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(54) Sound deadening guardrail

(57) A sound deadening guardrail for roads, particularly for the lateral side of the road, for a road embankment, or for the side of a bridge, comprising several elements that usually belong to two separate barriers, which serve respectively for the absorption of sound waves and for safety.

The guardrail includes the supporting posts (of the anti-noise panels or sound absorbing panels) which at the same time insure safety in the event of an accident, in addition to components of a traditional guardrail, which preferably are fixed to said posts. According to the homologation class, the mutual distance between the supporting posts that support the anti-noise panels may be chosen more or less wide, and/or possible intermediate posts - not integral to the anti-noise panels - could also be added.

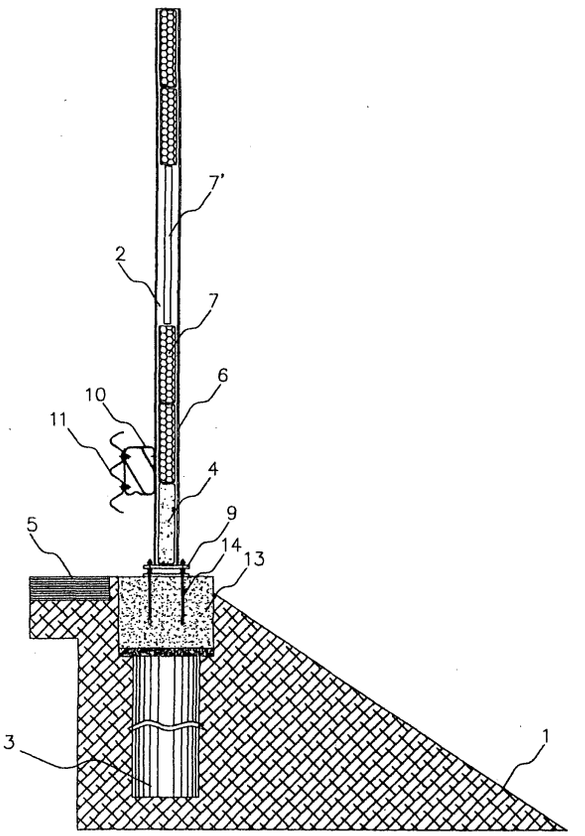

FIG. 2

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Description

Technical Field

[0001] The present invention relates to the field of guard rail construction, and more particularly it concerns problems related to safety and control (confinement) of vehicles along the carriageway, and also the attenuation of noise generated by the vehicles themselves.

Background Art

[0002] Various kinds of guardrails that may be mounted according to various needs and that correspond to different type test categories adapted to particular circumstances (lateral guardrails for bridges, traffic dividers, lateral guardrails for embankments, etc.) are already known in the art. Some of these guardrails are described for instance in other patent applications of the applicant: e.g., Italian patent application RM97A0452 (steel-made lateral New Jersey guardrail for bridges belonging to the B3 class, for which a PCT application has also been filed), Italian patent application RM93A000788 (spacer with a climbing-deformation effect, to be used in guardrails, for which a European patent application has been filed), to mention only some of these applications.

[0003] On the other hand, sound deadening barriers are known, whose structure may greatly vary according to specific requirements, but which are however unable to resist to impacts caused by veering vehicles. Such barriers are generally formed by a plurality of panels, e. g. made of porous concrete with a wavy surface, or by metallic sound absorbing panels which are either smooth or corrugated; these panels - in either case - being fixed or restrained to posts or standards having a "double-T" ("H") configuration (or the like), which are sized to resist only to the force (thrust) of the wind. The configuration and structure of these sound deadening barriers is also already known, so that in this context it is unnecessary to dwell upon their specific features, which may - as already noted - vary considerably. The only thing worth mentioning is that guardrails require the presence of a lateral free space for their deformation in the event of an impact, and for this reason the sound deadening barriers are usually mounted, on the road embankment, in a position shifted backwards with respect to the guardrail itself, and therefore, in order to compensate the difference in height due to the fact that the base of the sound deadening barrier happens to be erected on the "ramp" of the embankment, it is necessary to use a sound deadening barrier of greater height, and to employ e.g. a concrete-made plugging panel or the like to make up for this height difference, this concrete-made panel having - unlike the overlying sound absorbing panels - no sound absorbing function at all.

[0004] These additional means, together with the increased height of the barrier, give rise to higher costs.

[0005] Even in the case of a sound deadening barrier erected on a flush direct foundation, or in other words, when no difference in level (height) is present between the base of the sound deadening barrier and the road pavement, greater costs arise anyway because of the fact that two separate barriers are employed, i.e. the guardrail and the sound deadening barrier, thus requiring a greater number of structural elements, greater supply costs, and longer times and costs for their installation.

