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(54) Temporary road surface system with movable traffic deck

(57) A temporary road surface system (1), comprising:
- at least two elongate barrier elements (10) configured to be statically disposed in a spaced apart manner so as to define a portion of a temporary traffic lane (6) having a longitudinal direction between them, wherein each barrier element comprises a traffic deck element support surface (14) that substantially extends in the longitudinal direction;
- at least one traffic deck element (30) configured to be received between the two barrier elements and to be supported by the traffic deck element support surfaces thereof, such that the traffic deck element spans a distance between the two barrier elements; and
- bearing elements (52), provided on the barrier elements and/or the traffic deck element and configured to enable displacement of the traffic deck element relative to the barrier elements in the longitudinal direction.

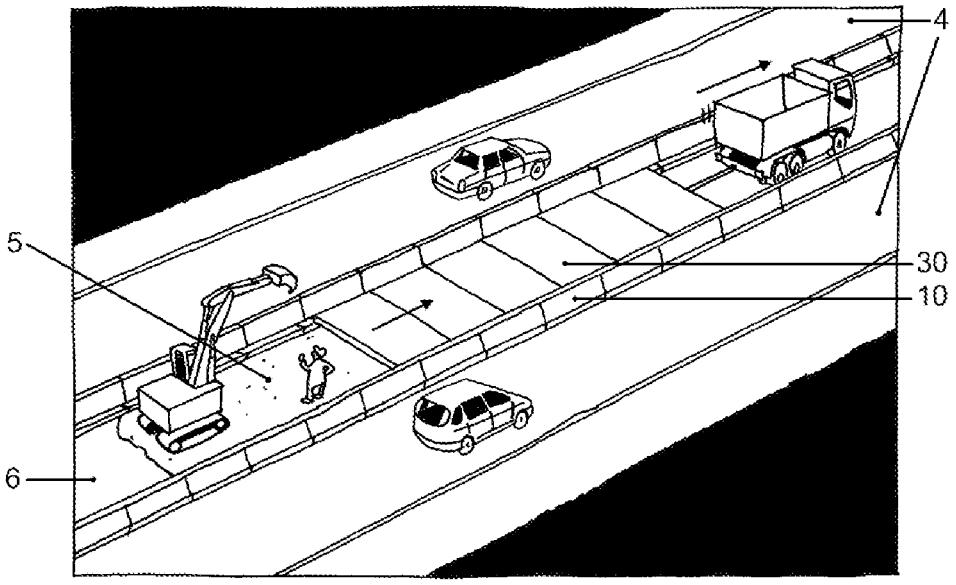

FIG. 1D

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Description

Field of the invention

[0001] The present invention relates to the field of roadway repair and maintenance equipment, and more in particular to a temporary road surface system with a movable traffic deck.

Background

[0002] Road works, for example for the purpose of maintenance or repair, typically entail closing off at least part of a roadway to traffic. Often said part of the roadway is closed off for a continuous period of time, e.g. a number of consecutive days and nights. During this time the flow of traffic along the roadway may be seriously hampered, which may lead to economical loss and annoyance with motorists that end up in a traffic-jam.

[0003] US 3,811,147 alleviates the problem by providing a mobile roadway repair unit that passes traffic above the roadway being repaired, while repair is conducted beneath the overpass. More particularly, the roadway repair unit includes a platform means for supporting a roadway vehicle (e.g. a car) at a level above the roadway to be repaired. The platform means is movable along the roadway and includes at least one repair module. A first transition means is utilized for directing the roadway vehicle upward from the roadway to the level of the platform means. A second transition means is utilized for directing the roadway vehicle downward from the level of the platform means to the roadway. During use, a portion of a roadway, located beneath the elevated platform means, is repaired and the roadway repair unit is moved along the roadway in progression with the repairing of the roadway. As stated, during the repair of the roadway vehicle traffic passes over the roadway repair unit.

[0004] A drawback of the mobile roadway repair unit according to US'147 is its considerable height. As road repairs take place below the platform means, the repair module is set up to accommodate repair equipment and possibly equipment operators. Consequently, the level of the platform means is reasonably high and traffic passing over the roadway repair unit may not clear obstructions arranged over the roadway being repaired, such as overpasses, traffic information portals and bridge structures. This implies that the roadway repair unit is ill-suited for work on many roads. In addition, the significant difference in height between the roadway and the platform means is generally unpleasant for motorists. It may force them to slow down substantially before they feel comfortable to drive their vehicle across the roadway repair unit, which does not promote the circulation. Another drawback associated with the mobile roadway repair unit is its considerable mass. Traffic passing over the roadway repair unit is preferably restricted to exclude trucks and other heavy vehicles. This allows the roadway repair unit to be relatively lightweight yet strong enough to support ordinary vehicles. Of course this provides for only half a solution since it requires heavy traffic to take a different route anyway. A heavier construction of the roadway repair unit might enable passage of heavy vehicles, but would also limit the usability of the unit in situations wherein the overall load that the roadway itself can carry is limited, which is typically the case for bridges.

