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(54) Method for arranging/removing a joint and device for covering said joint

(57) The present invention relates to a method for arranging or removing a joint in a recess between parts of a road surface, comprising the step of temporarily arranging a cover plate over the recess outside working hours in order to make it possible for traffic to travel over the road surface.

The invention also relates to a device for covering a joint arranged in a road surface, the device comprising at least one cover plate with a top and bottom side which can be arranged over the joint, and wherein the cover plate comprises dimensions and/or a form such that the joint arranged thereunder remains wholly or to at least considerable extent unloaded.

EP 2 000 592 A1

Description

[0001] The present invention relates to a method for arranging a joint in one or more recesses between parts of a road surface of a bridge. The present invention also relates to a device for temporarily covering a joint or joint construction arranged in a road surface or a recess where this joint or joint construction has to be arranged.

[0002] In order to compensate for expansion and contraction of the material of the construction of for instance a bridge or viaduct, such a bridge or viaduct is usually constructed from a basic construction consisting of a plurality of parts. Present between these parts is a space which is able to compensate the working of the material of the basic construction. In order to allow this working to take place in optimal manner and herein not load the road surface arranged on the basic construction, there is arranged at the position of the recess between the separate parts of the road surface a joint construction which substantially fills the space between the asphalt cover layer parts. Such (dilatation) joints are subject to wear and will generally require replacement or repair sooner than the main construction or, depending on the type, the asphalt arranged on the bridge surface.

[0003] Different methods of replacing or repairing such a dilatation joint are possible. A first method comprises of filling the joint space with bitumen, which results in less than twelve hours in a joint which may be loaded by traffic. A drawback of filling with bitumen is that such a joint is highly susceptible to wear. Exposure of the material to frost in particular can result in crack formation, which results in a leaking joint. Another method of replacing/repairing a dilatation joint is to arrange a profile of steel/rubber with cement. This results in a highly durable joint which can last for more than 20 years. A drawback of this joint is however that the arranging and curing is time-consuming, and can take up to two days and two nights.

[0004] In summary, it can be stated that replacement/repair of a dilatation joint, depending on the applied solution and method, is a time-consuming process during which traffic will be disrupted, which particularly during the day results in considerable economic cost and inconvenience.

[0005] A solution is known wherein a temporary bridge is constructed over which traffic can travel. This known temporary bridge is about two metres high and provides road workers space to arrange a joint under the traffic travelling over the bridge. The arranging of such a temporary bridge is expensive, difficult and time-consuming. In addition, the bridge is only suitable for low speeds (to a maximum of 50 km/hour) and for road workers it is unpleasant to work under the traffic travelling thereover, it is also potentially dangerous and contrary to Occupational Health and Safety Act regulations.

[0006] The present invention has for its object to enable travel over a road surface during work operations and curing of an arranged joint such that traffic can travel thereover with minimal disruption and wherein the above stated problems are substantially obviated.

[0007] Said object is achieved with the device and the method according to the present invention. The method for arranging or removing a joint in a recess between parts of a road surface according to the present invention comprises the step of temporarily arranging a cover plate over the recess outside working hours in order to make it possible for traffic to travel over the road surface.

[0008] According to this method a cover plate is placed over the joint, whereby traffic can continue to travel over the road surface even between work operations and curing of the joint. The cover plate placed over the joint will distribute the loads of the traffic travelling over the road surface and over the cover plate such that the joint arranged under the cover plate remains wholly or at least to considerable extent unloaded. The operations, usually lasting a number of nights, for replacing dilatation joints and the curing process for the arranged joint can hereby take place while traffic is subject to minimal disruption herefrom between work operations and during curing.

[0009] Because it is possible to travel over the road surface during work operations and curing of the arranged joint such that the traffic can travel thereover with minimum disruption, the drawback of the extensive work operations and much longer curing time required for the more durable solution of a profile of steel/rubber with cement is obviated, whereby this preferred solution can be applied at all times.