[0006] Therefore, the object of the present invention is to reduce the required spaces and related expropriation costs, the investments for the components supplies and for the laying of the guardrail, and also the time required to provide, in the region adjacent the road, both the system for the protection against noise pollution and the guardrails necessary to confine on the carriageway the transiting vehicles.

Disclosure of invention

[0007] The above objects are attained by means of a sound deadening guardrail, which is characterised in that it comprises:

- at least a plurality of anti-noise panels which are supported by uprights or posts anchored to the ground nearby the edge of the road pavement,
- at least components (10, 11; 12) that usually belong to a guardrail (as in patent application RM93A000788 or of a different nature), and that are directly leaned against (12) said uprights or are rigidly connected (10) thereto, in such a way that these uprights, supporting said anti-noise panels (7, 7'), insure safety in the event of an impact of a vehicle against the sound deadening guardrail.

[0008] Conventional - that is already known - guardrail technology and sound deadening barrier technology, is directly applicable to a sound deadening guardrail according to the present invention.

[0009] According to claim 2, said safety components may be formed for instance by spacers that are directly fixed to the posts supporting the anti-noise panels, the latter serving therefore at the same time for safety purposes. On these spacers it is for example possible to mount a steel blade (steel sheet or web) with a double or triple wave configuration, or the like, or any other continuos safety element, which is deformable like the spacers themselves. Therefore, it may be noted that the usual posts of a separated guardrail are no more necessary, thereby limiting both space and costs. Blades (webs), spacers, or similar devices used to stop a vehicle, could be mounted in a number greater than unity and could be arranged at different heights from the ground.

[0010] Further objects and advantages of the present invention will be apparent from the description of particular embodiments thereof.

Brief Description of Drawings

[0011] The present invention will now be explained in more detail with reference to some of its embodiments, which are neither limitative nor binding, and which are shown in the annexed figures, wherein:

Fig. 1 is a cross sectional view, showing a conventional sound deadening barrier erected on an embankment on a bearing pile, or foundation pile, and a conventional guardrail of the kind comprising a blade and posts, erected in front of the sound deadening barrier;

Fig. 2 is a cross sectional view of a barrier according to the present invention, installed on an embankment;

Fig. 3 is a different embodiment of the present invention, installed on an embankment and seen in cross section;

Fig. 4 is a cross sectional view of another possible embodiment of the invention, installed on an embankment, showing a second blade arranged at a greater height;

Fig. 5 is another embodiment of the invention, installed on an embankment and shown in cross section, wherein a different resistant element is arranged at a greater height.

Detailed Disclosure of the Invention

[0012] Referring in the first place to the background art schematically illustrated in Fig. 1, it shows the embankment 1, on which a sound deadening, or anti-noise barrier 2, has been erected by using for instance drilled bearing caissons 3, a concrete-made plugging panel 4 utilised for the compensation of the level difference (ΔH) with respect to the pavement 5 of the road, a plurality of sound absorbing panels (for instance of aluminium) 7, and possibly transparent panels 7'. The system used for anchoring the anti-noise barrier to the ground may in fact vary amply; for instance, it is also possible to use steel plates 9 welded on one side to the base of the standards 6, and fixed on the opposite side by means of hanger bolts 14 to continuous kerbstones or concrete-made foundation plinths. For what concerns the objects of the present patent application it is not necessary to dwell upon these details, and in the same way, upon the different materials that could be employed in the construction of the panels which are usually retained by standards or posts 6 having an H profile, or possibly a different cross section. The only important element in the design of the barrier 2 is that the latter should have a certain minimal height in order to attain the object of sufficiently attenuating the noise produced by the road traffic. Thus, since the sound deadening barrier 2 is installed separately from the guardrail which includes the posts 8 (the latter being also shown in Fig. 1), and at a certain distance (ΔS) from this guardrail (which depends on the kind of guardrail being used), it is necessarily arranged on the "ramp" or inclined surface of the embankment 1; it is therefore unavoidable to increase, by a length ΔH, the minimum height of the anti-noise barrier, and this, in turn, results in an increase of the costs for the employed materials.

[0013] Moreover, since the barriers 2 and 8 are separately realised, the required spaces and consequently the costs and time for their laying will increase as well.

[0014] On the other hand, Fig. 2 is a representation of the present invention. It may be noted that in this case the barrier 2 is a true "bivalent" barrier, which acts both as an anti-noise system and safety system. Its fundamental feature is that it is erected at the same level as the level of the pavement, using for instance as foundation drilled caissons 3, or a concrete-made kerbstone or plinth 13, or steel tubes driven into the ground, etc.

