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(54) **Segment of a motorway construction, and method of installing it**

(57) The invention relates to a segment (1) of a motorway construction for a motorway, comprising a crash barrier construction which includes a crash barrier (2), a channel construction (4) joined thereto and substantially parallel thereto, and fastening means for joining

the crash barrier (2) and the channel construction (4), and to which a plate (8) is fitted which is joined to the channel construction (4) and serves as at least partial support for a lane of the motorway.

The invention also relates to a method of installing a motorway construction from these segments.

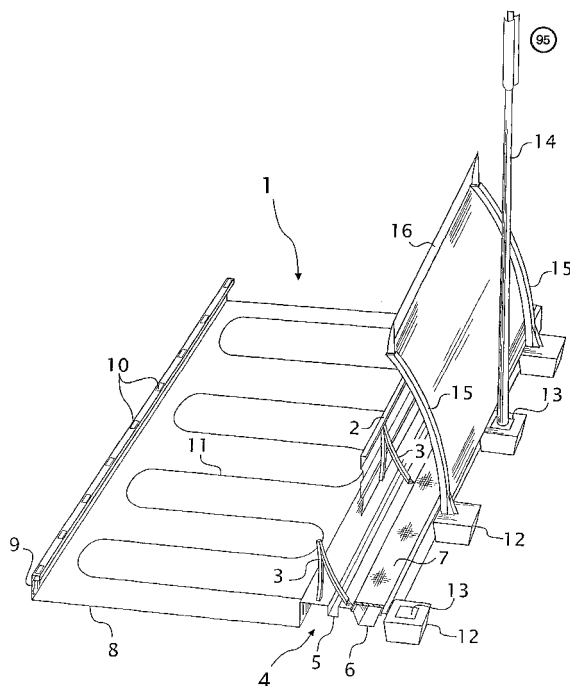


Fig. 1

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Description

[0001] The invention relates to a segment of a motorway construction. The invention also relates to a motorway construction of this type and to a method of installing it.

[0002] Given that the motorways are becoming increasingly crowded, means are being sought of increasing the capacity of the motorways. In the first instance, a conceivable approach would be to widen the motorways to provide more capacity, but in many locations, for example in urban areas, this is not possible. In addition, making motorways wider is costly and, in view of the problems involved in acquiring the land next to the motorways, time consuming. In many cases, widening a motorway is also not desirable in view of the larger area taken up and the environmental impact.

[0003] It is an object of the invention to provide greater road capacity without road-widening being required. It is another object of the invention to provide greater road capacity against relatively low costs.

[0004] Another object of the invention is to provide a method of building such a motorway. Still another object of the invention is to provide such a method which can be implemented relatively quickly.

[0005] According to a first aspect of the invention, one of these objects is achieved by means of a segment of a motorway construction for a motorway, comprising a crash barrier construction which includes a crash barrier, a channel construction joined thereto and substantially parallel thereto, and fastening means for joining the crash barrier and the channel construction, and to which a plate is fitted, which is joined to the channel construction and serves as at least partial support for a lane of the motorway.

[0006] This provides the basis for a construction which is simple to fabricate in an integrated manner and to install next to and under the hard shoulder, by means of which the hard shoulder can be converted into an additional lane. By installing an intelligent signalling and detection system to detect the road users on the motorway and the hard shoulder, and in particular to detect stranded vehicles on the hard shoulder, and by issuing signals to the road users, particularly the road users on the former hard shoulder in the event of, for example, a stationary vehicle on the hard shoulder, it is readily possible to use the current hard shoulder as an additional lane. The plate which is joined to the channel construction is meant to support the hard shoulder of a motorway, to carry the varied and heavy traffic making use of the hard shoulder when it serves as an additional lane. To prevent subsidence and the like, it is then possible to remove (part of) of the road surface of the hard shoulder, and doing away with the need for a sand bed which would first have to settle, the segments together with the plates can be installed. The plates distribute the point load of a lorry or car over a larger area, thus preventing subsidence. The plates can be supported by slabs or

blocks of foamed plastic, and on top of the plates an underlayer is applied, if required, and a customary top layer such as asphalt. With the aid of the segments according to this preferred embodiment, the hard shoulder, which is to serve as an additional lane, can therefore be simply and rapidly made suitable to carry a great deal of road traffic.

[0007] The conversion of hard shoulder to lane is in particular well implementable when the channel construction comprises a cable channel, through which the electricity cables and control cables for the detection system to detect the road users and the signalling or warning system for issuing signals to the road users can be run.

[0008] Preferably, this cable channel is covered by a removable sealing element which serves to protect the cables. At the same time, the sealing element can serve as a footway when the channel is disposed on that side of the crash barrier which is to face away from the motorway. This footway can be used, for example, as an escape route and as a walking route to for example an emergency telephone for a stranded driver. Likewise, it is possible to use the sealing element for maintenance vehicles for maintaining the segments and the like to run on.

