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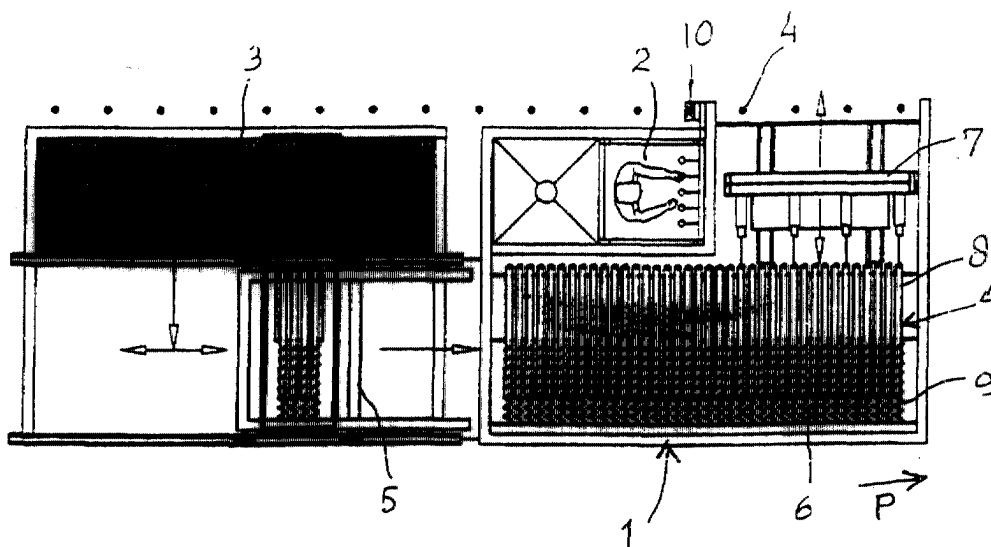
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(54) **Method of producing a guard rail structure and means for applying the method**

(57) Method and device for establishing a guard rail structure, in which a number of posts (4), each being provided with a threaded anchor (9), are brought into the ground simultaneously with the help of a robot (7) arranged on a vehicle (1). Subsequently, the vehicle (1) is moved and a guard rail segment (13) is connected to said posts (4) with the help of a second robot (11) ar-

ranged on a vehicle (12). Therein, snap fittings (16 - 19) are employed between the guard rail segment and the posts. The ends (23) of said guard rail segments (13) are designed in such a way, that they can be mated on mounting. The guard rail segments (13) are provided with signalling members (25, 26) and with cables (27) extending to said members. Members (26) can show a "green wave".

FIG. 1



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Description

[0001] The invention relates to a method of producing a guard rail structure, in which anchoring members are mounted in the ground and each anchoring member is provided with a post, whereupon guard rail segments are connected to said posts.

[0002] The anchoring member is generally in the shape of a pole, of concrete or steel, which is rammed into the ground, whereupon a post is secured on the pole by means of bolts. Subsequently, a guard rail segment is connected to a number of posts by means of bolts and the ends of said guard rail segments are mutually connected by means of bolts as well.

[0003] It is clear that this method is laborious and involves many activities to be carried out manually. In certain cases, ramming poles into the ground can also cause noise pollution. Carrying out activities in the evening or night, when there is little traffic, can then give rise to objections. Further, replacing a damaged piece of guard rail can not be carried out easily and is therefore relatively expensive. In bad weather conditions, the work will experience delay or will be stopped.

[0004] A further objection is that with the activities to be carried out manually, by virtue of statutory regulations, an employee is only allowed to handle parts having a limited weight. This may entail that movable hoisting devices must be used in the mounting of parts. This may cause delays in carrying out the work.

[0005] The object is to eliminate these objections and the method according to the invention is characterized in that with the help of a robot arranged on a vehicle, a number of posts provided with anchoring members in the shape of threaded anchors are picked up simultaneously from a stock and are screwed into the ground, whereupon the vehicle is moved and one single guard rail segment of a subsequent vehicle having the posts concerned is connected by means of snap fittings.

[0006] Bringing the threaded anchors into the ground and then mounting the guard rail segments onto the posts of the threaded anchors can largely occur automatically from one or more vehicles so that one can work in bad weather conditions as well. Since e.g. ramming is not required, the work involves little noise so that it is also possible to work during evening and night.

[0007] According to the invention, after placing a number of threaded anchors, the vehicle concerned will be moved across such a distance that the first threaded anchor of a subsequent number of threaded anchors can be located at a predetermined distance from the last threaded anchor of the previous set.

[0008] A simple method is achieved when the guard rail segment to be mounted on the posts is provided with bushes or pins which can be slid onto or into the posts from above, and can be connected to said posts by means of snap fittings.

[0009] For carrying out the method described, the vehicle, on which a supply of posts can be located, mounts

a robot being provided with means for picking up a number of posts simultaneously and with means for screwing them into the ground.