[0015] Obviously the uprights or standards of the anti-noise guardrail 6 may equally well be mounted, by means of a plate 9 and associated hanger bolts 14, on a curbstone of a bridge's edge or on the upper end of a wall.

[0016] The uprights or standards 6 of the sound deadening guardrail are dimensioned so as to resist not only to wind gusts, but also to the impacts caused by vehicles, and moreover they may be directly employed to weld or fix thereon by bolts or in any other way, the elements that usually form, or make part of, a traditional guardrail, thereby saving space and supply/laying costs with respect to the two conventional separate barriers.

[0017] Moreover, it can be noted that in the example of Fig. 2 the quantity ΔH reduces to zero, so that the minimum required height of this anti-noise barrier (= anti-noise guardrail) is reduced with respect to the anti-noise barrier of the background art (Fig. 1), and it can be further noted that the distance ΔS is also zeroed.

[0018] The numerals 7 and 7' respectively denote sound absorbing panels and light-transparent panels which are also commonly used in the conventional sound deadening barriers.

[0019] The elements of the "guardrail" may include, for instance, one or more spacers 10, and one or more blades (sheets, webs) forming a double or a triple wave 11 (mounted at different heights). The spacer 10 could form a "rising spacer" of the kind protected by the above mentioned Italian application RM93A000788 (granted patent number = 1,262,460), which is owned by the present Applicant. However, the present invention is not limited to a specific form of the components of the anti-noise guardrail, that derive (more or less directly) from various configurations of an already known guardrail considered in isolation.

[0020] To better illustrate the latter concept, we refer in the following to Fig. 3 annexed to the present docu-

ment.

[0021] Fig. 3 shows another possible embodiment of the sound deadening guardrail of the present invention.

[0022] In this case too, ΔH and ΔS reduce to zero, but instead of using triple wave elements and spacers (notably rising spacers), the anti-noise guardrail is completed by a barrier having a New Jersey profile, arranged in direct contact with a traditional anti-noise barrier. In this example the New Jersey barrier, that could be made of steel (as shown in the figure) or of concrete, could be simply laid on the curbstone, or could be anchored to the latter, and/or fixed to the uprights 6 that support the sound deadening panels 7. The reference numeral 7' denotes possible transparent panels commonly used in traditional sound-deadening barriers.

[0023] Figs. 4 and 5 show two other possible embodiments of the sound deadening guardrail according to the present invention, in which, besides the elements 10 and 11, further elements that cooperate with these elements in stopping the colliding vehicle are arranged at a higher point (they could however be arranged even at a lower point). For instance, these illustrative and non-binding embodiments show spacers 10' and 10" respectively connected to a double wave blade (web) 11' and to a rectangular tube 11".

[0024] It should be noted that in all cases the panels 7 and 7' of this anti-noise barrier may be adequately bound or fixed to the uprights 6, and/or protected in some regions near their base, by means of small cables or further elements (not shown), in order to prevent them from falling after their breakage caused by the impact of a vehicle. Usually, the posts of the sound deadening barrier are anchored to the foundation support thorough a plate 9 and respective hanger bolts 14, as may be seen from Fig. 2, and their mutual distance may for instance correspond to 3 meters. Instead, the mutual distance D between the posts of a conventional guardrail is usually smaller, that is, they are closer to each other (an average value for D is 1.50 meters). Depending on the type test class (category) to which the barrier according to the invention is designed to belong, different values for the distance D' between uprights which support the sound absorbing (insulating) panels 7 or 7' will be selected, or alternatively, it is possible to "insert" intermediate uprights, which could be fixed to the ground and connected to the safety blade(s) or web(s) 11.

[0025] However, it is essential that the posts which support the panels 7 or 7' in the various possible embodiments (of which Figs. 2 to 5 are only specific examples), must insure safety in case of an impact of a vehicle against the anti-noise guardrail of the invention. It should further be noted, that since a lateral guardrail of this inventive kind does not present isolated posts in its lower region, but has instead a continuous wall formed by the panels, the guardrail in question lowers the risks in the event of a motorcyclist's slip, during which unfortunately the motorcyclist would eventually hit - with serious consequences - an isolated post.

[0026] A skilled person in this field may obviously consider the possibility of making many simple modifications to the above description, which however do not depart from the same inventive concept.