[0009] Instead of a cable channel, the channel construction can also comprise a water drain channel, and the segment comprises preferably both a water drain channel and a cable channel. The water drain channel is particularly important in urban areas for removing rain water.

[0010] According to a preferred embodiment, that side of the segment which is to face away from the motorway is fitted with attachment constructions for a noise barrier. Fitting a noise barrier along the motorway is then an easy matter after the segments have been installed, without requiring a separate foundation or the like. The noise barrier can, for example, consist of a steel-plate sandwich construction, a fibrous material such as mineral wool or glass wool being arranged between the steel plates.

[0011] Preferably, that side of the segment which is to face away from the motorway is fitted with attachment constructions for one or more transceiver masts for signalling equipment and/or communications equipment. Since a good signalling system is required if the hard shoulder is used as an additional lane, and a communications system with the road users is also desirable, a great deal of signalling and communications equipment is required along the motorway with the motorway construction according to the invention. It is therefore highly advantageous for the segments of said motorway construction to be already provided with attachment constructions for transceiver masts for this equipment, so that these masts, after the segments have been installed along the motorway, can be put into position without much trouble, without further separate foundations and the like being necessary for this purpose. For that

matter, such masts are also suitable for mobile telephone applications.

[0012] Preferably, the attachment constructions are suitable both for installing transceiver masts and for noise barriers. Thus, the segments are kept as simple as possible. At the same time, this allows the motorway construction to be installed rapidly, whilst as many installation activities as possible will have been carried out beforehand by means of prefabrication. If desired, the noise barriers and the masts can also be attached to one another.

[0013] According to a preferred embodiment, the segment on its side which is to face the motorway is provided with controllable signalling means. These signalling means can, for example, be lamps or arrows which are therefore located on the right-hand side of the additional lane on the hard shoulder, and which can be controlled via the signalling equipment. If the signalling equipment notices, for example, that a vehicle on the former hard shoulder reduces speed sharply and comes to a stop, the signalling equipment can warn the road users behind, so that they will move to the left and drive on what was originally the right-hand half of the road. This can be achieved, for example, by having the signalling means light up red. The signalling means can, for example, be attached to the crash barrier or be incorporated in the road surface.

[0014] According to a preferred embodiment, pipe loops are disposed above the plate for a cooling or heating medium to be passed through. It is thus possible in the winter to pass warm water, for example, underneath the additional lane, so that, for example, no glazed frost will be formed. The water thus heated can, if required, be further processed with the aid of a heat pump and be used for other purposes. Equally, it is possible, with hot weather in the summer, to pass cool water through the pipe loops, so that no ruts will form.

[0015] The pipe loops are preferably connected to a conduit present in the channel. This results in an integrated heating/cooling system.

[0016] According to a preferred embodiment, the plate, on its side which is to face away from the crash barrier construction, is provided with controllable signalling means. This means that signalling means are also present in the additional lane or on the left-hand side of the additional lane, via which the road users can be warned, if necessary, that they must move to what was originally the right-hand lane.

[0017] According to an advantageous embodiment, the crash barrier of the crash barrier construction is substantially connected to the road surface of the motorway. This is particularly important for motorcyclists who, in the event of a crash, will, with the current crash barrier, come to lie up against and half underneath the crash barrier, which may result in serious injury.

[0018] Preferably, the segment is substantially made of steel. Steel has the strength and stiffness required for this type of segments.

The invention also relates to a motorway construction comprising two or more of the segments as described above.

[0019] The invention also relates to a method of installing a motorway construction comprising segments as described hereinabove, provided with a plate which is joined to the channel construction and serves as at least partial support for a lane of the motorway, wherein the lane adjoining the crash barrier construction is built by placing a layer consisting of slabs or blocks of foamed plastic on top of the road bed, placing two or more segments with their plate on top of the foamed plastic, possibly applying an underlayer, and applying a top layer, for example of asphalt.

[0020] This provides a relatively simple and rapid method of using the said segments to build up a hard shoulder, which does not have a sufficiently high load-bearing capacity to be used as an additional lane, into an additional lane suitable for varied traffic, while at the same time providing at least the crash barrier construction and the channel construction.

[0021] The invention will be explained below with reference to a specific embodiment and referring to the drawing.

[0022] Figure 1, schematically and not to scale, shows a specific embodiment of a segment of a motorway construction according to the invention.

[0023] The figure shows a segment 1 of a motorway construction according to the invention, into which as many of the desired functions are integrated as possible.

[0024] The segment 1 consists of a crash barrier 2 which, with the aid of fastening constructions 3, is attached to a channel construction 4. The channel construction 4, in the example shown, includes a water drain channel 5 and a cable channel 6. The water drain channel runs underneath the attachment constructions, in order to take up as little space as possible, and must be connected periodically to further water drain channels.