[0010] Further, the vehicle and/or the robot will be provided with measuring means for determining the position into which the vehicle or the robot must be brought so that the posts to be brought into the ground will be situated at a certain location.

[0011] The posts to be employed with the present invention can substantially be of the type as described in EP-B-0 189 962. In particular, these posts comprise a tubular or rod-shaped part and a helical part connected to it and projecting from it. Obviously, adaptations are required for making the posts suitable for the type of robot to be used and for establishing the snap fitting between posts and the guard rail segment.

[0012] In particular, bushes or pins will be connected to a guard rail segment, in such a way that a guard rail segment can be slid onto or into said posts from above. For the purpose of easy connection of the bushes or pins to the posts, they can be provided with bevelled portions, so that small deviations in the mutual position of the posts can be accommodated.

[0013] Further, a bush or pin connected to the guard rail segment, or the post can be provided with a resiliently arranged cross-pin, which can be snap-fitted into an opening or a groove in the other part.

[0014] The ends of the guard rail segments can be designed in such a way, that the end of one guard rail segment, on mounting it onto the posts, will be fittingly received in, or be enclosed around, the end of the preceding guard rail segment.

[0015] In particular, the guard rail segments can be manufactured of a non-corrosion sensitive material, like a laminated material in particular, its layers comprising a metal, such as aluminium, steel or the like, said layers being connected to one another by a fibre-reinforced plastic.

[0016] The guard rail segments can be provided with electrically or light conductive cables, such as glass fibre cables, extending in longitudinal direction of said rail, in such a way that the ends of the cables of subsequent segments can be connected to one another.

[0017] It is possible to integrate the cables into the plastic connecting the metal layers.

[0018] In particular, the guard rail segments can be provided with signalling means, in the shape of lamps, LEDs or the like, for forming signals indicating certain circumstances such as "fog", for example.

[0019] The same or additional signalling members can be operated in such a way, that they light one after the other indicating the speed the traffic should maintain. The members will then show in fact a "green wave".

[0020] The electrically or light conductive cables can also be employed for signalling when the guard rail is damaged to a certain degree. Then it will be possible to determine approximately on which location the damage has occurred, so that replacement can be effected more

quickly.

[0021] WO 97/35070 illustrates a guard rail structure in which the guard rail segments have snap fitting parts at their ends. However, bolts are employed for connecting the segments to a post.

[0022] FR 2 749 329 illustrates a guard rail structure constituted by elongated blocks bearing directly on the ground. The blocks are anchored to the ground by bringing pins through the blocks and into the ground, from above. Possibly, these pins can be received in bushes mounted in the ground beforehand, their ends being provided with a plate bearing on the ground.

[0023] FR 2 088 767 illustrates a separation for a garden or park, in which for fixing it one employs pins having forked ends. The pins secure an elongated, closed box on the ground at the same time, in which cables can be accommodated. Then it will not be necessary to dig a trench in the ground for the cables.

[0024] The invention is further explained by way of an embodiment, illustrated in the drawing, in which:

Fig. 1 shows schematically a plan view of a vehicle for placing posts;

Fig. 2 shows schematically a plan view of a vehicle for mounting the guard rail segments on the placed posts;

Fig. 3 shows schematically a perspective view of a number of posts placed in the ground and a part of a guard rail segment placed on it; and

Fig. 4 shows a cross-section of a part of a post onto which a bush connected to a guard rail segment has been slid and been snap-fitted to.

[0025] Figure 1 shows a vehicle 1 provided with a driver's cabin 2. The vehicle further has a storage space 3 for receiving posts 4 in. By means of transport devices 5 the posts are brought into the supply space 6, in which a number of posts 4 lie adjacent one another. Each post 4 comprises a pole 8 and a helical portion 9.

[0026] With the help of the robot 7 the posts 4 situated in the supply space 6 are grabbed and pivoted across 270° so that their helical parts 9 are directed to the ground. Then, with the help of the robot 7 the parts 9 are screwed into the ground at the desired location. The removed posts 4 are substituted by means of transport devices 5 as indicated with the various arrows. It is also possible that said transport devices bring the posts into vertical position and that they are picked up in this position by the robot 7. Obviously, it is possible that more or less than 4 posts are placed simultaneously, depending on the size of the vehicle 1 and the robot 7 being used.

[0027] After placing said four posts 4, the vehicle is driven across such a distance in the direction of the arrow P, that the desired distance is between the post placed last and the next post to be placed. To this end, the vehicle 1 can be provided with measuring devices and e.g. a detector 10 for determining where the vehicle

1 is in relation to the post placed last. The robot 7 can also be provided with detectors so that the posts 4 are placed in the proper position in relation to the previously placed posts.