[0027] For example, the New Jersey barrier shown in Fig. 3 could comprise or not comprise, or only partially comprise, the internal reinforcing lattice elements formed by many appropriately bent and welded sheet metal pieces in the manner described in Italian Patent No. 1,294,202 (corresponding to the above mentioned application number RM97A0452).

[0028] Alternatively, the New Jersey barrier could simply be formed by a block of reinforced concrete, or by a single steel sheet, fixed on its rear side (and/or upper side) directly to the anti-noise panels 7 (7') supporting uprights 6, and in this steel sheet the rear wall could be omitted.

[0029] Moreover, the uprights of the sound deadening barrier could be fixed directly to the upper end of a concrete-made New Jersey barrier or be incorporated in the very body of the same.

[0030] All these alternatives naturally depend on the type test class which is considered, and strictly, they do not directly relate to the present application and its general inventive concept.

[0031] In conclusion, it should be emphasised that all the technology of conventional sound deadening barriers is applicable to a sound deadening guardrail of the present invention, so that, for example, the posts or uprights used to support the sound absorbing panels could have any possible form, consistent with the relative type test, or upper diffraction elements could be provided, a. s.o.

Claims

1. A sound deadening guardrail, **characterised in that** it comprises at least a plurality of anti-noise panels (7, 7') which are supported by uprights or posts (6) anchored to the ground nearby the edge of the road pavement, and at least components (10, 11; 12) that usually belong to a guardrail and that are directly leaned against (12) said uprights or are rigidly connected (10) thereto, or are partially incorporated in them, in such a way that these uprights supporting said anti-noise panels (7, 7') insure safety in the event of an impact of a vehicle against the sound deadening guardrail.

2. A sound deadening guardrail according to claim 1, wherein said components (10, 11) are formed by elements usually belonging to a guardrail with posts, and include for instance a spacer (10) and a triple wave blade (11), said spacer (10) being directly fixed to the posts which support the anti-noise panels.

3. A sound deadening guardrail according to claim 1 or 2, wherein, in addition to said components (10, 11; 12), further elements (10', 11'; 10", 11") are provided, which co-operate in stopping and confining the colliding vehicle within the carriageway.

4. A sound deadening guardrail according to claim 3, wherein said further elements (10', 11'; 10", 11") are formed by spacers (10' and 10") of various configurations, either continuos or discontinuous, connected to a web or sheet (11') having a double wave configuration, or to a rectangular tube (11"), or the like.

5. A sound deadening guardrail according to any of the preceding claims, wherein the anti-noise panels (7 and 7') of the sound deadening guardrail are adequately fixed or bound to the uprights (6), and/or protected in some regions near their base, by means of small cables or additional elements, to prevent them from falling after a possible breakage caused by the impact of a vehicle.

6. A sound deadening guardrail according to claim 1, 3, or 4, wherein said components (12) consist of elements normally belonging to a New Jersey guardrail, which is formed by sheet steel or concrete.

7. A sound deadening guardrail according to claims 1 to 4, wherein the uprights (6) are connected to the edge of a bridge or at the upper end of a wall, by means of a plate (9) and hanger bolts (14).