[0005] It is an object of the present invention to overcome or mitigate at least one of the aforementioned drawbacks associated with the prior art.

Summary of the invention

[0006] The present invention provides for a temporary road surface system that allows a temporary road surface to be intermittently disposed over a roadway section under maintenance or repair, so as to pass traffic over this section. The temporary road surface system enables road works to be planned flexibly and with minimal inconvenience for traffic. For example, during periods of high traffic volumes such as rush hour, roadway sections under construction (and therefore having an impassable roadway surface) may be made available to traffic by deploying the temporary road surface system. Its relatively low-lying temporary road surface may thereby cover and bridge the roadway section and provide free passage to traffic. At times of low amounts of traffic on the other hand, e.g. during the night, the roadway section may be closed off to traffic to allow road works to be conducted. The temporary road surface may then be displaced from over the roadway section in question to make the construction site accessible to road workers. Displacement of the traffic deck elements that provide for the temporary road surface is particularly easy as they may be borne by bearing elements, such as rollers, that facilitate their movement. Altogether the system may be thought of as somewhat similar to a (roll or slide) shutter. A roadway section may thus be closed off to traffic only when road works are actually being carried out. This is advantageous since in the nuisance perception of motorists, roadways that are closed off for no apparent reason (e.g. hardening of the roadway surface or unsafety thereof) rank among the most annoying of annoyances.

[0007] According to one aspect of the invention, a temporary road surface system is provided. The system comprises at least two elongate barrier elements configured to be statically disposed in a spaced apart manner so as to define a portion of a temporary traffic lane having a longitudinal direction between them, wherein each barrier element comprises a traffic deck element support surface that substantially extends in the longitudinal direction. The system further comprises at least one traffic deck element configured to be received between the two barrier elements and to be (laterally) supported by the traffic deck element support surfaces thereof, such that the traffic deck element spans a distance between the two barrier elements. The system also comprises bearing elements, provided on the barrier elements and/or the

traffic deck element and configured to enable displacement of the traffic deck element relative to the barrier elements in the longitudinal direction.

[0008] The temporary road surface system according to the present invention is a modular system comprising a number of basic elements. These basic element will now be briefly elucidated in turn.

[0009] As far as its rough outline is concerned, a barrier element may be modelled after a conventional step barrier. It may comprise an elongate base on which an upwardly extending crash barrier may be provided. The base may be economically manufactured from concrete, and may provide for a traffic deck element support surface. The crash barrier may be mounted on top of the base, and be made of metal, e.g. steel. In one embodiment, the crash barrier may be blind (in the sense that it blocks light) so as to prevent road users located in traffic lanes next to the temporary traffic lane from being dazzled by the headlights of traffic driving over the elevated traffic deck elements thereof.

[0010] Altogether, barrier elements may serve a number of purposes. First of all, they may serve to define a temporary traffic lane. On the one hand the barrier elements may thereby act as containment barriers that prevent traffic using the temporary traffic lane from accidentally leaving it. On the other hand they may serve to prevent traffic travelling alongside the temporary traffic lane from moving onto it. Accordingly, when the temporary traffic lane is closed off to traffic so that road works can be carried out, the barrier elements may provide for a safe working environment for road workers. Secondly, the barrier elements may provide for good stability of the temporary road surface system and a proper distribution of loads. These loads may include the weight of the temporary road surface system itself and that of any traffic passing it. The proper distribution of loads may be especially important when the temporary road surface system is being deployed on bridges having load restrictions, such as steel bridges having an orthotropic deck. In such cases loads may preferably be transferred onto at least two longitudinal ribs of the bridge deck supporting the barrier elements. In elaborated embodiments of temporary road surface system the barrier elements they may serve additional purposes, as will become clear from the description below.

[0011] A traffic deck element may be configured to directly support traffic and to 'carry' said traffic over the roadway section that is under construction. The weight of any traffic and of the traffic deck element itself is in fact, of course, supported by the traffic deck element support surfaces provided on the barrier elements, while the barrier elements transfer this weight onto the roadway upon which they rest. An upper side of a traffic deck element may provide for a temporary road surface portion. The temporary road surface portions of multiple concatenated traffic deck elements may so form a continuous temporary road surface. A temporary road surface portion may comprise a layer of longwearing and reasonably rough epoxy for good driving characteristics, and be lineated if desired. A traffic deck element may typically have a rectangular, plate-like shape. Its length (i.e. the dimension measured in the longitudinal direction of the temporary traffic lane, and not necessarily referring to a longest side) may normally be on the order of several meters, e.g. 2-4 meters. Its width (i.e. the dimension measured in a direction transverse to the longitudinal direction of the traffic lane) determines the width of the temporary road surface, and may also be on the order of several meters, e.g. 4-5 meters. Such dimensions allow for both a reasonable transportability and structural stability of traffic deck elements. It is contemplated, however, that traffic deck elements of any suitable shape and dimensions may be used.

[0012] The bearing elements may be diverse in nature, as will become clear below. Their primary purpose, however, is each time to facilitate displacement of traffic deck elements relative to the barrier elements for the benefit of covering or uncovering the road section that is under construction.

