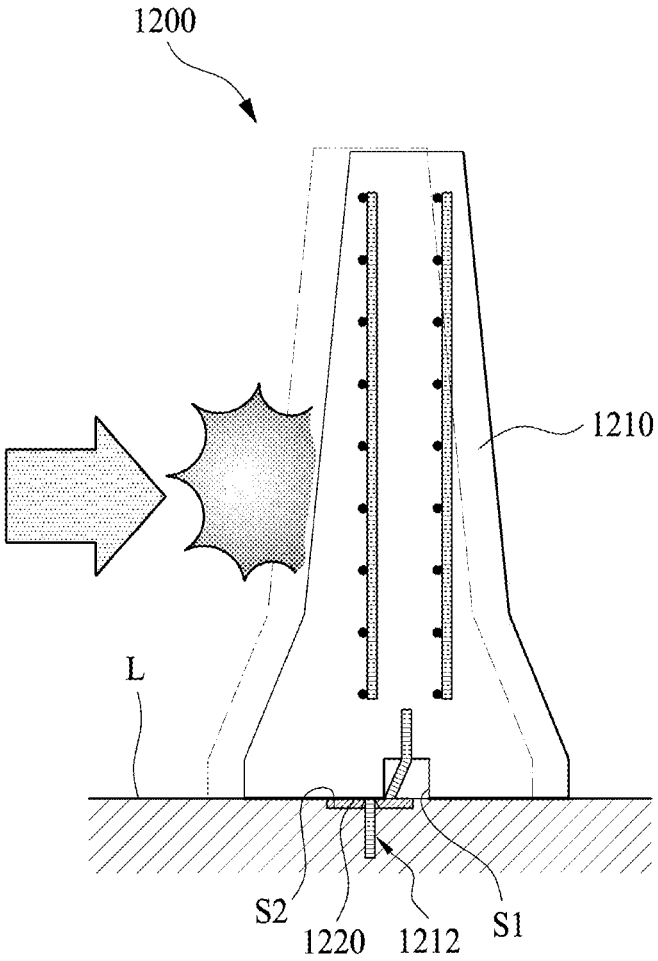


FIG.33

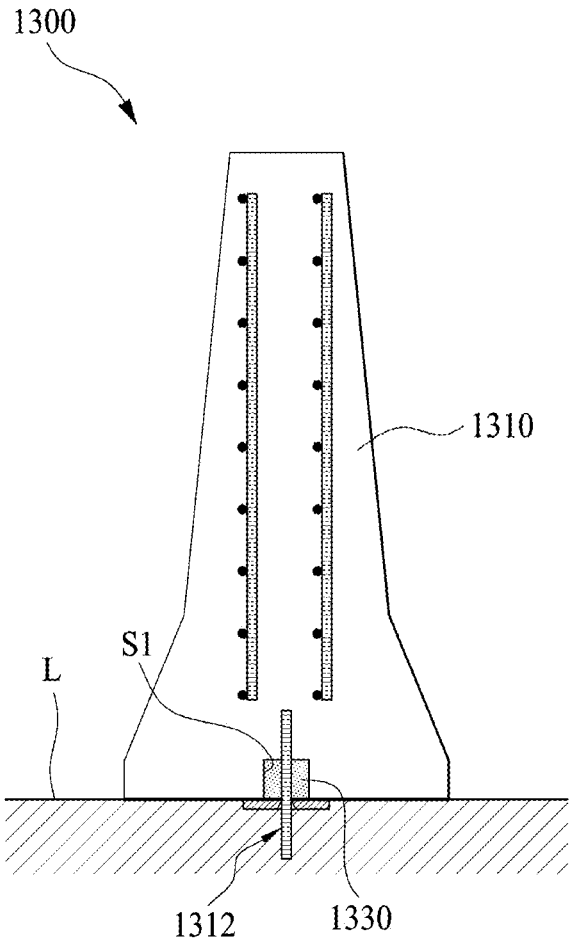


FIG.34

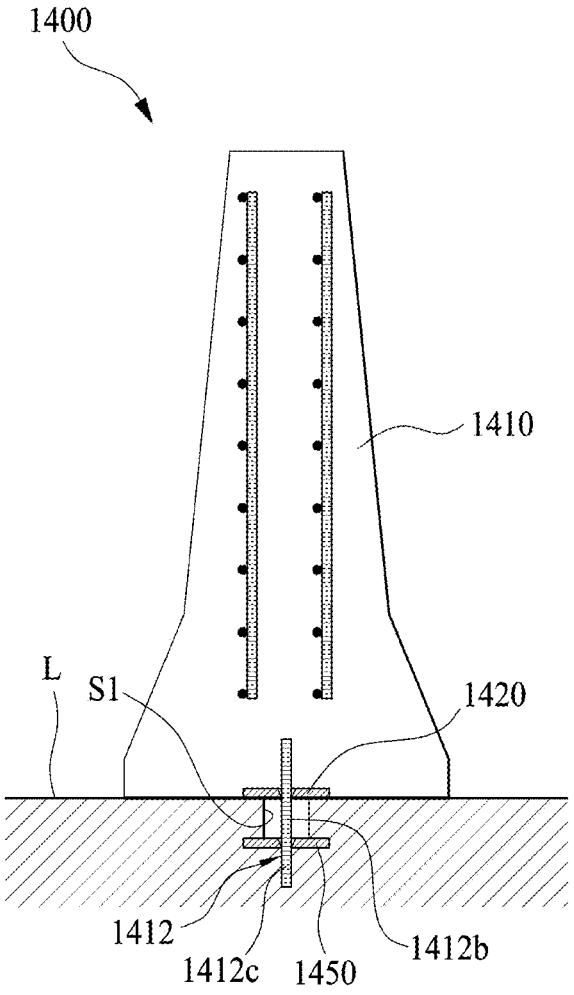


FIG.35

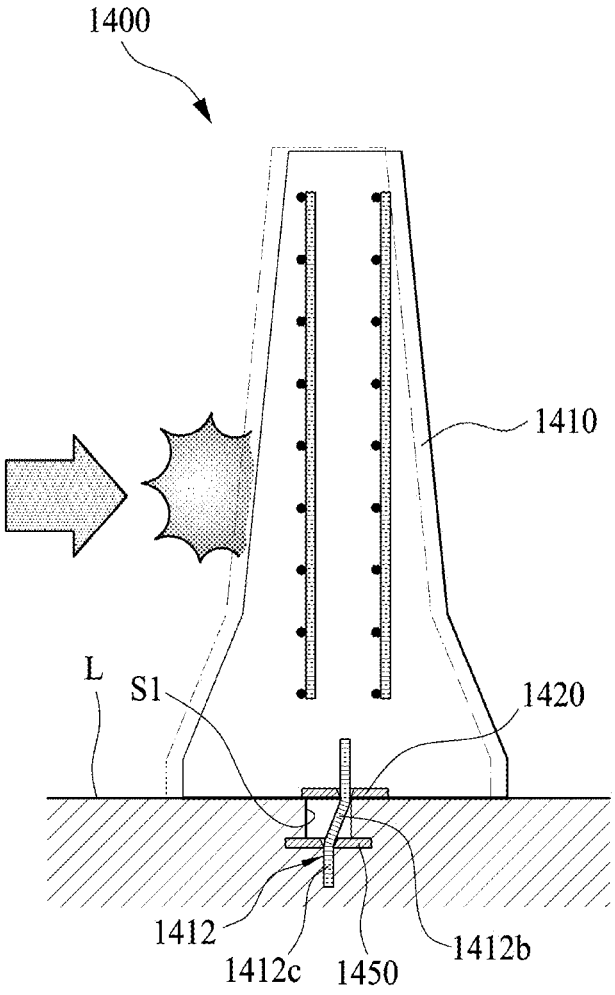


FIG.36

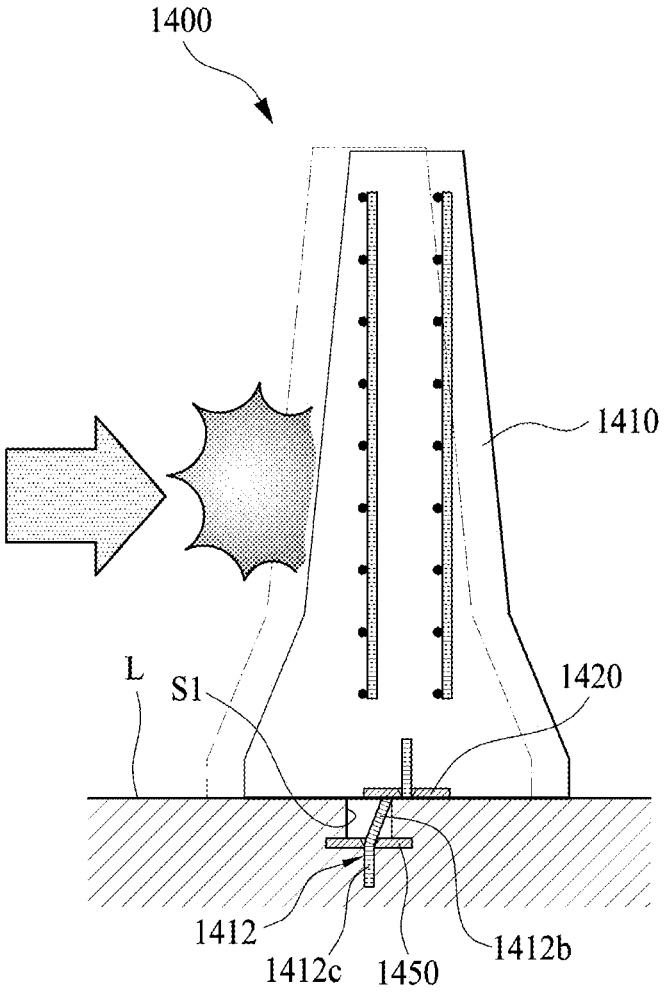


FIG.37

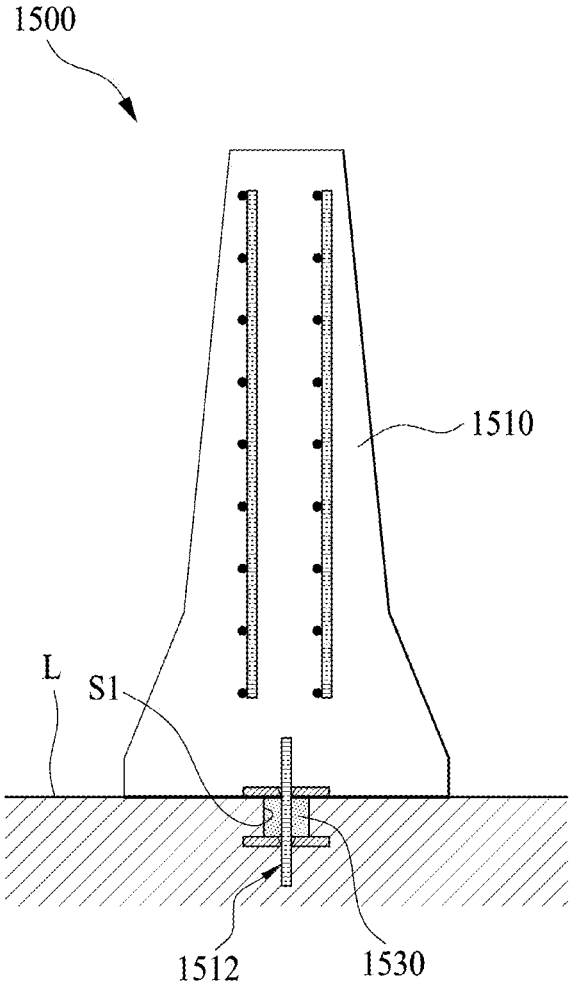


FIG.38

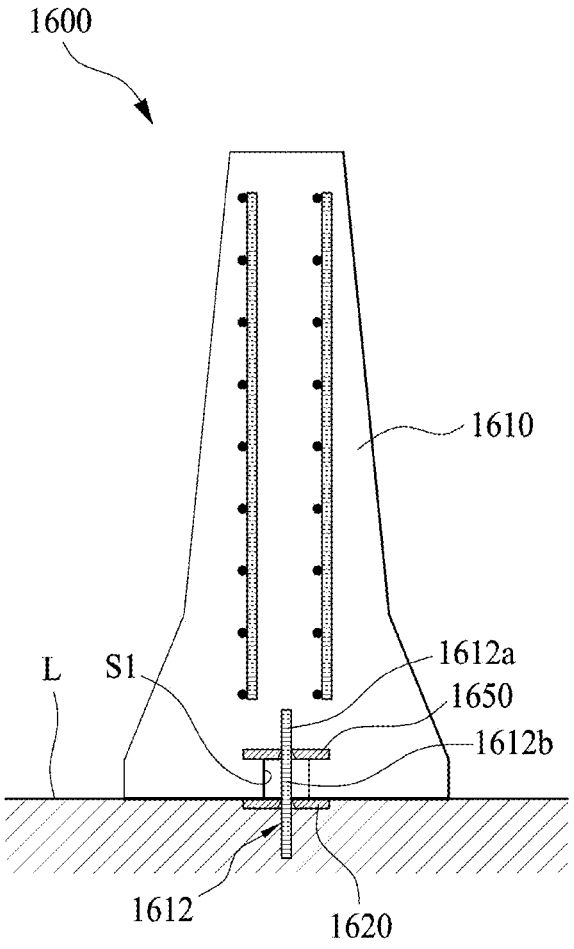


FIG.39

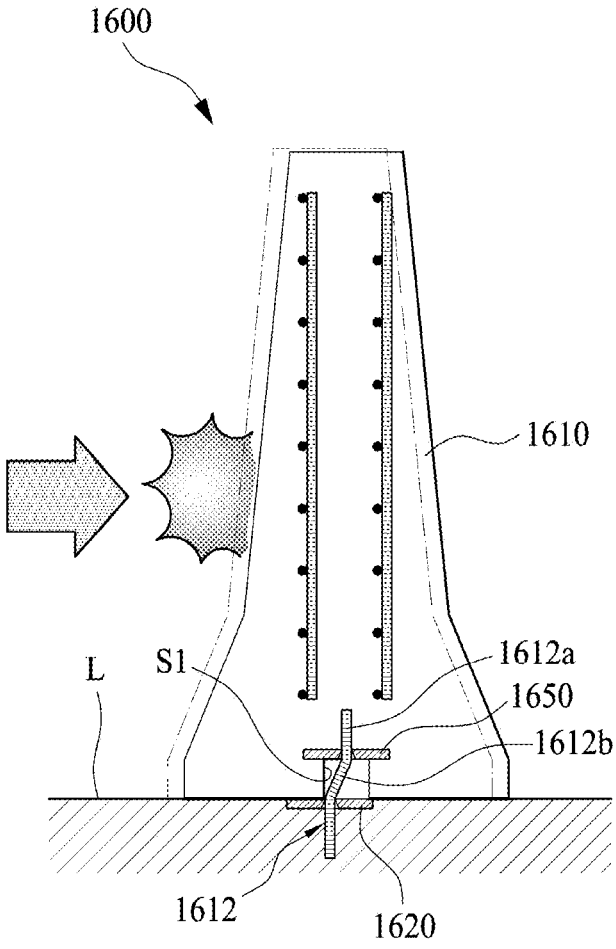


FIG.40

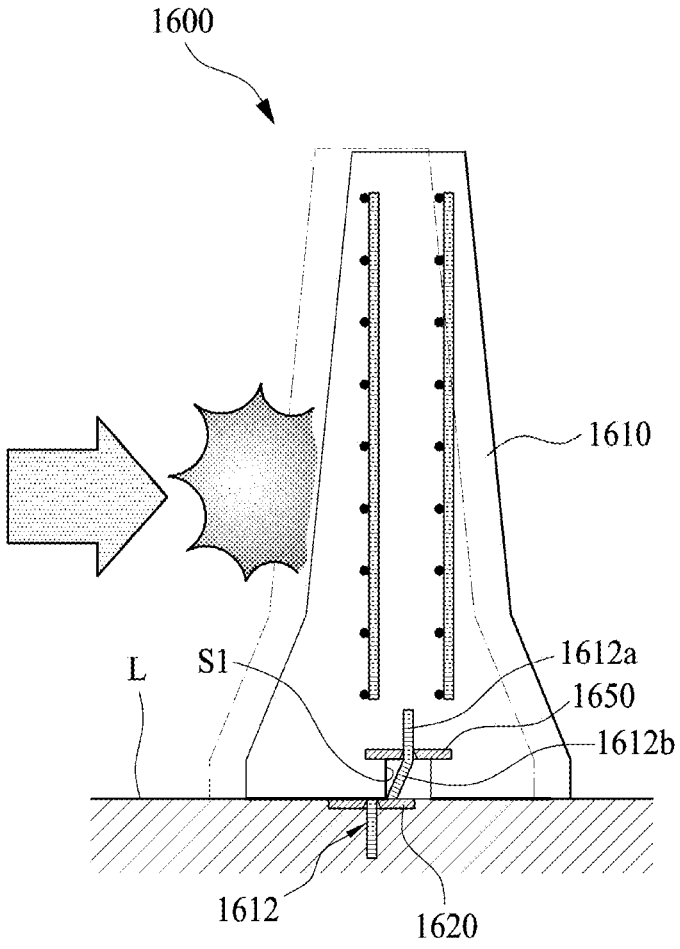
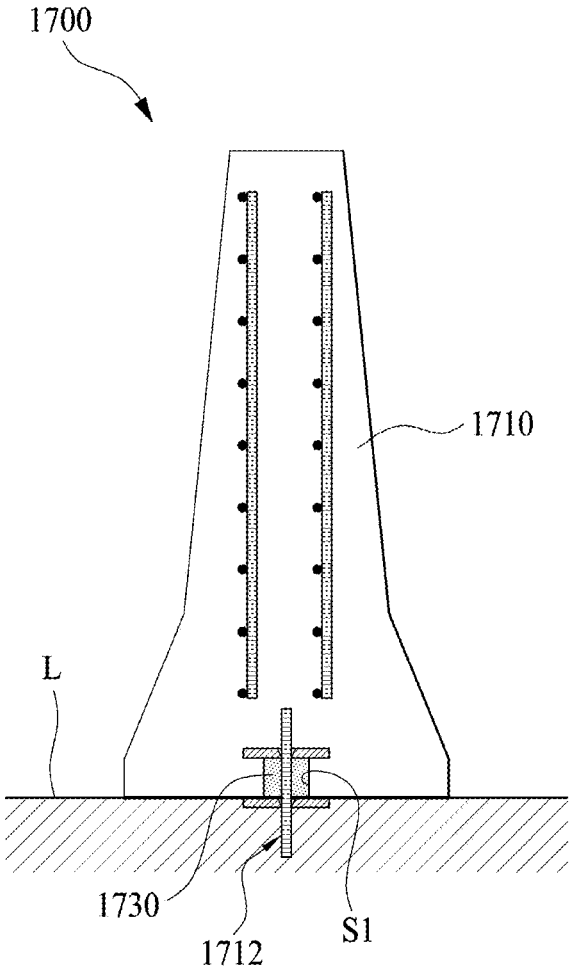


FIG.41



SAFETY BARRIER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a divisional of similarly-titled U.S. patent application Ser. No. 16/137,733, filed Sep. 21, 2018, which claims priority to and