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(54) Shock dampener for road guardrails and process for manufacturing such dampener

(57) A shock dampener (1) for road guardrails (2) is described, made of recycled rubber and having a semi-cylindrical shape; such dampener (1) comprises: at least two elongated arms (3, 4) adapted to engage a respective vertical riser (6) of said guardrail (2), or the horizontal part of said guardrail (2) nearest to the road bottom; a

rounded protecting surface (5) that mutually connects said at least two elongated arms (3, 4); and an elongated recess (7) adapted to house said vertical riser (6) of said guardrail (2) or the horizontal part of said guardrail (2), allowing its engagement with said at least two elongated arms (3, 4). A process for manufacturing such shock dampener (1) is further described.

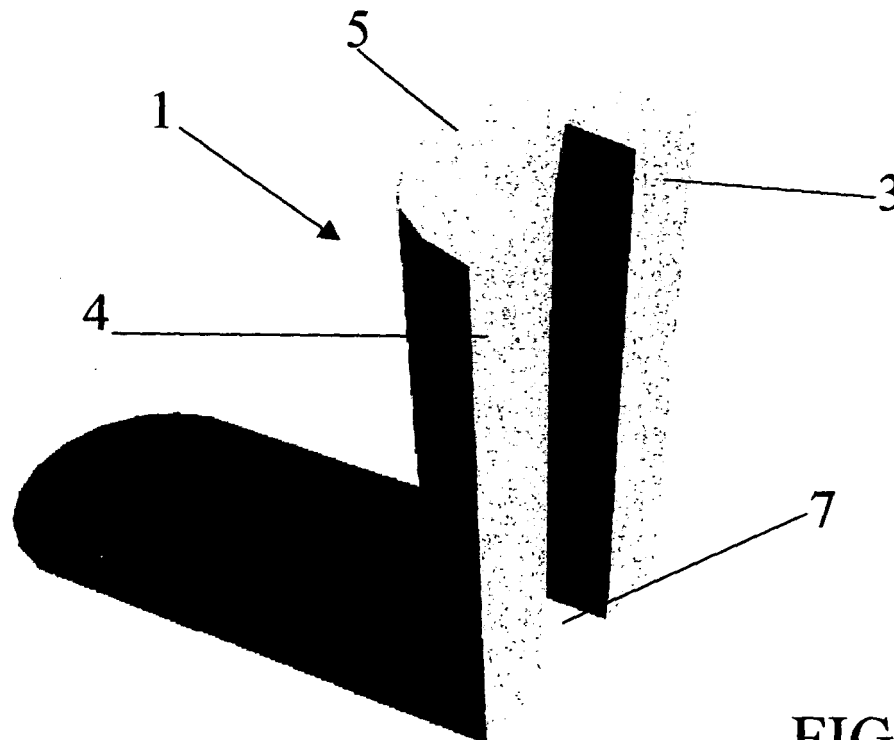


FIG. 1

Description

[0001] The present invention refers to a shock dampener for road guardrails and to a process for manufacturing such dampener.

[0002] Road guardrails are commonly known: they are applied to edges of roads, highways and other communication ways as protection in case of side skidding of vehicles, both for preventing such vehicles from going out of the road carriageway, and for protecting from skidding vehicles what is possibly outside the carriageway itself. The protective function of the guardrails is therefore evident and precious for human beings and objects.

[0003] However, the guardrails as currently made are commonly composed of one or more elongated protecting elements (usually made of plate) placed in parallel with the vehicles running direction, and each supported by a plurality of short supporting elements (usually made of the same material of the elongate elements, namely of plate, but sometimes also made of cement or other similar materials), placed in contact with the road on one side and with the respective elongated elements on the other side. Such short elements are in practice a very big danger for motor-cyclists or, in general two-wheeled vehicle drivers: in fact, should such vehicles skid, their drivers tend to slide on the asphalt and, if they get in contact with the short supporting elements, they can be injured, even severely, or die (a rather frequent case). This very severe danger also occurs for any person (that travels in any type of vehicle) that is thrown out of the vehicle and gets in direct contact with such guardrail supporting elements.