5 **[0028]** After placing the posts and after driving the vehicle 1 sufficiently far, with the help of a second robot 11, as indicated in Figure 2, being situated on a second vehicle 12, a guard rail segment 13 can be placed on a number of posts 4.

10 **[0029]** To that end, the vehicle 12 is positioned in the desired location in relation to a post 4 with the help of a detector 34. A number of guard rail segments 13 are present on the vehicle 12, which will be brought to a certain location near the robot 11 with the help of a transport device.

15 **[0030]** Then, the robot 11 grabs a guard rail segment from its place and pivots it until it is situated above the posts 4. After that, the robot lowers the guard rail segment so that, partly on account of its own weight, slides down across the posts.

20 **[0031]** As appears from Figures 3 and 4 in particular, the guard rail segment 13 comprises a pipe 14 having its free end provided with a pipe 15 in which part of the post 4 can be received. A strip of spring steel 16 being provided with a cross-pin 17 projecting outwards through an opening 18 in the post 4 and being received in a groove 19 in the bush 15, is secured in the interior of the post 4.

25 **[0032]** On sliding the bush 15 onto the post 4, the cross-pin 17 is pushed inwards against the spring force of said strip 16, whereupon it is received in the groove 19 in the bush. The bush can then no longer be pulled upwards unless the strip 16 is pressed inwards. This can happen by e.g. applying a tool into the opening 20 in the post 4. The opening can also be threaded for screwing in a screw, which seals the opening 20 and is able to press strip 16 in on demounting a guard rail segment 13. For facilitating sliding the post 4 onto the bush 15, the bush can be provided with a conical entrance plane 21.

30 **[0033]** However, this is obviously just one possibility for locking a guard rail segment 13 and a number of posts 4 mounted in the ground in relation to each other.

35 **[0034]** As appears from Figure 3, the guard rail segment 13 further comprises a profile 22 which can be formed of one single, bent plate part, or otherwise. At one side, coupling parts 23 project outwardly beyond the end plane 24 so that coupling parts of a subsequent guard rail segment 13 will be able to fall across it.

40 **[0035]** The side plane of the guard rail segment 13 can be provided with members 25, such as in the form of lamps or LEDs which can signal certain things. The top plane can be provided with a ribbon-shaped lighting such as in the form of lamps or LEDs 26, which can light up in a certain rhythm so that vehicles moving across the road can adapt their speeds to it.

45 **[0036]** Cables 27 for supplying electricity to the lighting members can be provided at the inside of the profile 22. Possibly, solar cells or wind energy with accumula-

tors and the like can be employed for current supply. It is also possible to mount cables in the interior of the material of the guard rail segments. One can also employ glass fibre cables for supplying light to the lighting members.

[0037] In order to avoid too much hindrance of the traffic on the road, vehicle 12 will generally be close behind vehicle 1. A signalling vehicle moving along can then be present at some distance behind vehicle 12.

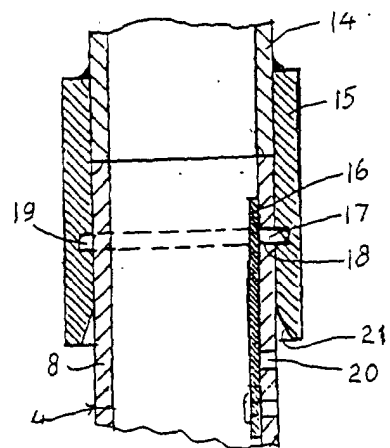
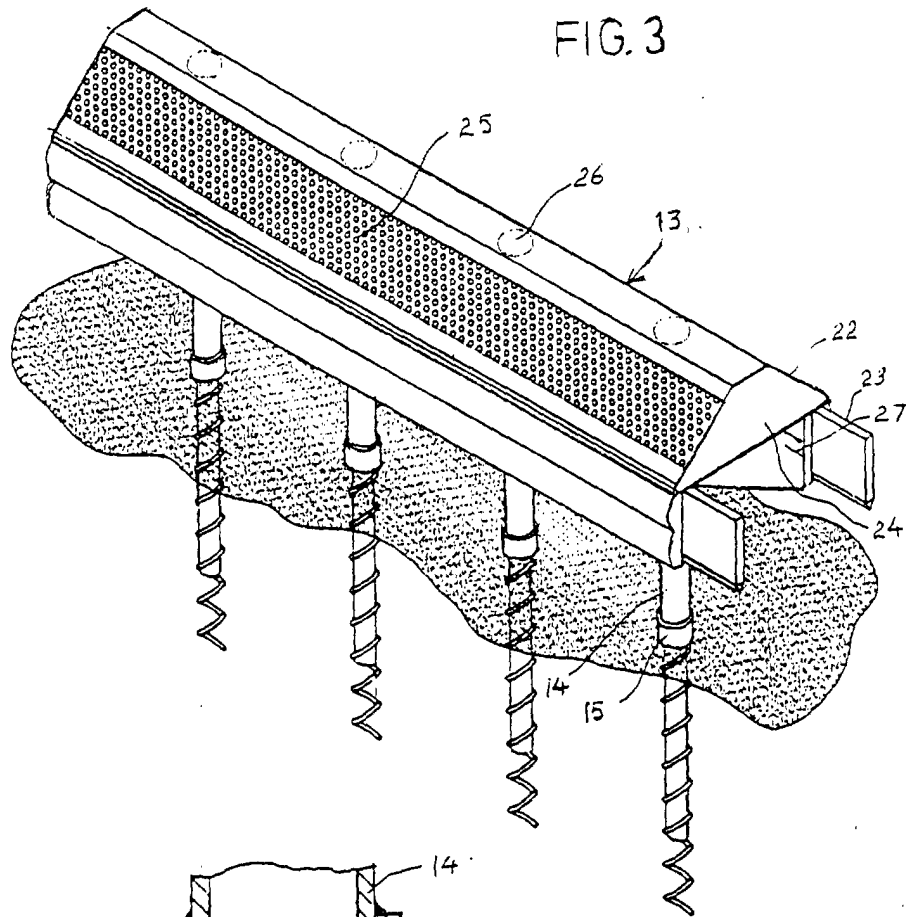
[0038] It is obvious, that only one possible embodiment of the invention of a device according to the invention and for application of the method according to the invention has been illustrated in the drawing and described above and that many modifications can be made without leaving the inventive idea, as it is indicated in the accompanying claims.