the benefit of Korean Patent Application No. 2018-0062706, filed on May 31, 2018, the disclosure of each of which is incorporated by reference herein 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.

[0017] The steel plate portion may define the lower side of the first space before the impact is applied to the body.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] 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.

[0022] 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.

[0023] 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

[0024] 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:

[0025] FIG. **1** is a schematic perspective view of a safety barrier according to a first embodiment of the present invention;

[0026] FIG. **2** is a schematic cross-sectional view of the safety barrier according to the first embodiment of the present invention;

[0027] 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;

[0028] 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;

[0029] 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;

[0030] 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;

[0031] FIG. **7** is a schematic cross-sectional view of a safety barrier according to a second embodiment of the present invention;

[0032] FIG. **8** is a schematic cross-sectional view of a safety barrier according to a third embodiment of the present invention;

[0033] FIG. **9** is a schematic perspective view of a safety barrier according to a fourth embodiment of the present invention;

[0034] FIG. **10** is a schematic cross-sectional view of the safety barrier according to the fourth embodiment of the present invention;

[0035] 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;

[0036] 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;

[0037] FIG. **14** is a schematic cross-sectional view of a safety barrier according to a fifth embodiment of the present invention;

[0038] FIG. **15** is a schematic cross-sectional view of a safety barrier according to a sixth embodiment of the present invention;

[0039] FIG. **16** is a schematic cross-sectional view of a safety barrier according to a seventh embodiment of the present invention;

[0040] FIG. **17** is a schematic perspective view of a safety barrier according to an eighth embodiment of the present invention;

[0041] FIG. **18** is a schematic cross-sectional view of the safety barrier according to the eighth embodiment of the present invention;

[0042] 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;

[0043] 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;

[0044] 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;

[0045] FIG. **23** is a schematic perspective view of a safety barrier according to a ninth embodiment of the present invention;