[0013] According to an elaboration of the temporary road surface system, the traffic deck element may provide for a temporary road surface portion, which in an operational, traffic supporting state of the temporary road surface system is located less than 60 cm above a level at which the barrier elements are supported.

[0014] Barrier elements may typically be supported by a roadway surface alongside a portion thereof that is under construction. That is, they may typically be supported at the normal roadway surface level of the roadway under construction. To minimize discomfort for traffic, to promote the circulation and to prevent structures over the roadway from becoming accidental obstacles, the temporary road surface may preferably be provided no more than 60 cm, and more preferably less than 50 cm above said normal roadway surface.

[0015] According to another elaboration of the invention, the traffic deck element may have a substantially plate-like shape and an internal foam or framework structure.

[0016] Traffic deck elements having a substantially plate-like, preferably rectangular shape are economically stackable, which facilitates their transport to and from the location where the temporary road surface system is brought into action. The traffic deck elements may further have an internal foam or framework structure. Such internal structures may offer sufficient structural strength at a reduced mass (compared to massive structures). A relatively low mass, corresponding to a proportionately low weight, may generally promote the manageability of the traffic deck elements, in particular their transportability and their movability back and forth between the barrier elements. In addition, a lower weight is advantageous to the overall weight of the temporary road surface system, which must be supported by the roadway under construction. Both a foam structure and a framework structure are preferably manufactured from lightweight materials,

for example relatively lightweight metals such as aluminum.

[0017] In one embodiment of the temporary road surface system, the traffic deck element may comprise a first edge and a second edge, both said edges extending substantially transverse to the longitudinal direction. The first edge may have a first profile that is configured for fitting engagement with a second profile provided on the second edge.

[0018] Traffic deck elements may preferably be structurally identical and therefore interchangeable. Within the context of the temporary road surface system, a number of such identical traffic deck elements may be aligned in the longitudinal direction of the temporary traffic lane to form a single, continuous temporary road surface. To promote a smooth and virtually seamless transition between any two adjacent traffic deck elements, opposing transversal edges of a traffic deck element may be provided with complementary profiles that are configured for fitting engagement. Such complementary profiles may take any suitable shape, including, for example, tongue and groove-like configurations. In an engaging condition the complementary profiles may preferably allow for a little play such that adjacent traffic deck elements may follow the curvature of a roadway having a varying slope.

[0019] According to a further elaboration of the temporary road surface system, the traffic deck element may comprises at least one interlocking provision configured to interlock the traffic deck element with another, adjacent traffic deck element.

[0020] Traffic deck elements may be interconnected or concatenated using interlocking provisions. This prevents the traffic deck elements from moving apart, for example under the influence of acceleration and deceleration forces exerted by traffic passing over them. Additionally, interlocked traffic deck elements may conveniently be moved as a whole between the barrier elements when the temporary road surface has to be relocated. Interlocking provisions of any suitable kind may be used, including, for example, different types of bolted joints such as turnbuckles. Interlocking provisions may preferably be provided near the longitudinal edges of the traffic deck elements so as to prevent detrimental contact with vehicle tires. It is noted that a fully functional interlocking provision may comprise several components, part of which may be provided on one traffic deck element, and another (complementary) part of which may be provided on another traffic deck element. The term 'interlocking provision' is therefore not to be construed as merely referring to a fully functional interlocking provision, but also to a portion thereof.

[0021] In one embodiment of the temporary road surface system, the bearing elements may be brought into a bearing state and in a non-bearing state. When the bearing elements are in their bearing state, the traffic deck element may be supported by the bearing elements to facilitate relative movement between the traffic deck element and the barrier elements. When the bearing elements are in the non-bearing state, the traffic deck element may not be supported by the bearing elements.

[0022] Generally, the temporary road surface system may be switched between two states: an operational, traffic supporting state and a non-operational, non-traffic supporting state. In the operational state the temporary road surface may be used to pass traffic over an underlying roadway section that is under construction, but that is temporarily not being treated by road workers. In the non-operational state the temporary road surface may be / have been moved away from over the roadway section under construction, so that the site becomes / is accessible to road workers for treatment. In the operational state the traffic deck elements may preferably be secured in place relative to the barrier elements, and thus be prevented from moving under the action of traffic passing over them. However, to facilitate movement of the traffic deck elements, bearing elements are provided. To ensure that these bearing elements do not promote movement of the traffic deck elements in the operational state, they may be configured such that they can be switched between a bearing state and a non-bearing state. Accordingly, the bearing elements may be brought into their non-bearing state when the temporary road surface system is into its operational state, and no relative motion between the traffic deck elements and the barrier elements is desired. The traffic deck elements may then be supported directly by the traffic deck support surfaces of the barrier elements. To facilitate relocation of the traffic deck elements relative to the barrier elements, as may be desired in the non-operational state of the system, the bearing elements may be brought into their bearing state.