[0010] The work operations comprise, among others, of removing joint material of an existing joint from the recess between parts of the road surface, performing preparatory work operations for placing a new joint, and arranging joint material in the recess between parts of the road surface in order to form a new joint.

[0011] After performing one or more of these operations, for instance when traffic intensity increases (morning or evening rush-hour, or even for the whole day) and operations have to be halted, according to the method of the present invention a cover plate is arranged temporarily over the recess between the parts of the road surface.

[0012] According to a further preferred embodiment, the cover plate remains placed over the joint at least for a considerable part of the work operations and the curing time of the joint material before being removed. This cover plate ensures that the work, or the arranged joint, remains wholly or at least to considerable extent unloaded. Disruption of traffic is minimal and the operations can be resumed at a later stage, normally after the evening rush-hour and during the night.

[0013] According to a further preferred embodiment, the method also comprises the step of removing the cover plate arranged over the recess. The operations can be resumed after the removal.

[0014] After arranging of joint material in the recess between parts of the road surface for the purpose of forming a new joint, it is desirable that the cover plate remains arranged over the joint for at least a considerable part of

the curing time of the joint material. The method therefore also comprises the step of removing the cover plate arranged over the recess when the arranged joint material has substantially cured.

[0015] In a further preferred embodiment 8-15 hours elapses between placing and removal of the cover plate. The work can hereby be covered in the morning before the morning rush-hour, and work operations resumed again after the evening rush-hour. The cover plate remains placed over the joint during the day for about 8-15 hours and it is possible to continue the following night(s) with the work operations and/or allowing curing of the joint material. The joint material can cure properly during this time before being loaded, this enhancing the durability of the joint.

[0016] In a preferred embodiment of the invention the cover plate remains placed over the joint for at least a considerable part of the curing time of the joint material before being definitively removed.

[0017] In a further preferred embodiment the road surface comprises an asphalt layer, concrete layer or layer of epoxy.

[0018] Although it is recommended to apply the above method with joint material consisting of a profile of steel and/or rubber with cement, which provides a durable solution which can last for more than twenty years, it is also possible to apply the method of the present invention with other joint material requiring preparatory operations and needing some curing, such as for instance joint material comprising bitumen.

[0019] In a preferred embodiment of the method the underside of the cover plate is directed toward the road surface and a recess is arranged in the underside of the cover plate, and the cover plate is positioned such that the recess arranged in the underside of the cover plate is situated substantially above the arranged joint. Although it is possible to envisage the cover plate having sufficient rigidity to leave the joint unloaded to a sufficient extent, the arrangement of a recess in the underside of the cover plate guarantees that the joint is not loaded. Even when the traffic travelling over the cover plate causes a bending of the cover plate, contact between the cover plate and the arranged joint will be prevented by the recess. The joint hereby remains unloaded and can cure and attain its full strength under optimum conditions, this enhancing the durability. Work that has already been carried out is protected from damage by the cover plate. The joint can of course also lie slightly deeper than the upper surface of the asphalt, which also guarantees that the joint remains at least substantially unloaded by the traffic travelling over the cover plate arranged over the joint. If the joint lies slightly higher than the upper surface of the asphalt, use of the above stated recess will prevent contact between the cover plate and the arranged joint.

[0020] In a further preferred embodiment the method comprises the further step of anchoring the cover plate to the road surface once it has been positioned such that the recess arranged in the underside of the cover plate is situated substantially above the arranged joint or the recess in the road surface where the joint and joint construction must be arranged. Anchoring of the cover plate to the road surface guarantees that it cannot shift when (heavy) traffic travels over the cover plate, or even when traffic brakes while driving over the cover plate. On the one hand road safety is hereby ensured and there is on the other hand a guarantee that the cover plate remains positioned in the correct manner, i.e. that the recess arranged in the underside of the cover plate is situated and remains substantially above the arranged joint.

[0021] In a further preferred embodiment the underside of the cover plate lies substantially along its whole contact surface against the road surface, which ensures that the loads of the traffic travelling over the cover plate are distributed optimally over the road surface. The contact surface comprises substantially the whole underside of the cover plate, except for that part where the recess is arranged.