[0046] FIG. **24** is a schematic cross-sectional view taken along a line B-B of FIG. **23**;

[0047] 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;

[0048] FIG. **26** is a schematic cross-sectional view of a safety barrier according to a tenth embodiment of the present invention;

[0049] 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;

[0050] FIG. **29** is a schematic cross-sectional view of a safety barrier according to an eleventh embodiment of the present invention;

[0051] FIG. **30** is a schematic cross-sectional view of a safety barrier according to a twelfth embodiment of the present invention;

[0052] 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;

[0053] FIG. **33** is a schematic cross-sectional view of a safety barrier according to a thirteenth embodiment of the present invention;

[0054] FIG. **34** is a schematic cross-sectional view of a safety barrier according to a fourteenth embodiment of the present invention;

[0055] 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;

[0056] FIG. **37** is a schematic cross-sectional view of a safety barrier according to a fifteenth embodiment of the present invention;

[0057] FIG. **38** is a schematic cross-sectional view of a safety barrier according to a sixteenth embodiment of the present invention;

[0058] 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

[0059] 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

[0060] 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.

[0061] 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

[0062] 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.

[0063] 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.

[0064] 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.

[0065] Reinforcing bars **111***a* and **111***b* for reinforcement may be installed inside the body **110**.

[0066] 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.

[0067] 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.

[0068] 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.

[0069] 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**.

[0070] 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.

[0071] 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.

[0072] Also, the anchor portion **120** may be formed to have various shapes.

[0073] 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.

[0074] 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.

[0075] 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.

[0076] 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.

[0077] (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.

[0078] 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.

[0079] 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.

[0080] 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 **111***a* and **111***b* caused by an external impact is greatly increased compared to the safety barrier according to the related art.

[0081] 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.

[0082] 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.

[0083] 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°.

[0084] 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

[0085] 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.

[0086] 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

[0087] FIG. **7** is a schematic cross-sectional view of a safety barrier according to a second embodiment of the present invention.

[0088] 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.

[0089] 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**.

[0090] 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

[0091] FIG. **8** is a schematic cross-sectional view of a safety barrier according to a third embodiment of the present invention.

[0092] 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.

[0093] 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**.

[0094] 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

[0095] 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.

[0096] 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.

[0097] 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.

[0098] 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.

[0099] 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.

[0100] Reinforcing bars **411***a* and **411***b* for reinforcement may be installed inside the body **410**.

[0101] 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.

[0102] 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.

[0103] 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**.

[0104] In this case, the elastic base portion **420** may be also adhered to at least one of the body **410** and the road L.

[0105] 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.

[0106] 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**.

[0107] 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.

[0108] 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.

[0109] 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**.

[0110] 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.

[0111] 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**.

[0112] 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**.

[0113] 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**.

[0114] 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.

[0115] 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.

[0116] 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**.

[0117] 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**.

[0118] 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 **112**.

[0119] 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.

[0120] 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.

[0121] 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.

[0122] 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.

[0123] (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.

[0124] 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.

[0125] 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.

[0126] Thus, because the wide plastic strain region is distributed compared to the elastic strain region which is relatively restorable, more damage occurs.

[0127] 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

[0128] FIG. **14** is a schematic cross-sectional view of a safety barrier according to a fifth embodiment of the present invention.

[0129] 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 **520***a* and **520***b* having different elastic modulus.

[0130] 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.

[0131] 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 **520***a* and **520***b*.

[0132] 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

[0133] FIG. **15** is a schematic cross-sectional view of a safety barrier according to a sixth embodiment of the present invention.

[0134] 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**.

[0135] 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.

[0136] 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**.

[0137] 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**.

[0138] 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

[0139] FIG. **16** is a schematic cross-sectional view of a safety barrier according to a seventh embodiment of the present invention.

[0140] 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**.

[0141] 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**.

[0142] 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.

[0143] In this way, the elastic base portion **720** may realize a change of elastic strains using various methods.

[0144] 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

[0145] 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.

[0146] 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.

[0147] 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**.

[0148] The body **810** may be installed on the road L, and in the present embodiment, the body **810** is formed of concrete, for example.

[0149] 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.

[0150] Reinforcing bars **811***a* and **811***b* for reinforcement may be installed inside the body **810**.

[0151] 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.

[0152] 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.

[0153] 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.

[0154] 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**.