[0004] The protection of guardrails so far has been made in several ways, using rubber guards, without anyway specifying in detail which type of material were the best for such application. Examples of these known protecting types are as follows:

- WO-A-2007/036593, that provides for recovering the low guardrail part with an elongated band, whose installation is long, difficult and costly;
- FR-A-2622914 and EP-A-1762659, that provide for protecting only the base of guardrail supporting risers;
- WO-A-02/10517, that provides for an elongated guardrail-protecting band that uses a sort of junction elements of the band parts next to the risers, solution that is also lengthy, costly and difficult to realise;
- US-A-6257557, EP-A-1382747 and DE-A-3330123, that provide for the complete protection of vertical risers on all their sides, with an obvious waste of material, but above all with a long and difficult installation work: in fact, US-A-6257557 provides for the use of two protecting elements to be screwed one against the other upon installation, operation that, given the enormous number of risers present on a road, lasts for a very long time; EP-A-1382747 provides for equipping every "T"-shaped risers with a double protection with abutments, also costly and difficult to install; and DE-A-3330123 provides an approximate description about how to wind foamed material around the risers, operation that would seem feasible only upon installing the guardrail.

[0005] The above-mentioned patents, and in particular US-A-6257557, EP-A-1382747 and DE-A-3330123, have the following drawbacks:

- a) protections are provided around all vertical guardrail-supporting risers, when it is clear that the side to be protected is only the one oriented towards the road: this implies a waste of material;
- b) all mentioned protections either have to be installed upon making the guardrail, making it impossible to protect already installed guardrails, or must be assembled on each one of the risers with screwing or fastening operations of two substantially equal parts, such operation being long and costly given the presence of a very high number of risers on the roads;
- c) the material of which such protections are made is described in general as rubber, but it is known that not all types of rubber can be used in this application, since they must on one hand be sufficiently sturdy to support vehicle impacts of a certain amount, but at the same time they must be sufficiently soft not to be a danger for the life of people impacting against them; and
- d) no protecting elements are provided that can be used at the same time both for vertical guardrail risers, and for the horizontal parts of the guardrails themselves.

[0006] The Applicant of the present Application is currently marketing parking-preventing elements made of recycled rubber. Starting from such elements and from the material of which they are made, the Applicant is thereby arrived at the solution in the present Application.

[0007] Therefore, object of the present invention is solving the above prior art problems, by providing a shock dampener for guardrails that is made of a sturdy, but elastic and soft, material, and that therefore allows providing protection against vehicle impacts and at the same time protection against impacts of human beings against it.

[0008] A further object of the present invention is providing a shock dampener as mentioned above that is simple, inexpensive and quick to make, in various shapes and colours according to applications, and at the same time can be

quickly and easily installed on guardrails.

[0009] A further object of the present invention is providing a shock dampener as mentioned above that, due to its configuration, can be installed indifferently on vertical guardrail-supporting risers or on the low horizontal parts of the guardrails themselves.

[0010] Another object of the present invention is providing a process for manufacturing a shock dampener as mentioned above, which is efficient, quick and inexpensive to implement.

[0011] The above and other objects and advantages of the invention, as will result from the following description, are obtained with a shock dampener for guardrails and a process for manufacturing such dampener as described in the respective independent claims.

[0012] Preferred embodiments and non-trivial variations of the present invention are the subject matter of the dependent claims.

[0013] It will be immediately obvious that numerous variations and modifications (for example related to shape, sizes, arrangements and parts with equivalent functionality) can be made to what is described, without departing from the scope of the invention as appears from the enclosed claims.

[0014] The present invention will be better described by some preferred embodiments thereof, provided as a nonlimiting example, with reference to the enclosed drawings, in which:

- Figure 1 is a side perspective view of a preferred embodiment of the shock dampener of the present invention;
- Figure 2 shows a top view of the shock dampener of Fig. 1;
- Figure 3 is a front view of a road guardrail to which a plurality of shock dampeners of Fig. 1 are applied in a first application mode;
- Figure 4 is a detailed view of Fig. 3;
- Figure 5 is another front view of a road guardrail to which a plurality of shock dampeners of Fig. 1 are applied in a second application mode; and
- Figure 6 is a detailed view of Fig. 5.

[0015] With reference to the Figures, the shock dampener 1 for road guardrails 2 according to the present invention has been devised starting from the assumption that its application to all types of guardrails 2 must not modify the characteristics for which the barrier 2 itself is homologated. Therefore, the dampener 1 is first of all made, as will be better described below, of recycled rubber and has a semi-cylindrical shape; such dampener 1 comprises:

- at least two elongated arms 3, 4 adapted to engage a respective vertical riser 6 of the guardrail 2, or the horizontal part (not shown) of the guardrail 2 nearest to the road bottom;
- a rounded protecting surface 5 that mutually connects the two elongated arms 3, 4; and
- an elongated recess 7 adapted to house the vertical riser 6 of the guardrail 2 or the horizontal part of the guardrail 2, allowing its engagement with the two elongated arms 3, 4.