[0023] Bearing elements of all suitable types may be used. In one embodiment, for example, the barrier elements may be provided with permanent magnets while the traffic deck elements may be provided with electromagnets located opposite to the permanent magnets. Suitably powering the electromagnets on the traffic deck elements may then drive them apart from their permanent counterparts to cause magnetic levitation of the traffic deck elements. It is, of course, also possible to employ conductive materials instead of permanent magnets to effect levitation through eddy currents, and/or to swap the disposition of the permanent magnets and the electromagnets. In another embodiment, the bearing elements may provide for a fluidum bearing, for example one based on a high-pressure air cushion (cf. the principle of a hovercraft). In such a case, the bearing elements may include fluidum ducts, fluidum ejection nozzles and/or fluidum pumps. In still another embodiment, the bearing elements may comprise extendable and retractable rollers. An embodiment of this sort will be elucidated infra with reference to the drawings.

[0024] According to another aspect of the invention, a method is provided. The method comprises providing a temporary road surface system as described in this text. It further comprises lining up a first series of barrier elements and a second series of barrier elements such that

the two series extend substantially parallel to each other, defining a temporary traffic lane between them. The method also comprises supporting a number of continuously arranged traffic deck elements onto the traffic deck element support surfaces of the barrier elements so as to form a continuous temporary road surface, and enabling traffic to pass over the thus formed temporary road surface of the temporary traffic lane.

[0025] These and other features and advantages of the invention will be more fully understood from the following detailed description of certain embodiments of the invention, taken together with the accompanying drawings, which are meant to illustrate and not to limit the invention.

Brief description of the drawings

[0026]

Figs. 1A-1E schematically illustrate the assembly and use of an exemplary temporary road surface system according to the present invention;

Fig. 2 is a schematic transverse cross-sectional view of the temporary road surface system shown in Fig. 1, illustrating in particular two barrier elements supporting a traffic deck element;

Fig. 3 is a schematic longitudinal cross-sectional view of exemplary profiled end portions of two adjacent traffic deck elements;

Fig. 4 is a schematic side view of an exemplary interlocking provision comprising a turnbuckle that may be employed to interlock two adjacent traffic deck elements;

Fig. 5 is a schematic longitudinal cross-sectional view of two adjacent traffic deck elements, having profiled end portions as shown in Fig. 3, and interlocked by the interlocking provision shown in Fig. 4;

Fig. 6 is a schematic transverse cross-sectional view of a case provided alongside a longitudinal edge of a traffic deck element as shown in Fig. 2;

Fig. 7 is a schematic longitudinal cross-sectional view of a portion of a case provided alongside a longitudinal edge of a traffic deck element, comprising a bearing element in an extended position (i.e. bearing state); and

Fig. 8 is a schematic longitudinal cross-sectional view of the portion of the case shown in Fig. 7, this time with the bearing element in a retracted position (i.e. non-bearing state).

Detailed description

[0027] Figs. 1A-1E schematically illustrate the use of an exemplary temporary road surface system 1 according to the present invention. The temporary road surface system 1 (shown in its entirety in Fig. 1C) may typically be built up as part of the preparations for road works that are to take place. Fig. 1A illustrates the disposition and alignment of barrier elements 10 to define a temporary traffic lane 6. After some or all of the traffic lanes 4 of a roadway 2 have been closed off to traffic, a first row of barrier elements 10 (on the right) may be disposed on the roadway surface. The barrier elements 10 may be supplied by and lifted off a truck by means of a crane, and once disposed, be interconnected in a manner that is conventional for (step) barrier elements in order to create a well-aligned row. A second row of barrier elements 10 (being built on the left) may subsequently be disposed next to the first. The distance between the first and the second row of barrier elements 10 may preferably be chosen such that the traffic deck elements 30 (see Fig. 1B) fit in between.

[0028] Fig. 1B illustrates the disposition of the traffic deck elements 30. Before any traffic deck elements 30 are brought into position, an inner portion 18 of a crash barrier 15 (cf. Fig. 2) of two opposing barrier elements 11 may be temporarily removed. Through the opening thus created traffic deck elements 30 can be lowered off a truck by means of a crane until they come to rest on bases 12 of the barrier elements 11. The traffic deck elements 30 in the depicted embodiment come equipped with extendable and retractable rollers 52 (see Figs. 2, 6-8), which rollers may be in the extended position when they are first lowered onto the bases 12. As a result the traffic deck elements 30 may be rolled away over the bases 12 as soon as the crane cables are detached. Each lowered traffic deck element 30 may be interlocked with the preceding traffic deck element(s) so as to form a continuous temporary road surface therewith. It is understood that the temporary road surface is constituted by the concatenated temporary road surface portions 36 of adjacent traffic deck elements 30. When a desired length of the temporary road surface is reached, the opening between the barrier elements 11 may be closed again by remounting the inner portions 18 of the crash barriers 15, and the rollers-up to this point still bearing the traffic deck elements 30-may be retracted to lower the traffic deck elements 30 into their operational, traffic bearing positions. Subsequently, access and exit ramps 70 may be put into position in alignment with the temporary road surface. A ramp 70 may comprise one or more (sloping) segments that together provide for a gradual transition between the level of the temporary road surface, and the level of a permanent roadway on which the temporary road surface system 1 is disposed. The ramps 70 thus allow vehicles to move on and off the temporary road surface safely and comfortably, and without significantly diminishing their speed. Once the ramps 70 are in place, the temporary traffic lane 6 may be opened to traffic. See Fig. 1C.