[0022] The present invention further relates to a device for covering a joint arranged in a road surface, the device comprising:

- at least one cover plate with a top and bottom side which can be arranged over the joint;
- wherein the cover plate comprises dimensions and/or a form such that the joint arranged thereunder remains to at least considerable extent unloaded.

[0023] In a preferred embodiment of the invention there is arranged in the underside of the cover plate a recess of dimensions such that, in the position of the cover plate arranged on the road surface, there is a space present between the arranged joint and the cover plate.

[0024] In a further preferred embodiment the cover plate is a substantially elongate plate with a length and a width, wherein the recess extends substantially in the width direction over the plate.

[0025] In a further preferred embodiment of the device the cover plate comprises one or more boreholes through which the plate can be fixed to the road surface by means of fixing means.

[0026] In a further preferred embodiment of the device the cover plate comprises on its underside a protruding body which can be engaged in a recess arranged in the road surface. Such a connection is also referred to as dowelling.

[0027] In yet another preferred embodiment the cover plates are provided with coupling means for coupling a plurality of plates to form a whole. This prevents the plates being able to shift relative to each other. In addition, the coupled construction of a plurality of cover plates will have a mass and size such that - depending on traffic and the permitted driving speed - it will no longer even require anchoring to the road surface.

[0028] In an integrally coupled construction the individual cover plates can be given a lighter form if desired, which has a favourable effect in respect of handling and

material cost of the plates.

[0029] According to yet another preferred embodiment, the cover plate is manufactured from metal.

[0030] According to yet another preferred embodiment, the cover plate is provided on the top side with a rough surface structure, this enhancing road safety.

[0031] According to yet another preferred embodiment, the top side of the cover plate is provided with an epoxy covering layer.

[0032] According to yet another preferred embodiment, the thickness of the plate in the longitudinal direction has a variation such that the plate comprises a smaller thickness close to its outer ends.

[0033] According to yet another preferred embodiment, the thickness variation of the plate is an inclination in the order of magnitude of 1/60 - 1/100.

[0034] According to yet another preferred embodiment, the thickness of the plate varies in the order of magnitude of 5-50 mm.

[0035] According to yet another preferred embodiment, the plate comprises a width in the order of magnitude of 1.75 m.

[0036] According to yet another preferred embodiment, the recess has a width in the order of magnitude of 700-800 mm.

[0037] A preferred embodiment of the present invention is further elucidated in the following description with reference to the drawing, in which:

Figure 1 shows a perspective view of part of a road with a viaduct, wherein cover plates according to the present invention are arranged;
Figure 2 is a side view in cross-section of a joint which is arranged in the road part of figure 1 and over which a cover plate according to the present invention is arranged;
Figure 3 is a detail view of the outer end of the cover plate shown in figures 1 and 2; and
Figure 4 is a detail view of a joint arranged in the road surface of figures 1 and 2 and having a cover plate arranged thereover;
Figure 5 is a detail view of the connection shown in figures 1 and 2 between the cover plate and the road surface;
Figure 6 shows a detail view of an alternative connection between cover plate and road surface; and
Figure 7 shows an embodiment of a connection mutually coupling cover plates.

[0038] Figure 1 shows a part of a road with a viaduct 1, wherein an asphalt layer 2 is arranged on concrete parts of basic construction 26. Cover plates 6 are arranged over a joint (not shown) on the parts of asphalt layer 2. Cover plates 6 have a length 8 and a width 10. Arranged in cover plates 6 are openings 30 through which cover plates 6 can be releasably attached to asphalt layer 2. Other fixing provisions, such as for instance a dowelling (figure 6), can also be arranged instead of openings 30 (figure 5).