[0155] 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.

[0156] 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.

[0157] 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.

[0158] 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**.

[0159] 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.

[0160] 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 concreate 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.

[0161] 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.

[0162] 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.

[0163] 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.

[0164] 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.

[0165] 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.

[0166] 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.

[0167] 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.

[0168] 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.

[0169] 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.

[0170] Referring to FIG. **21**, a through hole H**1** through which the anchor portion **812** passes, may be formed inside a steel plate portion **820***a*, and an inner circumferential surface of the through hole H**1** may be inclined.

[0171] Thus, the anchor portion **812** may be more easily broken by the steel plate portion **820***a* compared to the cases of FIGS. **17** through **20**.

[0172] That is, the inner circumferential surface of the through hole H**1** is inclined so that an inwardly-protruding portion can be formed in the through hole H**1**. Thus, the steel plate portion **820***a* 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 **820***a*.

[0173] Meanwhile, the through hole H**1** is formed in such a way that a diameter of the through hole H**1** is decreased as

it goes downwards. However, contrary to this, the through hole H**1** may also be formed in such a way that the diameter of the through hole H**1** is decreased as it goes upwards.

[0174] Alternatively, the inner circumferential surface of the through hole H**1** may also be formed to be highly uneven.

[0175] 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.

[0176] Referring to FIG. **22**, a diameter d_2 of a portion **813***a* of the anchor portion **812***a* 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 **812***a*.

[0177] That is, because the portion **813***a* of the anchor portion **812***a* that corresponds to the through hole H of the steel plate portion **820** has an inwardly-concave recessed shape and the anchor portion **812***a* is made of the same material, a strength of the portion **813***a* of the anchor portion **812***a* 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 **812***a*.

[0178] Thus, the anchor portion **812***a* may be more easily broken by the steel plate portion **820***a* compared to the cases of FIGS. **17** through **20**, like in the description with reference to FIG. **21**.

[0179] Of course, the anchor portion **812***a* may also be applied to the steel plate portion **820***a* described with reference to FIG. **21**.

[0180] Meanwhile, unlike in the present case where a portion of the anchor portion **812***a* is recessed, the portion of the anchor portion **812***a* may be formed of a different material, or post processing is performed in a corresponding point so that the strength of the anchor portion **812***a* may be lowered.

Ninth Embodiment

[0181] 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.

[0182] 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**.

[0183] 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.

[0184] The body **910** may be implemented by installation and curing of concrete, for example, and reinforcing bars **911***a* and **911***b* for reinforcement may be installed inside the body **910**.

[0185] Here, the reinforcing bars **911***a* and **911***b* 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 **911***a* and **911***b* 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.

[0186] 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.

[0187] 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**.

[0188] 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.

[0189] The impact-absorbing portion **930** may be made of material including Styrofoam, non-woven fabric, urethane, or the like.

[0190] Meanwhile, the accommodation space S may be recessed into a lower part of the body **910** and may include a first accommodation space S**1** for accommodating the steel plate portion **920** and a second accommodation space S**2** for accommodating the impact-absorbing portion **930**.

[0191] Here, the first accommodation space S**1** and the second accommodation space S**2** may have sizes corresponding to the steel plate portion **920** and the impact-absorbing portion **930**, respectively, and the first accommodation space S**1** may be placed in a lower position than the second accommodation space S**2**.

[0192] 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**.

[0193] 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**.

[0194] 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.

[0195] 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**.

[0196] 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.

[0197] 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**.

[0198] 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.

[0199] 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.

[0200] 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.

[0201] 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.

[0202] 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.

[0203] 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.

[0204] 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.

[0205] 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

[0206] 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.

[0207] 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.

[0208] 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 **1012***a* buried in the body **1010** and a lower part **1012***c* buried in the road L.

[0209] Here, a first space S**1** in which a middle part **1012***b* of the anchor portion **1012** other than the upper part **1012***a* and the lower part **1012***c* is placed, may be formed between the body **1010** and the road L.

[0210] The first space S**1** may be provided by the road L. In detail, the first space S**1** may be a space recessed from a top surface of the road L.

[0211] The body **1010** may have a second space S**2** in which the steel plate portion **1020** is placed in the lower part **1012***c* of the anchor portion **1012**, and the steel plate portion **1020** may be accommodated in the second space S**2** 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 S**2** in such a way that the body **1010**.