[0025] The cable channel 6 is covered by a removable sealing element 7. The cables for, for example, transceiver masts and signalling equipment (see below) can be laid in the cable channel in a simple manner, without having to be buried in solid ground. Repair and replacement is thus much simpler, and it is also possible to lay other cables, which per se have nothing to do with the motorway, in the cable channel.

[0026] The sealing element 7 must be installed to protect the cables against rain water and the like, and as a result, the sealing element can also do excellent service as a footway behind the crash barrier, for use as an escape route and as walking route for a stranded road user, for example to an emergency telephone. Likewise, maintenance vehicles for motorway construction and the like can be propelled on top of the sealing element.

[0027] Extending on that side of the crash barrier 2 which faces the motorway is a steel plate 8 which, after the segment has been put into place, extends below the

road surface. On top of the steel plate, an optional underlayer and a mandatory top layer of asphalt, for example, is applied, so that the rain water will flow into the water drain channel 5 by itself. The steel plate can be planar, or to provide greater stiffness, be provided with a relief. On its side facing away from the crash barrier, the steel plate is provided with a raised edge 9, disposed within which at the top are signalling means in the form of e.g. LEDs 10, which usually emit white light, but in the event of a control signal light up red.

[0028] Disposed above the steel plate 8 at regular intervals are pipe loops 11 which are connected to a conduit (not shown) which, for example, can run through the cable channel 6. In winter, a heating medium such as warm water can be passed through the conduit and the pipe loops 11, for example to prevent glazed frost or cause snow to melt, and in summer cold water can be passed through to counteract ruts in excessively warm asphalt.

[0029] Disposed on that side of the channel construction 4 which faces away from the motorway are attachment constructions 12 against the channel construction. These attachment constructions 12 are provided with a structure 13, to which transceiver masts 14 for signalling and communication equipment can be attached in a simple manner, and to which attachment fins 15 for noise barrier 16 can be attached. The attachment constructions 12 at the end of the segment can also serve to interconnect the segments.

[0030] The use of the segments as described herein-above is as follows.

[0031] If a hard shoulder must be converted into an additional lane, and the hard shoulder has not been designed to bear varied and heavy (freight) traffic, the hard shoulder and its subsoil must be dug away to a certain depth. A layer of foamed plastic is then arranged in the form of slabs or blocks. On top of the foamed plastic, the segments are then fitted, in such a way that the steel plates rest on the plastic base. The channel construction can, if required, project at the side of the plastic slabs or blocks, but must of course be supported. The sections are joined to one another, for example, by welding. On top of the steel plates of the segments an optional underlayer and finally a top layer of, for example, asphalt is then applied. The pipe loops are incorporated in this layer or layers. Then the transceiver masts can be mounted in the attachment construction in a simple manner and the noise barriers can be put into place.

[0032] This method can be carried out relatively quickly and inexpensively, by virtue of using the integrated segments, and has the major advantage that it is not necessary for a sand bed to be left to settle, since the steel plates will divert the point loads from the cars or lorries over a larger area, so that the subsoil will not settle.

[0033] The segments provided with a steel plate are also eminently suitable in the construction of new motorways.

Claims

1. Segment of a motorway construction for a motorway, comprising a crash barrier construction which includes a crash barrier, a channel construction joined thereto and substantially parallel thereto, and fastening means for joining the crash barrier and the channel construction, and to which a plate is fitted which is joined to the channel construction and serves as at least partial support for a lane of the motorway.
2. Segment according to claim 1, wherein the channel construction comprises a cable channel and/or a water drain channel.
3. Segment according to any one of the preceding claims, wherein the channel construction is covered by a removable sealing element, wherein preferably the covered channel construction is arranged on that side of the crash barrier which is meant to face away from the motorway, and serves as a footway and/or roadbed for (maintenance) vehicles.
4. Segment according to any one of the preceding claims, wherein that side of the segment which is to face away from the motorway is fitted with attachment constructions for a noise barrier.
5. Segment according to any one of the preceding claims, wherein that side of the segment which is to face away from the motorway is fitted with attachment constructions for one or more transceiver masts for signalling equipment and/or communications equipment.
6. Segment according to the preceding claim 4 or 5, wherein the attachment constructions are suitable for fitting both a noise barrier and transceiver masts.
7. Segment according to any one of the preceding claims, wherein the segment on its side which is to face the motorway is provided with controllable signalling means.
8. Segment according to any one of the preceding claims, wherein pipe loops are disposed above the plate for a cooling or heating medium to be passed through, wherein preferably the pipe loops are connected to a conduit present in the channel construction.
9. Segment according to any one of the preceding claims, wherein the plate, on its side which is to face away from the crash barrier construction, is provided with controllable signalling means.
10. Segment according to any one of the preceding

claims, wherein the crash barrier of the crash barrier construction is substantially connected to the road surface of the motorway.