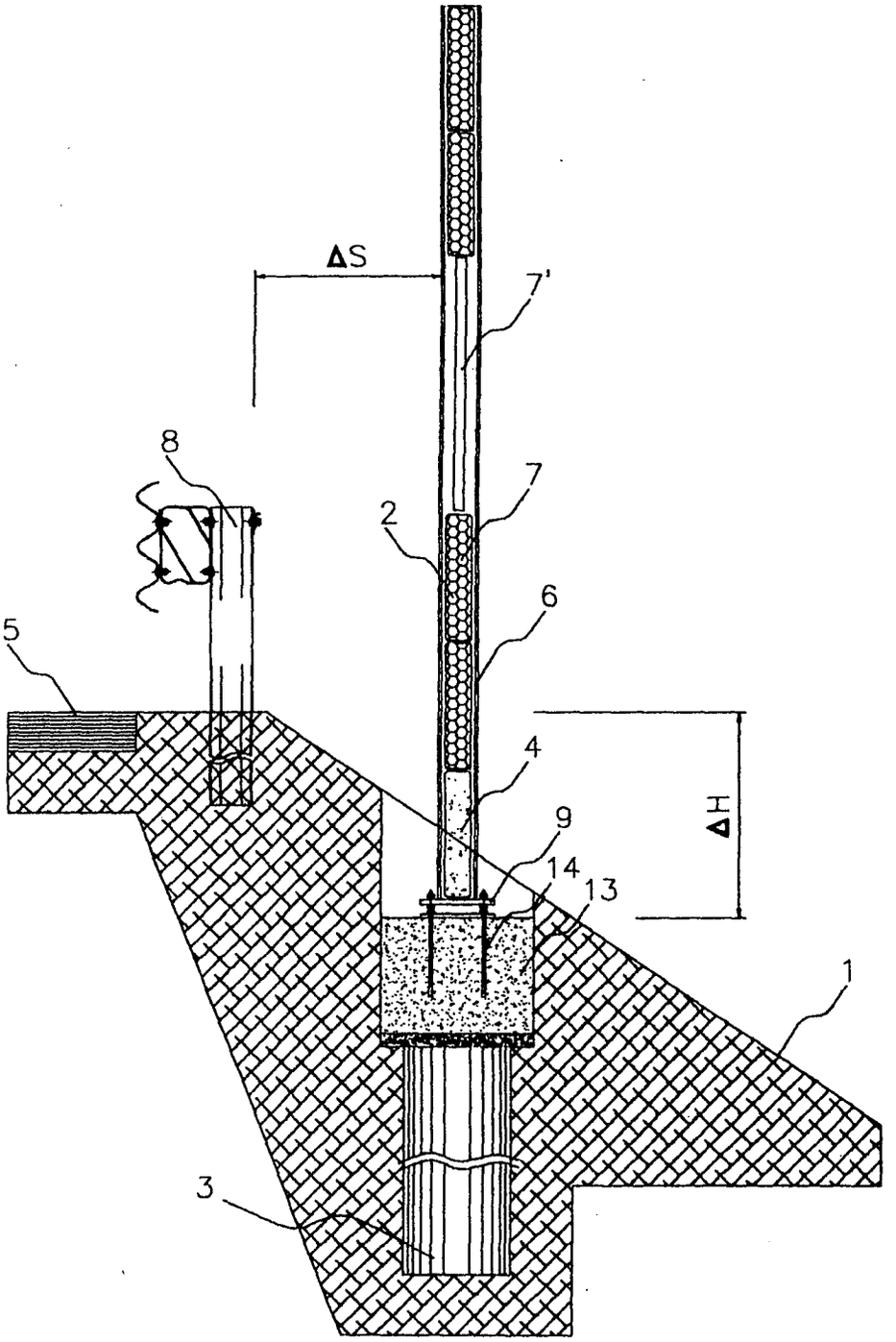

FIG. 1

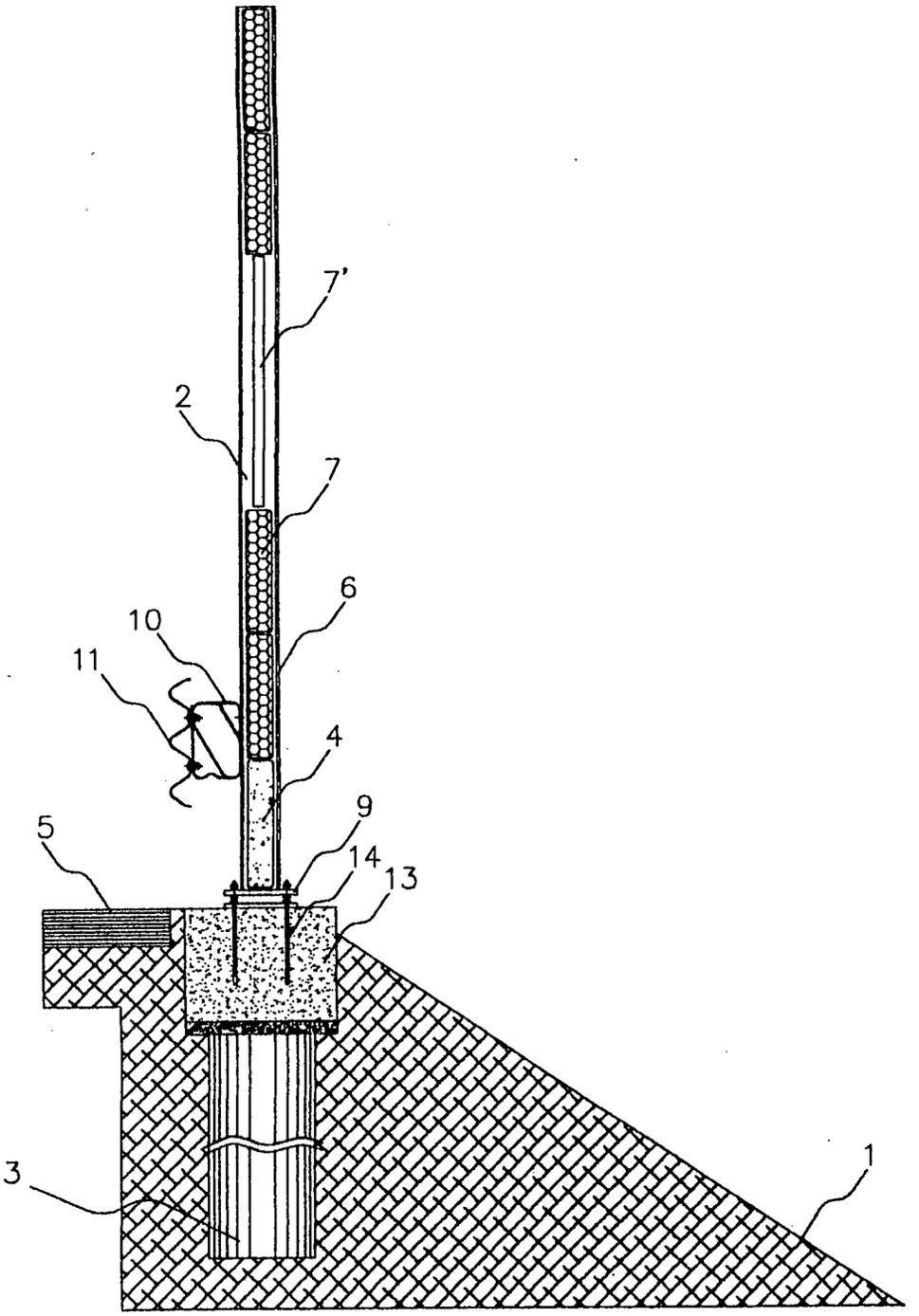

FIG. 2

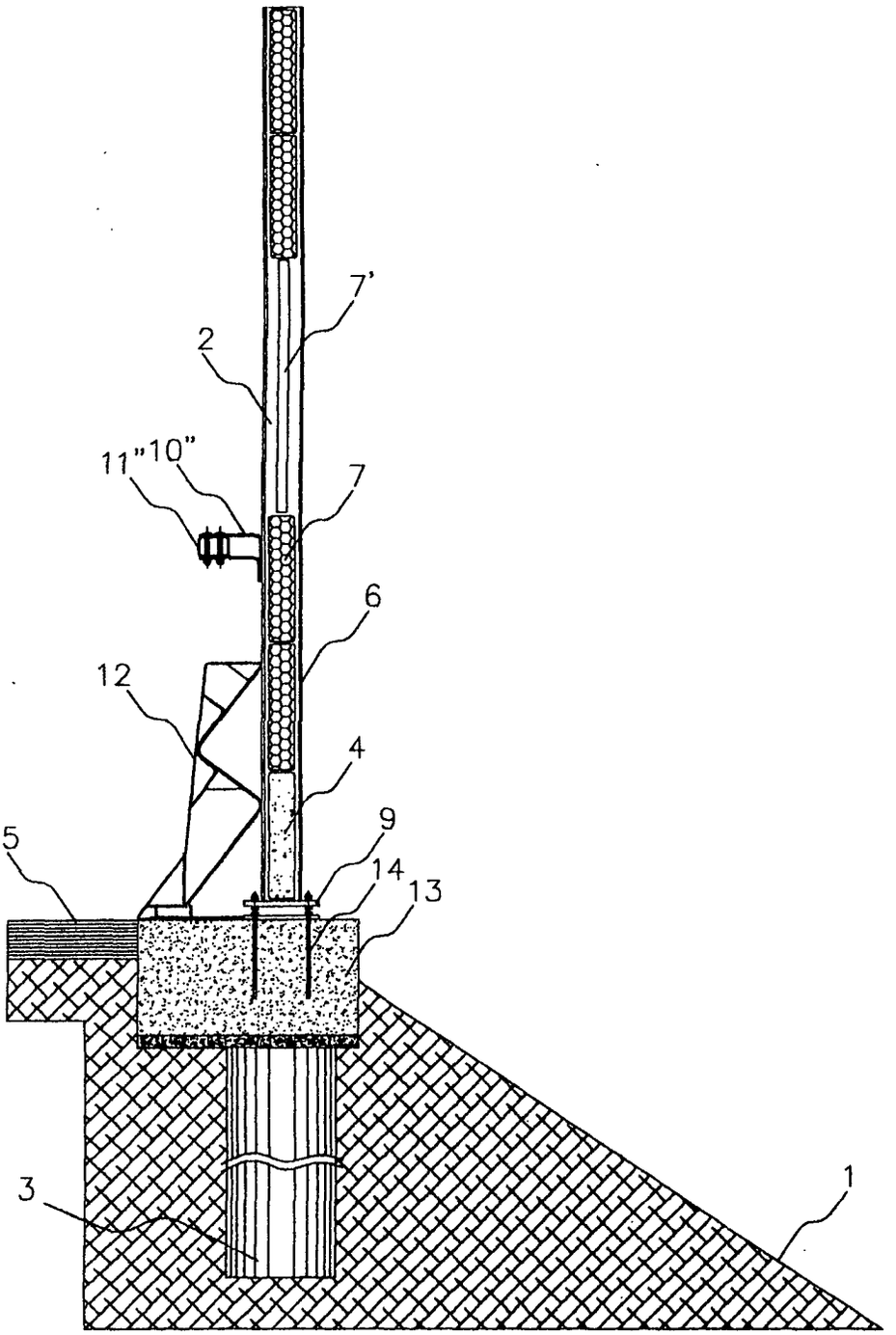

FIG. 3

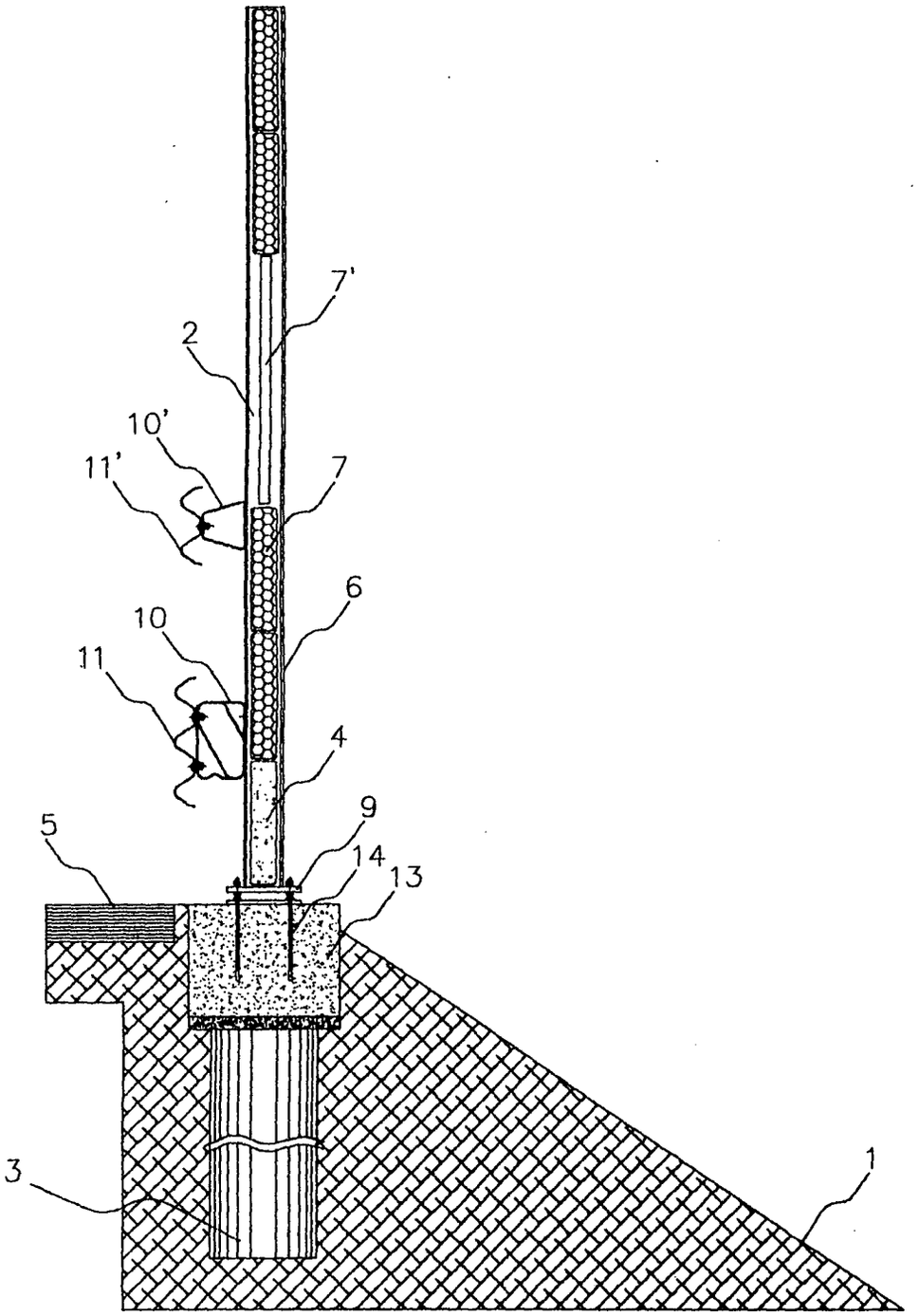