[0029] Fig. 1D schematically illustrates how, for example during the night, road works may be carried out on the temporary traffic lane 6. First the temporary traffic lane 6 may be closed off to traffic. Then the access and exit ramps 70 may be removed, after which the aforementioned rollers 52 connected to the traffic deck ele-

ments 30 may be extended. As will be explained in more detail below, each of the retractable rollers 52 may be operated by a hydraulic cylinder 54 (see Fig. 2). The hydraulic cylinders 54 may be coupled in series by means of hoses or tubes, and finally to a central pump that may be used to activate the cylinders to force the rollers 52 into their extended positions. Once the rollers 52 bear the interconnected traffic deck elements 30, the whole may be moved/rolled away from over the roadway section 5 that is to be reconstructed by means of a push-pull bar connected to a truck. Altogether, clearing the roadway section 5 may take about thirty to fifty minutes. It is noted that the traffic lanes 4 next to the temporary traffic lane 6 may remain open to traffic, and any road workers may safely work within the confines of the barrier elements 30.

[0030] When a period of higher traffic volume approaches, such as a morning rush hour, the road works may be suspended and the traffic deck elements 30 may be rolled back over the roadway section under construction 5. As before, the traffic deck elements 30 may be moved as a whole, for example by means of a truck fitted with a push-pull bar that engages a trailing or leading traffic deck element. When the traffic deck elements 30 again cover the construction site 5, the aforementioned hydraulic cylinders 54 may be used to retract the rollers 52 in order to lower the traffic deck elements 30 onto the traffic deck supporting surfaces 14 (see Figs. 2, 6-8) of the bases 12 of the barrier elements 10. The access and exit ramps 70 may then be placed back to make the temporary traffic lane 6 ready for use once more.

[0031] Now that the use of an exemplary temporary road surface system 1 according to the present invention has been elucidated, attention is invited to some structural details of said system.

[0032] Fig. 2 is a schematic transverse cross-sectional view of the temporary road surface system 1 shown in Fig. 1, illustrating in particular two (identical) barrier elements 10 supporting a traffic deck element 30.

[0033] Each barrier element 10 may comprise a base 12, which may be manufactured economically of concrete or, if desired, of any other suitable material. The base 12 may preferably have a width in the range of 700-900 mm, which is wider than a width of standard barriers having a high vehicle deflection capability. H2 containment level barriers, for example, typically have a base that is 540 mm wide. In combination with its own weight, the weight of the traffic deck elements 30 and any traffic load, the relatively wide base 12 provides for a good stability of the construction. The base 12 may have any desirable length (measured perpendicular to the plane of the drawing), but preferably measures several meters. It has been found that barrier elements 10 having a length of about three meters possess a good manageability and are, when mutually connected in the longitudinal direction, still sufficiently capable of following most variably sloping roadways. The base 12 may typically have a height on the order of tens of centimeters, e.g. 30 cm, which is conventional for step barriers. In a top surface of the base 12 a guide track 13 may be provided. The guide track 13 may be lined with a conventional U-profile, for example made of steel, that extends in the length direction of the base 12. It is understood that when multiple barrier elements 10 are aligned in a row to form a continuous barrier (see Figs. 1A-1E), their respective guide tracks 13 are also aligned to form a single continuous guide track. As will be elucidated infra, the guide track 13 may serve to receive and guide a side portion of the traffic deck element 30. A bottom portion of the U-profiled guide track 13 may thereby provide for a traffic deck support surface 14.

[0034] On top of the base 12 a crash barrier 15 may be provided. The crash barrier 15 may comprise a number of spaced apart standards 20 that are firmly connected to the base 12, and an outer portion 16 and an inner portion 18 that are in turn connected to the standards 20. The outer 16 and inner 18 portions of the crash barrier 15 may each basically provide for half a step barrier, and may preferably be made of steel plating that extends along the length of the barrier element 10. The configuration of the inner portion 18 and the outer portion may be advantageously overlapping so as to form a closed or blind barrier that is effectively impermeable to light. The inner portion may further extend a little inward so as to cover (and protect) a side portion of the traffic deck element 30, i.e. the portion that may comprise the hydraulically extendable rollers 52. As was noted above with reference to Fig. 1A, the inner portion 18 may be detachably connected to the standards 20 to enable a traffic deck element 30 to be placed between two opposing rows of barrier elements 10 from above. Also with additional reference to Figs. 1A-1E, it will be clear that for traffic travelling over the temporary traffic lane 6 between the barrier elements 10, either before or after the temporary road surface provided by the traffic deck elements 30, vehicle deflection is provided by both the bases 12 and the inner portions 18 of the crash barriers 15 of the barrier elements 10. For traffic travelling over the temporary road surface, i.e. on top of the traffic deck elements 30, vehicle deflection is provided by the inner portions 18 of the crash barriers 15 only. On the outside of the temporary traffic lane 6, e.g. for traffic on a neighboring traffic lane 4 (cf. Fig. 1D), vehicle deflection is provided by both the bases 12 and the outer portions 16 of the crash barriers 15 mounted on top thereof.