[0016] The inventive dampener 1, with such configuration, as it is clear, brings about, first of all, a high material saving, since it is only a semi-cylinder and not a complete cylinder, like prior art protections.

[0017] Then, in order to make such shock dampener 1 with an inexpensive material, that can be easily modelled and above all is resistant, soft and elastic for the particular application for which it is aimed, the Applicant of the present invention has performed extended studies and tests, and has come to the following conclusions.

[0018] The most efficient material to be used in this case is recycled rubber: rubber granules have always had such impact elasticity that nowadays makes them preferable to any other material; similarly, great performances are due to long working life, without becoming yellowish: in fact, atmospheric conditions, even the most difficult ones, do not modify its structure.

[0019] Having therefore discovered the validity of rubber granules, the Applicant afterwards has started assuming and designing several geometric figures, till he finally chose the one described herein.

[0020] The rounded shape of the dampener 1 allows a more complete wrapping around the part of the riser 6 oriented towards the road, while the recess 7 on the back allows an application both for the vertical riser 6, and for the horizontal part (wheel-bumper) of the guardrail 2.

[0021] The inventive shock dampener 1 has also the very important feature of being capable to be easily, quickly and immediately installed: in fact, due to its particular configuration, it is adapted to be joined to the vertical riser 6 of the guardrail 2 or to the horizontal part (wheel-bumper) of the guardrail 2 through a manual pressure for installing it in place and through gluing for securing it: therefore, it can be understood that the dampener can be both installed in a factory upon manufacturing the guardrail 2, and can be quickly assembled on existing guardrails 2 by even unskilled personnel.

[0022] The inventive dampener 1 is made through a manufacturing process that provides for a single moulding operation, and has substantially the following steps:

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- providing an amount of rubber granules deriving from spent vehicle tires, said granules having a granulometry included between 0.5 mm and 10 mm;
- providing an amount of polyurethane resin such that the weight ratio between said polyurethane resin and said rubber granules ranges from 1:9.73 to 1:10.55, and is preferably equal to 1:10;
- mutually amalgamating rubber granules and polyurethane resin with a cold process and with the possible addition of colouring paste; and
- filling a die with an adequate shape with the obtained amalgam, closing the die and leave it closed for a time ranging between 20 and 22 hours.

[0023] Moulding can also be performed hot with an amalgam temperature included between 120°C and 170°C.

[0024] A fundamental choice for the material to be used for the invention has been the self-flammability degree of the rubber granule SBR, that is around 270°C, as well as its water-insolubility at ambient temperature.

[0025] As regards the polyurethane resin to be used, it can be of any nature suitable for the purposes of the invention, taking into account that it is preferably an isocyanate.

[0026] As an example, an arrangement of the shock dampener 1 according to the above-described process has a weight ranging between 6 kg and 11 kg, a height included between 48 and 52 cm, a circumference between 25 and 33 cm, a seat for connecting the U-shaped riser between 5 and 12 cm, with a mean thickness of 7 cm.

[0027] The amount of rubber granules ranges from a minimum weight of 6 kg to a maximum weight of 9 kg.

[0028] The following Table 1 shows the results of tests performed in a laboratory on different resin compositions, with different die opening hours after casting: the result of the test ranges from "very bad" to "good" according to the compliance with the required sturdiness and elasticity/softness requirements for the final application.

TABLE 1

TESTS ON DAMPENERS - AMBIENT TEMP. 27°C			
GRANULES WEIGHT	RESIN WEIGHT	DIE OPENING TIME	TEST RESULT
7.5 kg	4.5 hg	after 15 hours	Insufficient
8.3 kg	4.3 hg	after 15 hours	Insufficient
7.7 kg	4.2 hg	after 15 hours	Insufficient
8.5 kg	4.1 hg	after 18 hours	Very bad
7.5 kg	7.5 hg	after 21 hours	Good
7.2 kg	7.1 hg	after 20 hours	Sufficient
7.4 kg	7.3 hg	after 19 hours	Discrete
7.6 kg	7.3 hg	after 20 hours	Sufficient
7.7 kg	7.3 hg	after 21 hours	Sufficient
7.5 kg	7.5 hg	after 22 hours	Good
7.1 kg	7.3 hg	after 22 hours	Good
7.5 kg	7.4 hg	after 22 hours	Good
7.5 kg	7.6 hg	after 22 hours	Good
7.6 kg	7.5 hg	after 22 hours	Good

[0029] From the above-listed table, it is clear and it can be determined that only after 20 hours of manufacturing an optimum product is produced.