[0212] The steel plate portion **1020** has an area of the first space S**1** 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 S**1**.

[0213] A plurality of first spaces S**1** 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 S**1**, respectively.

[0214] However, a plurality of first spaces S**1** do not need to be spaced apart from each other and may also be consecutively formed in the longitudinal direction of the body **1010**.

[0215] 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 S**1** continuously formed. However, a plurality of steel plate portions **1020** may be spaced apart from each other.

[0216] 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 **1012***b* in the first spaces S**1** so that the impact can be absorbed.

[0217] 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 **1012***b* 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.

[0218] 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.

[0219] 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

[0220] FIG. **29** is a schematic cross-sectional view of a safety barrier according to an eleventh embodiment of the present invention.

[0221] 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.

[0222] The connector **1130** is placed around the middle part **1112***b* of the anchor portion **1112** so that the first space S**1** can be formed while at least one of the road L and the body **1110** is formed.

[0223] 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.

[0224] 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 S**1** to be naturally formed. Thus, a process of forming the first space S**1** may be simplified.

[0225] 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.

[0226] 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

[0227] 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.

[0228] 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 S**1** and the second space S**2** and the position of the steel plate portion **1220** caused thereby. Thus, descriptions other than those of the positions of the first space S**1** and the second space S**2** and the position of the steel plate portion **1220** caused thereby will be omitted.

[0229] The first space S**1** 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.

[0230] The road L may include a second space S**2** 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 S**2** and may be placed independently of movement of the body **1210** caused by an impact.

[0231] That is, the steel plate portion **1220** may be placed in the second space S**2** 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 S**1** before the impact is applied to the steel plate portion **1220**.

[0232] Meanwhile, the movement of the body **1210** and bending deformation and fracture 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

[0233] FIG. **33** is a schematic cross-sectional view of a safety barrier according to a thirteenth embodiment of the present invention.

[0234] 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.

[0235] 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 S**1** to be naturally formed. Thus, a process of forming the first space S**1** may be simplified.

[0236] The material and effect of the connector **1330** have been described above. Thus, a detailed description thereof will be omitted.

Fourteenth Embodiment

[0237] 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.

[0238] 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.

[0239] The damage prevention portion **1450** may be an element that is placed at a lower side of the first space S**1**,

defines the lower side of the first space **S1** and prevents damage of the road L due to the lower part **1412***c* of the anchor portion **1412** when bending deformation of the middle part **1412***b* of the anchor portion **1412** occurs.

[0240] 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.

[0241] 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

[0242] FIG. **37** is a schematic cross-sectional view of a safety barrier according to a fifteenth embodiment of the present invention.

[0243] 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.

[0244] 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.

[0245] The material and effect of the connector **1530** have been described above. Thus, a detailed description thereof will be omitted.

Sixteenth Embodiment

[0246] 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.

[0247] 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.

[0248] 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 **1612***a* of the anchor portion **1612** when bending deformation of a middle part **1612***b* of the anchor portion **1612** occurs.

[0249] 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.

[0250] Meanwhile, movement of the body **1610** due to an impact such as collision with the car and bending deformation and fracture of the anchor portion **1612** have been described above. Thus, a detailed description thereof will be omitted.

Seventeenth Embodiment

[0251] FIG. **41** is a schematic cross-sectional view of a safety barrier according to a seventeenth embodiment of the present invention.

[0252] Referring to FIG. **41**, a safety barrier **1700** according to the seventeenth embodiment of the present invention has the same configuration and effects as hose 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.

[0253] 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.

[0254] The material and effect of the connector **1730** have been described above. Thus, a detailed description thereof will be omitted.

[0255] 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.

[0256] 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.

[0257] 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.

[0258] In addition, damage of the safety barrier itself is minimized so that maintenance and repair can be rapidly and easily performed.

[0259] In addition, because lateral displacement does not occur in a light collision or graze phenomenon of a car, maintenance can be conveniently performed.

[0260] 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.

[0261] 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;

an anchor portion passing through the steel plate portion and having an upper part buried in the body, a lower part buried in the road and a middle part therebetween, the middle part extending through a first space formed between the body and the road; and

a connector placed around the middle part, allowing the first space to be formed during formation of at least one

of the road and the body and allowing connection of the road and the body after the formation of the road and the body,

wherein upon an impact 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.

2. The safety barrier of claim **1**, 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.

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