[0035] A traffic deck element 30 spans the distance between the bases 12 of the two barrier elements 10. The traffic deck element 30 may typically have a substantially rectangular, plate-like shape. It is contemplated however, that other shapes may be employed as well. Each traffic deck element 30 may have a central body 32 with an internal foam or framework structure (not shown in Fig. 2; cf. Figs. 3 and 5) that is capable of properly distributing locally applied loads. This may allow for a relatively thin and lightweight traffic deck element 30. In one embodiment, the body 32 may for example com-

prise a framework structure of extruded aluminum profiles, having a thickness of no more than 150 mm. An upper side of the traffic deck element 30 may provide for a temporary road surface portion 36, for example comprising a layer of asphalt and/or epoxy.

[0036] Along its longitudinal sides (i.e. the sides extending in the longitudinal direction of the temporary traffic lane 6), the body 32 may be flanked by two elongate cases 34. These cases 34, which may be made of a lightweight material such as aluminum, may accommodate extendable and retractable rollers 52. In case the traffic deck elements 30 are indeed substantially rectangularly shaped (in top view; cf. Figs. 1B-1E), each of the four corners of such a traffic deck element 30 may be fitted with one roller 52. In other embodiments a different number of rollers 52 may be used if desired. Each of the rollers 52 may be operable, i.e. movable between a bearing state and a non-bearing state, by means of a hydraulic cylinder 54. As can be seen in Fig. 2, a hydraulic cylinder 54 may be connected to a case 34, whereby a part of of the cylinder may protrude from the upper surface of the traffic deck element 30. This protruding part, to which pressure hoses or tubes may be connected for operating the cylinder 54, may preferably be roofed over by an inner portion 18 of a crash barrier 15 for protection.

[0037] Figs. 6-8 illustrate the construction accommodated within a case 34 in some more detail. Fig. 6 is a schematic transverse cross-sectional view (of an end portion) of a case 34 provided alongside a longitudinal edge of a traffic deck element 30. Figs. 7 and 8 are schematic longitudinal cross-sectional views of the portion of the case 34 shown in Fig. 6 according to section A-A. In Fig. 7, the roller 52 is in a bearing state (corresponding to the situation shown in Fig. 6), while in Fig. 8 it is in a non-bearing state. It is understood that the construction shown in Figs. 6-8 may be provided on each of the corners of a rectangular traffic deck element 30.

[0038] Referring now to Figs. 6-8 together.A substantially rectangular, internal support frame 56 may be mounted within the case 34. The internal support frame 56 may be made of four steel plates that are welded together, and may be connected to the case 34 through an upper plate. The internal support frame 56 may serve to support a pivot 58. One end of an arm 60 may be bearingly mounted on the pivot 58. An other end of the arm 60 may be rotatably connected to a roller 52. About halfway the arm 60 a stop 62 may be provided for interaction with an actuator pin 55 of the hydraulic cylinder 54. Pressurizing the hydraulic cylinder 54 may force the actuator pin 55 downwards, against the stop 62 provided on the arm 60. As a result, the arm 60 may rotate around the pivot 58, and the roller 52 may be forced out of the case 34 via an opening in the bottom part thereof. This will lift the traffic deck element 30 and bring the roller 52 into its bearing state. See Fig. 6, and note the gap between the bottom of the guide track 13 (i.e. the traffic deck support surface 14) and the slabs of frictional material 64, e.g. rubber, provided at an underside of the case 34. The traffic deck element 30 may be lowered again by bringing the roller 52 connected thereto into its non-bearing state. It is understood that removing the pressure from the hydraulic cylinder 54 and/or actively retracting the actuator pin 55 thereof, will result in retraction of the roller to substantially within the case 34. This is simply because the weight of the traffic deck element 30 forces it downwards, causing the roller 52 to rotate back around pivot 58 until the case 34 comes to rest onto the frictional slabs 64 provided on an underside thereof.

[0039] As can be seen clearly in Figs. 2 and 6, the U-profiled guide tracks 13 provided in the bases 12 of the two opposing barrier elements 10 on the one hand, and the cases 34 provided on the traffic deck element 30 on the other, together provide for an engagement provision that interlocks the opposing barrier elements 10 by means of the traffic deck element 30. The engagement provision ensures that-at least in an operational, traffic supporting state of the temporary road surface system 1-the barrier elements 10 supporting the traffic deck element 30 are prevented from moving apart in a direction transverse to the longitudinal direction. In the case of a collision between a vehicle and a barrier element 10, this means that both the barrier element 10 that is hit by the vehicle and the barrier element 10 opposite thereto will be called upon to contain of deflect the vehicle, and to absorb the impact of the collision.