[0030] The final approximate weight of the products that provided the best results is about 8.20 kg.

[0031] The manufactured product elasticity, due to rubber granules, has remained unchanged even in the days following its manufacture, following tests performed under different atmospheric conditions, and specifically both at +2°C, and at +35°C.

[0032] The inventive shock dampener 1, therefore, in addition to having the above-mentioned properties, has the big advantage of not getting rusted, not getting discoloured, and keeping its shape unchanged in time; moreover, it can be easily applied and above all is lightweight for the end purpose for which it is aimed.

Claims

1. Shock dampener (1) for road guardrails (2) **characterised in that** it is made of recycled rubber and it has a semi-cylindrical shape, said dampener (1) comprising:
 - at least two elongated arms (3, 4) adapted to engage a respective vertical riser (6) of said guardrail (2), or the horizontal part of said guardrail (2) nearest to the road bottom;
 - a rounded protecting surface (5) that mutually connects said at least two elongated arms (3, 4); and
 - an elongated recess (7) adapted to house said vertical riser (6) of said guardrail (2) or the horizontal part of said guardrail (2), allowing its engagement with said at least two elongated arms (3, 4).
2. Shock dampener (1) according to claim 1, **characterised in that** it is adapted to be joined to said vertical riser (6) of said guardrail (2) or to said horizontal part of said guardrail (2) through a manual pressure for installing it in place and through gluing for securing it in place.
3. Process for manufacturing a shock dampener (1) for road guardrails (2) comprising at least two elongated arms (3, 4) adapted to engage a respective vertical riser (6) of said guardrail (2), or the horizontal part of said guardrail (2) nearest to the road bottom; a rounded protecting surface (5) that mutually connects said at least two elongated arms (3, 4); and an elongated recess (7) adapted to house said vertical riser (6) of said guardrail (2) or the horizontal part of said guardrail (2), allowing its engagement with said at least two elongated arms (3, 4), said process comprising the steps of:
 - providing an amount of rubber granules, said granules having a granulometry included between 0.5 mm and 10 mm;
 - providing an amount of polyurethane resin such that the weight ratio between said polyurethane resin and said rubber granules ranges from 1:9.73 to 1:10.55;
 - mutually amalgamating rubber granules and polyurethane resin with a cold process; and
 - filling a die, with such a shape as to make said dampener (1), with the obtained amalgam, closing the die and leaving it closed for a time ranging between 20 and 22 hours.
4. Process according to claim 3, **characterised in that** the weight ratio between said polyurethane resin and said rubber granules is preferably equal to 1:10.
5. Process according to claim 3 or 4, **characterised in that** said step of amalgamating and moulding is performed hot, with an amalgam temperature included between 120°C and 170°C.
6. Process according to any one of claims 3 to 5, **characterised in that** it further comprises the step of adding colouring paste to said amalgam.
7. Process according to any one of claims 3 to 6, **characterised in that** the rubber granules have a self-flammability degree equal to 270°C, and a water-insolubility at ambient temperature.
8. Process according to any one of claims 3 to 7, **characterised in that** the polyurethane resin to be used is an isocyanate.
9. Process according to any one of claims 3 to 8, **characterised in that** the amount of rubber granules ranges from a minimum weight of 6 kg to a maximum weight of 9 kg.
10. Process according to any one of claims 3 to 9, **characterised in that** the rubber granules are granules deriving from spent vehicle tires.