[0039] As shown in figure 2, a road surface 2, for instance consisting of an asphalt layer 2, is arranged on each of the parts of basic construction 26. It will be apparent to the skilled person that layers of other materials, such as concrete or epoxy, are also possible instead of an asphalt layer. Situated between the parts of basic construction 26 is a space 36 over which is arranged a joint construction 4 which mutually connects the parts of asphalt layer 2 in a manner such that the upper surface of joint construction 4 lies substantially flush with the upper surface of asphalt layer 2. As a result the traffic travelling over the road surface will be subject to minimal inconvenience during the transition from asphalt layer 2 of the one basic construction 26, via joint construction 4, to a road surface 2 of an adjacently situated part of basic construction 26. In order to enable arranging of the joint construction and to allow curing of the joint material during work operations usually lasting a number of nights, and to nevertheless enable traffic to travel outside working hours over the road surface in which joint 4 is arranged, cover plates 6 are arranged over the recess or the arranged joint construction 4 after working operations and during the curing process of the joint and joint construction 4. Cover plate 6 has a length 8, width 10 (figures 1, 2) and a thickness 12, in addition to an upper side 14 and an underside 16 (figures 3, 4 and 5) .

[0040] As shown in figure 4, there is arranged in the underside 16 of cover plate 6 a recess 20 which guarantees a space between underside 16 of cover plate 6 and the top side of the arranged joint construction 4, even when cover plate 6 bends slightly due to the load of the traffic travelling thereover. As can be seen from the figures, cover plate 6 is a substantially elongate plate with a length 8 and a width 10, wherein recess 20 extends substantially in the width direction over plate 6. Cover plate 6 is arranged with its longitudinal direction 8 substantially in the direction of travel 34 on roadway parts 2 (figures 1 and 2), wherein the recess 20 extending in the width direction over plate 6 covers the joint construction 4 situated substantially transversely of the direction of travel 34.

[0041] In a preferred embodiment one or more recessed holes 30 are arranged in the cover plate through which the plate is anchored to asphalt layer 2 using bolts (figure 5). By giving the openings a recessed form the bolts can be received countersunk in the cover plate so that they do not protrude above the upper side 14 of cover plate 6.

[0042] In a further preferred embodiment there is arranged on the underside 16 of cover plate 6 a protruding body 38 (dowelling) which can engage in a hole 40 in the road surface (figure 6). Owing to the mass of cover plates 6 and the downward forces of the traffic travelling over the plates this anchoring method between cover plate 6 and road surface 2 guarantees a reliable anchoring which is very user-friendly since - once a hole 40 suitable for this purpose has been arranged in road surface 2 - no

further additional tool is required for the purpose of placing and removing cover plates 6.

[0043] In a further preferred embodiment a plurality of cover plates 6 can be connected to each other, whereby cover plates 6 together form one whole (figure 7). Cover plates 6 are preferably manufactured from metal, for instance steel. In coupled position the cover plates 6 together form a covering construction of some weight and some size, this enhancing the stability and position-retention of the cover plates on the asphalt layer. With a mass of up to 4,000 kg per cover plate 6 the mass of the mutually coupled covering construction will be sufficiently high that - depending on the traffic and the permitted driving speed - no further anchoring to the road surface is even required. Figure 7 shows a coupling between two adjacent cover plates 6. Arranged on the sides of cover plates 6 is a recess 42 in which a coupling piece 46 can engage. This coupling piece 46 has a U-shaped profile and drops with its protruding edge 50 into a deepened portion 48 of recess 42 of cover plate 6. Protruding edge 50 of coupling piece 46 engages on the standing edge 44 of the cover plate, whereby cover plates 6 are mutually coupled to form one whole. In coupled position the coupling piece 46 forms a substantially flat transition with the top side of cover plates 6, whereby traffic is subject to minimum disruption when driving over the coupling piece. If desired, the coupling piece can be provided with locking means in order to prevent undesired release of the coupling piece.

[0044] In yet another preferred embodiment the cover plate 6 is provided on its upper side 14 with a rough surface structure (figures 3-5), whereby the vehicles travelling over the cover plate have a good grip. The cover plate can for instance be provided for this purpose with an epoxy covering layer, such as for instance epoxy slurry, which provides the cover plate with sufficient grip.