[0040] Turning now to Figs. 3-5. Along its transversal edges, the traffic deck element 30 shown in Fig. 2 may be provided with complementary profiles that are configured for mutually fitting engagement. It is understood that any two transverse *edges* of a same traffic deck element 30 are not configured for actual mutual engagement. Instead, in an assembled temporary road surface system 1 according to the invention, multiple identical traffic deck elements 30 may be aligned so that their transverse edges connect (cf. Fig.1C). To make the transverse connection between adjacent traffic deck elements 30 virtually seamless, complementary profiles may be provided on both transverse edges of each of them. Fig. 3 schematically illustrates two such complementary profiles 38, 40, provided on adjacent traffic deck elements 30, 30'. The two profiles resemble a tongue 38 and a groove 40, and would in Dutch together be referred to as a"hol en dol'-connection. The tongue profile 38 comprises a protruding, substantially semicircular arc, whereas the groove profile 40 comprises a smooth recess for the reception thereof. In an engaging condition (cf. Fig. 5) the complementary profiles 38, 40 allow for a little play around a transversally extending axis, such that the adjacent traffic deck elements 30, 30' may follow a curvature of a roadway having a varying slope.

[0041] Fig. 4 illustrates an exemplary interlocking provision that is configured to interlock two adjacent traffic deck elements 30, 30'. The interlocking provision includes a first bracket 42 provided on a first of the traffic deck elements 30, a second bracket 44 provided on a second of the traffic deck elements, and a turnbuckle 46

one end of which is connected to the second bracket. By turning the turnbuckle 46 counter-clockwise through an angle of about 90 degrees relative to the position shown in Fig. 5, a head 48 provided at the other end of the turnbuckle 46 may be caught behind the first bracket 42. Then, by turning the turnbuckle 46 around a longitudinal axis (parallel to the plane of the drawing), the two adjacent traffic deck elements 30, 30' may be tightened towards each other. Executing these steps in reverse may again unlock the two traffic deck elements 30, 30.

[0042] Fig. 5 is a schematic longitudinal cross-sectional view of two concatenated traffic deck elements 30, 30' provided with both the transversal profiles 40, 38 shown in Fig. 5, and the interlocking provision as shown in Fig. 5.

[0043] Although illustrative embodiments of the present invention have been described above, in part with reference to the accompanying drawings, it is to be understood that the invention is not limited to these embodiments. Variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, the appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, it is noted that particular features, structures, or characteristics of one or more embodiments may be combined in any suitable manner to form new, not explicitly described embodiments.

List of elements

[0044]

1 temporary road surface system
2 roadway
4 traffic lane of roadway
5 roadway section under construction
6 temporary traffic lane between barrier elements
10 barrier element
11 barrier element from which an inner portion has been removed
12 base
13 guide track
14 traffic deck element support surface
15 crash barrier
16 outer portion of crash barrier
18 inner portion of crash barrier
20 standard of crash barrier
30 traffic deck element
32 body of traffic deck element
34 case
36 temporary road surface portion
38 first profile (groove)
40 second profile (tongue)
42 first bracket
44 second bracket
46 turnbuckle
48 head on one end of the turnbuckle
52 roller
54 hydraulic cylinder
55 actuator pin of hydraulic cylinder
56 internal support frame
58 pivot
60 arm
62 stop
64 slab of rubber
70 access or exit ramp

Claims

1. A temporary road surface system (1), comprising:

- at least two elongate barrier elements (10) configured to be statically disposed in a spaced apart manner so as to define a portion of a temporary traffic lane (6) having a longitudinal direction between them, wherein each barrier element comprises a traffic deck element support surface (14) that substantially extends in the longitudinal direction;
- at least one traffic deck element (30) configured to be received between the two barrier elements and to be supported by the traffic deck element support surfaces thereof, such that the traffic deck element spans a distance between the two barrier elements; and
- bearing elements (52), provided on the barrier elements and/or the traffic deck element and configured to enable displacement of the traffic deck element relative to the barrier elements in the longitudinal direction.

2. The temporary road surface system according to claim 1, wherein the traffic deck element (30) comprises a temporary road surface portion (36), which in an operational, traffic supporting state of the temporary road surface system (1) is located less than 60 cm above a level at which the barrier elements (10) are supported.

3. The temporary road surface system according to any of the claims 1-2, wherein each barrier element (10) comprises a concrete base (12) on which an upwardly extending crash barrier (15) is provided.

4. The temporary road surface system according to any of the claims 1-3, wherein the traffic deck element (30) has a substantially plate-like shape and an internal foam or framework structure.

5. The temporary road surface system according to any of the claims 1-4, wherein the traffic deck element (30) comprises a first edge and a second edge, both said edges extending substantially transverse to the longitudinal direction, and wherein the first edge has a first profile (40) that is configured for fitting engagement with a second profile (38) provided on the second edge.

6. The temporary road surface system according to any of the claims 1-5, wherein the traffic deck element (30) comprises at least one interlocking provision (42, 44, 46) configured to interlock the traffic deck element with another, adjacent traffic deck element.