Claims

1. Method of establishing a guard rail structure, in which posts (4) that are taken from a vehicle (1) are mounted in the ground whereupon guard rail segments (13) are connected to said posts, **characterized in that** with the help of a robot (7) arranged on the vehicle (1), a number of posts (4) provided with anchoring members in the shape of threaded anchors (9) are picked up simultaneously from a supply (3) and are screwed into the ground, whereupon the vehicle (1) is moved and one single guard rail segment (13) of a subsequent vehicle (12) having the posts (4) concerned is connected by means of snap fittings (16 - 19).
2. Method according to claim 1, **characterized in that** the guard rail segment to be mounted on the posts (4) is provided with bushes (15) or pins which can be slid onto or into the posts (4) from above, and can be connected to said posts (4) by means of snap fittings (16 - 19).
3. Device for applying the method according to claim 1 or 2, **characterized in that** a robot (7) provided with means for picking up a number of posts (4) simultaneously and with means for screwing them into the ground, is present on the vehicle (1) which can be provided with a supply of posts (4).
4. Device according to claim 3, **characterized in that** the vehicle (1) and/or the robot (7) is provided with measuring means (10) for determining the position in which the vehicle or the robot should be brought so that the posts (4) to be brought into the ground will be situated at a certain location.
5. Guard rail segment for application with the method and device according to one of the preceding claims, **characterized in that** bushes (15) or pins

are connected to a guard rail segment (13) in such a way that a guard rail segment can be slid onto or into the posts (4) from above.

6. Guard rail segment according to claim 5, **characterized in that** a bush (5) or pin connected to the guard rail segment (13), or the post (4) is provided with a resiliently arranged cross-pin (17), which can be snap-fitted into an opening or a groove (19) in the other part.
7. Guard rail segment according to one of the claims 5 and 6, **characterized in that** its ends are designed in such a way that the end (23) of one guard rail segment (13), on mounting it onto said posts (4), is fittingly received in, or encloses the end of the preceding guard rail segment.
8. Guard rail segment according to one of the claims 5 - 7, **characterized in that** it is made of a non-corrosion-sensitive material, such as a laminated material in particular, its outer layers comprising a metal, such as aluminium, steel or the like, said layers being connected to one another by a fibre-reinforced plastic.
9. Guard rail segment according to one of the claims 5 - 8, **characterized in that** a guard rail segment is provided with electrically or light conductive cables (27), such as glass fibre cables, extending in its longitudinal direction in such a way that the ends of the cables of successive guard rail segments (13) can be connected to each other.
10. Guard rail segment according to claim 9, **characterized in that** the cables are incorporated in the plastic connecting both metal layers to each other.
11. Guard rail segment according to claim 9, **characterized in that** a guard rail segment is provided with signalling means (25), such as in the form of lamps or LEDs, for forming signs indicating certain situations such as "fog", for example.
12. Guard rail segment according to one of the claims 5 - 11, **characterized in that** it is provided with signalling members (25, 26) being controlled in such a way, that the light up one after another indicating the speed the traffic should maintain, so that the members will in fact show a "green wave".





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EUROPEAN SEARCH REPORT

Application Number
EP 01 20 0696

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Place of search THE HAGUE		Date of completion of the search 28 June 2001	Examiner Verveer, D
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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