[0045] In yet another preferred embodiment cover plate 6 has a thickness variation in the longitudinal direction such that plate 6 comprises a smaller thickness 12 close to its outer ends 18 than in the middle part of plate 6, i.e. at the position of the arranged joint construction 4 (figures 2-5). This thickness variation creates an inclination which enhances travel of vehicles onto and off cover plate 6.

[0046] In a further preferred embodiment the thickness variation of the plate provides an inclination in the order of magnitude of 1/60 to 1/100. Keeping the angle of inclination within this order of magnitude makes it possible for vehicles to travel over the plate at high speeds up to 140 km/hour. When no work is being carried out and the plate is covering the work, or the joint, traffic is therefore subject to minimal disruption.

[0047] In a further preferred embodiment the thickness of the plate varies in the order of magnitude of 5 to 50 mm. A minimum thickness of 5 or 7 mm is desirable in order to prevent ruts being driven into the plate when vehicles pass from road surface 2 onto plate 6. In addition, with a minimum height of 5 or 7 mm a drive-on ramp edge is present which is acceptable for the traffic.

[0048] In a further preferred embodiment plate 6 has a width in the order of magnitude of 1.75 metres.

[0049] In yet another preferred embodiment the recess 20 has a width in the order of magnitude of 700 to 800 mm. The width of recess 20 lies in the longitudinal direction of plate 6.

[0050] Although preferred embodiments of the invention, the above described embodiments are intended only to illustrate the present invention and not in any way to limit the specification of the invention. It is particularly noted that, instead of in a viaduct, the present invention can also be applied in other road constructions where dilatation joints are applied, such as for instance in bridges. The scope of the invention is therefore defined solely by the following claims.

Claims

1. Method for arranging or removing a joint in a recess between parts of a road surface, comprising the step of temporarily arranging a cover plate over the recess outside working hours in order to make it possible for traffic to travel over the road surface.

2. Method as claimed in any of the foregoing claims, further comprising the step of temporarily arranging a cover plate over the recess between the parts of the road surface after the work operations have been performed.

3. Method as claimed in claim 2, wherein the cover plate remains placed over the joint for at least a considerable part of the curing time of the joint material before being removed.

4. Method as claimed in any of the foregoing claims, wherein:

   - the underside of the cover plate is directed toward the road surface and a recess is arranged in the underside of the cover plate; and
   - the cover plate is positioned such that the recess arranged in the underside of the cover plate is situated substantially above the recess or the arranged joint.

5. Method as claimed in claim 4, further comprising the step of anchoring the cover plate to the road surface once it has been positioned such that the recess arranged in the underside of the cover plate is situated substantially above the arranged joint or the recess in the road surface.

6. Device for covering a joint arranged in a road surface, the device comprising:

- at least one cover plate with a top and bottom side which can be arranged over the joint;
- wherein the cover plate comprises dimensions and/or a form such that the joint arranged thereunder remains to at least considerable extent unloaded.

7. Device as claimed in claim 6, wherein there is arranged in the underside of the cover plate a recess of dimensions such that, in the position of the cover plate arranged on the road surface, there is a space present between the arranged joint and the cover plate.

8. Device as claimed in either of the claims 6 or 7, wherein the cover plate comprises on its underside a protruding body which can be engaged in a recess arranged in the road surface.

9. Device as claimed in any of the claims 6-8, wherein the cover plates are provided with coupling means for coupling a plurality of plates to form a whole.

10. Device as claimed in any of the claims 6-9, wherein the cover plate is provided on the top side with a rough surface structure.

11. Device as claimed in any of the claims 6-10, wherein the thickness of the plate in the longitudinal direction has a variation such that the plate comprises a smaller thickness close to its outer ends.

12. Device as claimed in claim 11, wherein the thickness variation of the plate comprises an inclination in the order of magnitude of 1/60 - 1/100.

13. Device as claimed in claim 11 or 12, wherein the thickness of the plate varies in the order of magnitude of 5-50 mm.

14. Device as claimed in any of the claims 6-13, wherein the plate comprises a width in the order of magnitude of 1.75 m.