FIG. 4

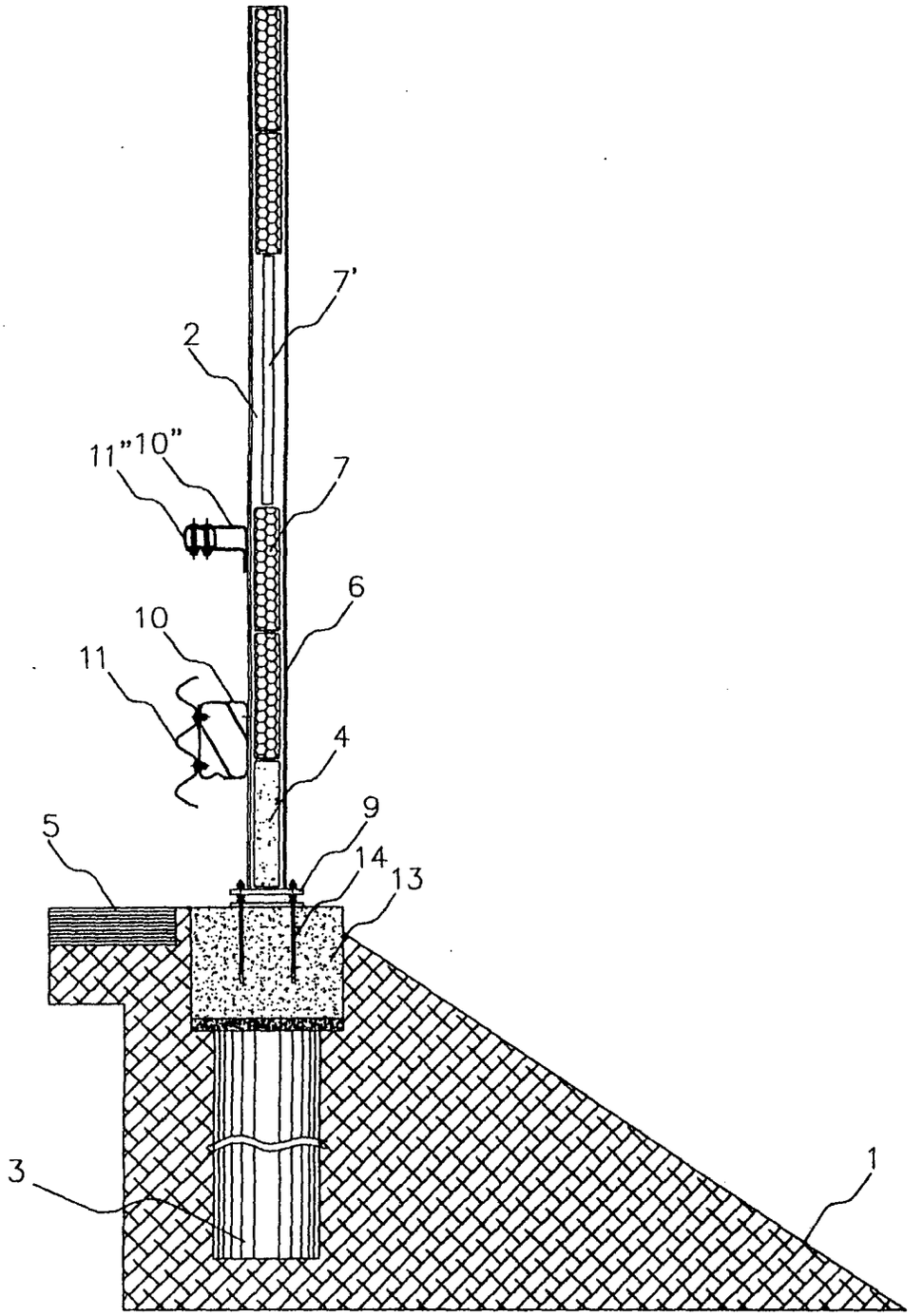

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5784

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Y	WO 01/06063 A (BRUSCHI STEFANO ; AUTOSTRADE CONCESS CONST (IT); CAMOMILLA GABRIELE (I) 25 January 2001 (2001-01-25) * figure 19 *	7	TECHNICAL FIELDS SEARCHED (Int.Cl.7) E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 January 2005	Kriekoukis, S

CATEGORY OF CITED DOCUMENTS

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