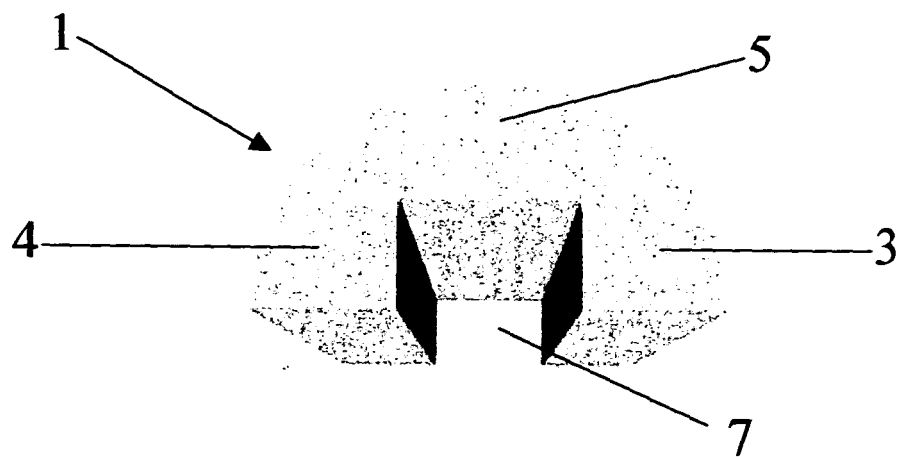


FIG. 2

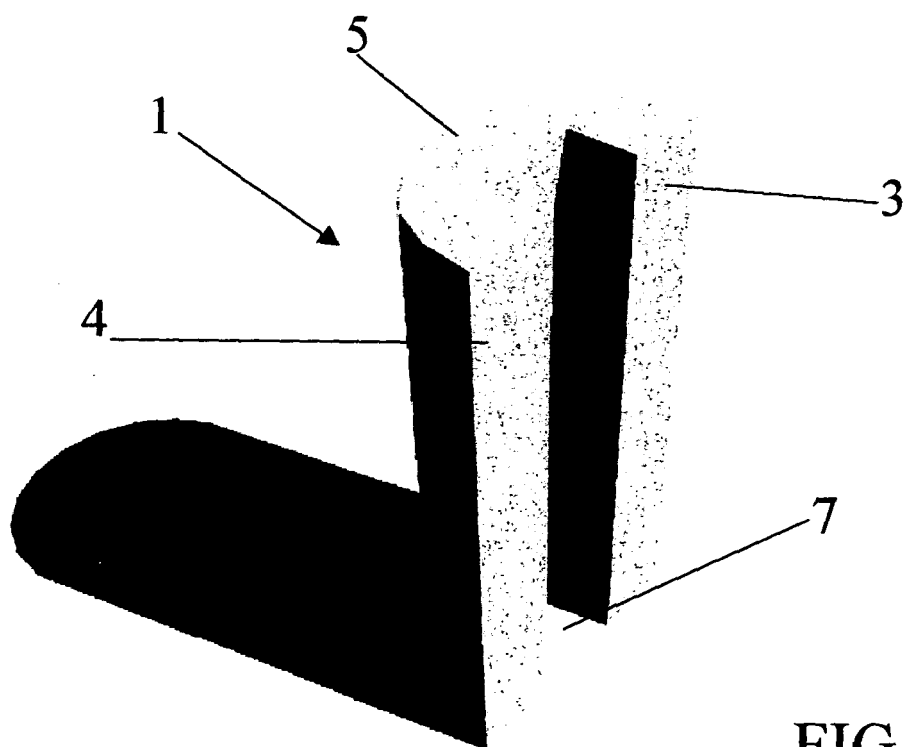


FIG. 1

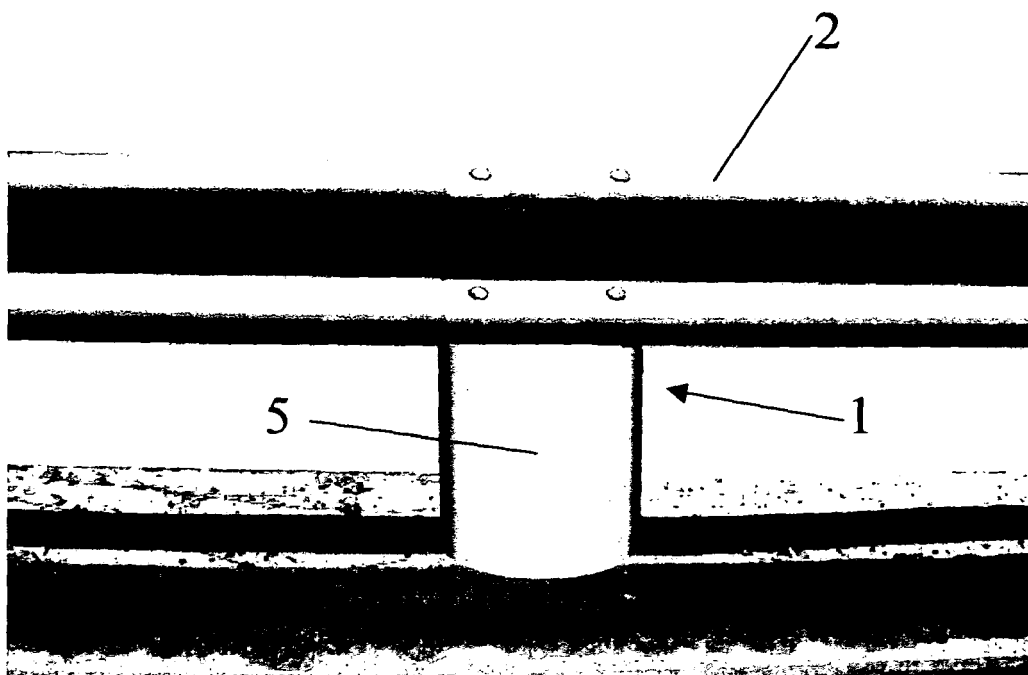


FIG. 4



FIG. 3

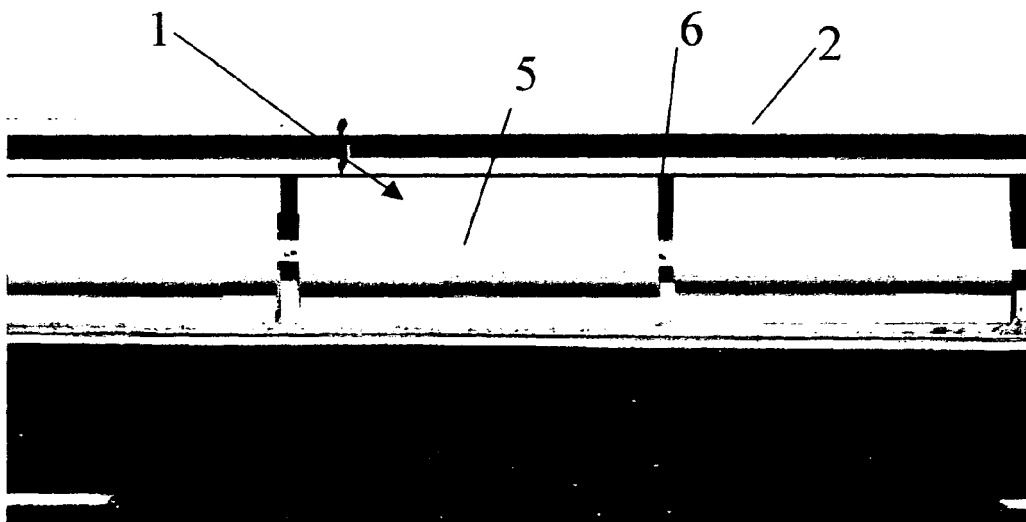


FIG. 6

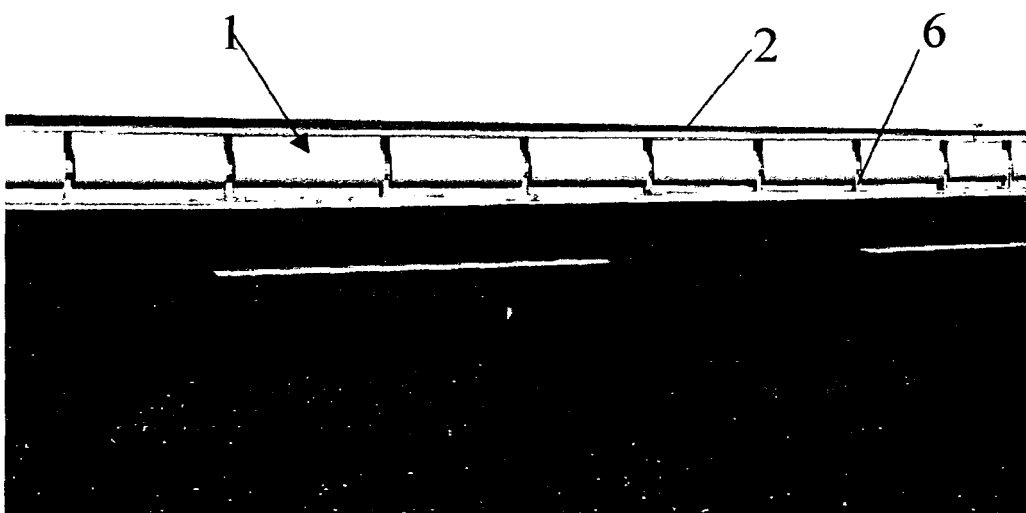


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 08 42 5571

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 December 2008	Examiner Tran, Kim-Lien
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EUROPEAN SEARCH REPORT

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

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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