15. Device as claimed in any of the claims 6-14, wherein the recess has a width in the order of magnitude of 700-800 mm.

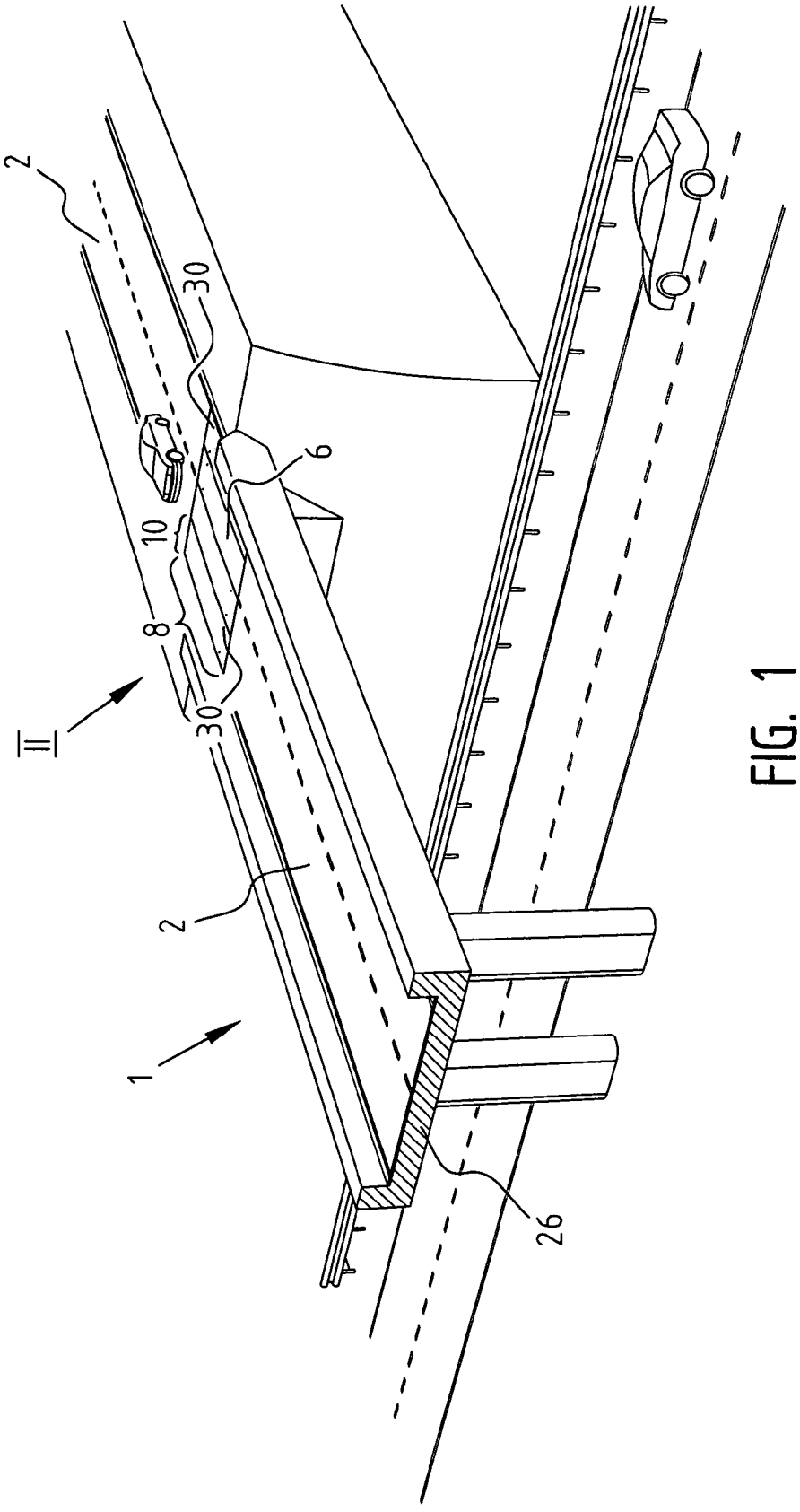

FIG. 1

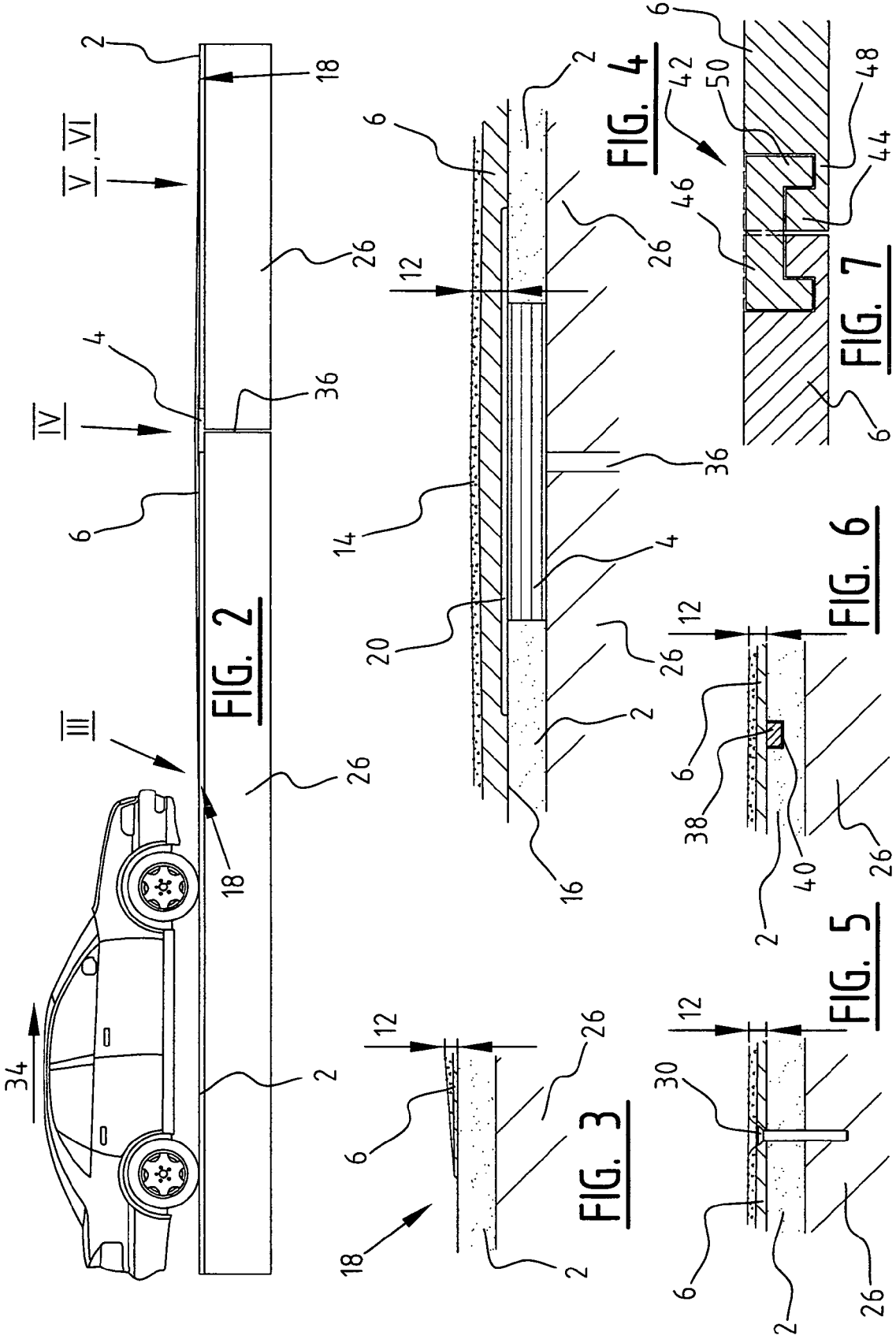

FIG. 2

FIG. 4

FIG. 7

FIG. 6

FIG. 3

FIG. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 07 5543

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

E01D
E01C
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 September 2008	Movadat, Robin

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 07 5543

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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