11. Segment according to any one of the preceding claims, wherein the segment is substantially made of steel. 5
12. Motorway construction comprising two or more of the segments according to any one of the preceding claims. 10
13. Method of installing a motorway construction comprising segments according to any one of the preceding claims, wherein the lane adjoining the crash barrier construction is built by placing a layer consisting of slabs or blocks of foamed plastic on top of the roadbed, placing two or more segments with their plate on top of the foamed plastic, possibly applying an underlayer, and applying a top layer, for example as asphalt. 15 20

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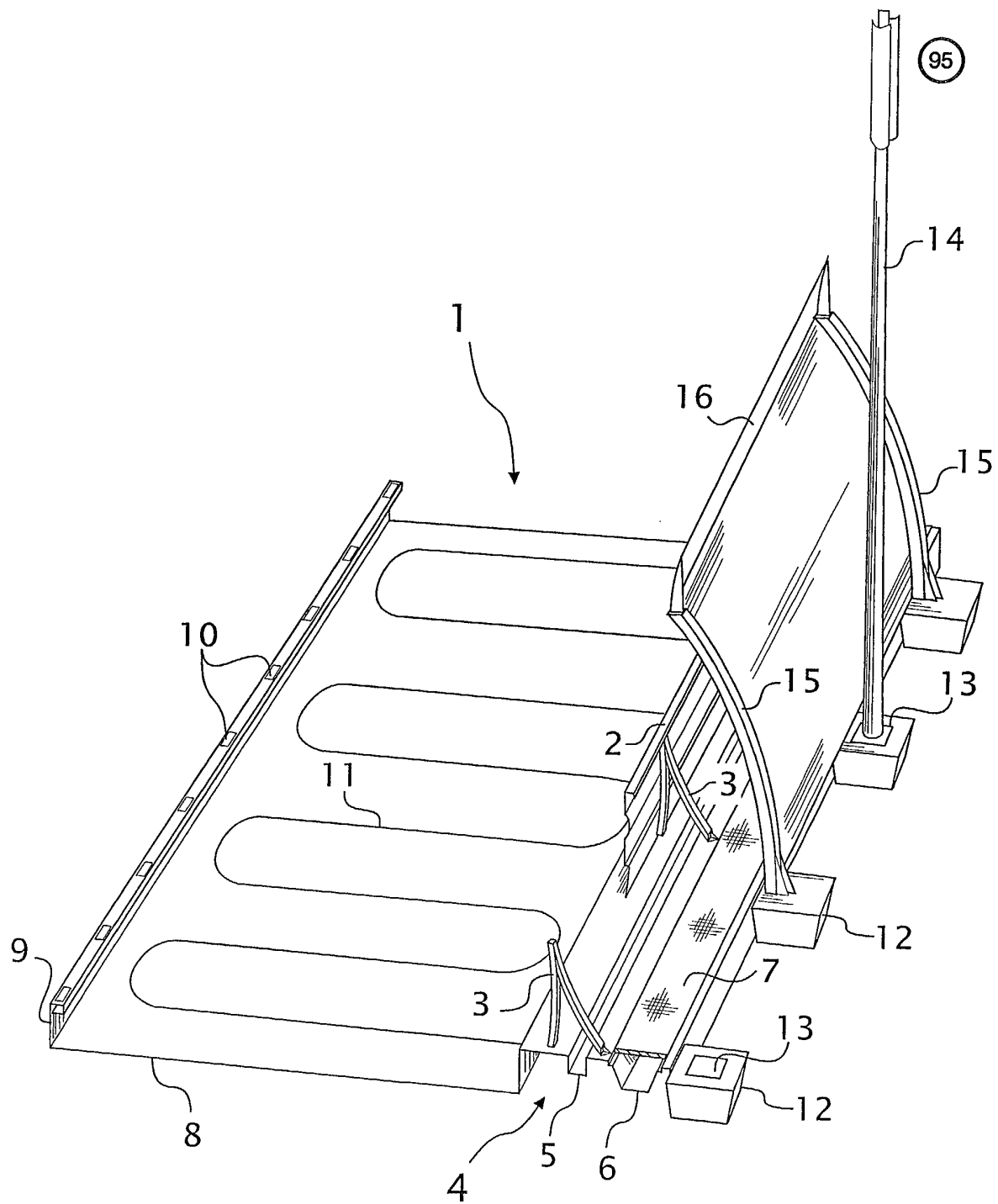


Fig. 1



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EUROPEAN SEARCH REPORT

Application Number
EP 01 20 3649

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Place of search THE HAGUE		Date of completion of the search 4 January 2002	Examiner Vijverman, W
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