7. The temporary road surface system according to any of the claims 1-6, wherein the bearing elements (52) can be brought in a bearing state and in a non-bearing state, such that
when the bearing elements are in the bearing state, the traffic deck element (30) is supported by the bearing elements to facilitate relative movement between the traffic deck element and the barrier elements (10), and
when the bearing elements are in the non-bearing state, the traffic deck element is not supported by the bearing elements.

8. The temporary road surface system according to any of the claims 1-7, wherein the bearing elements comprise at least one of:

- magnets to provide for magnetic levitation of the traffic deck element;
- fluidum ducts and/or fluidum ejection nozzles to provide for a fluidum bearing between the barrier elements and the traffic deck element; and
- extendable and retractable rollers (52).

9. The temporary road surface system according to claim 8, wherein the bearing elements comprise extendable and retractable rollers (52) and at least one hydraulic cylinder (54) by means of which extension and/or retraction of the rollers can be effected.

10. The temporary road surface system according to any of the claims 1-9, comprising an engagement provision (13, 34) that is configured to interlock the at least two barrier elements (10) by means of the traffic deck element (30), such that, at least in an operational, traffic supporting state of the temporary road surface system (1), the barrier elements supporting the traffic deck element are prevented from moving apart in a direction transverse to the longitudinal direction.

11. The temporary road surface system according to any of the claims 1-10, further comprising at least one ramp element (70) that is configured to provide for at least part of transition between a temporary road surface portion (36) provided by the traffic deck element (30) and a portion of a permanent roadway on which the temporary road surface system (1) is disposed.

12. A method comprising:

- providing a temporary road surface system (1) according to any of the claims 1-11;
- lining up a first series of barrier elements (10) and a second series of barrier elements such that the two series extend substantially parallel to each other, defining a temporary traffic lane (6) between them; and
- supporting a number of continuously arranged traffic deck elements (30) onto the traffic deck support surfaces (14) of the barrier elements (10) so as to form a continuous temporary road surface.

13. The method according to claim 12, further comprising:

- interlocking the continuously arranged traffic deck elements (30).

14. The method according to claim 12 or 13, wherein the bearing elements (52) can be brought in a bearing state and in a non-bearing state, and further comprising:

- bringing the bearing elements into a bearing state in which they support the traffic deck elements (30) and facilitate relative movement between the traffic deck element and the barrier elements (10).

15. The method according to any of the claims 12-14, further comprising:

- moving the traffic deck elements (30) relative to the barrier elements (10) in the longitudinal direction of the temporary traffic lane (6).

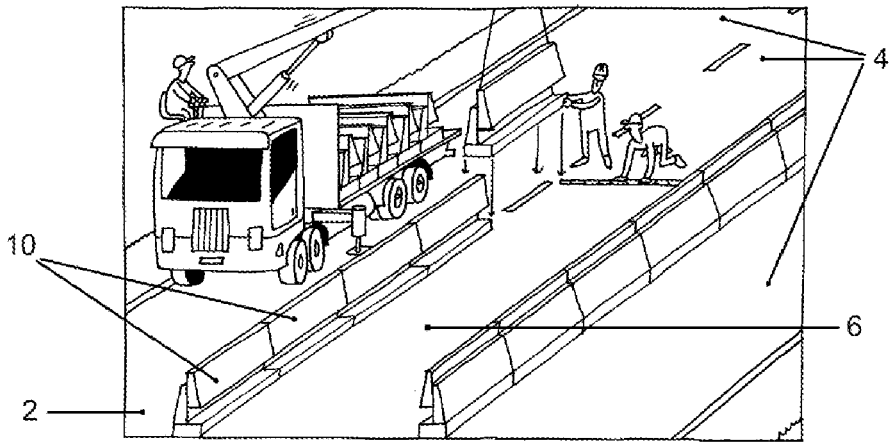

FIG. 1A

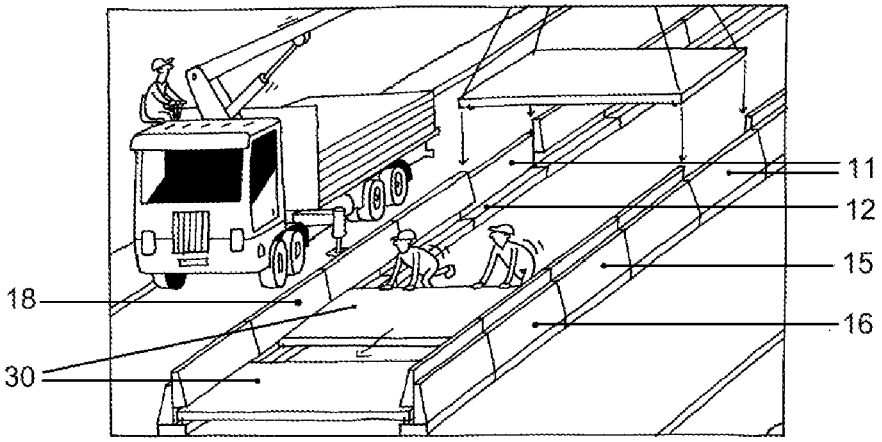

FIG. 1B

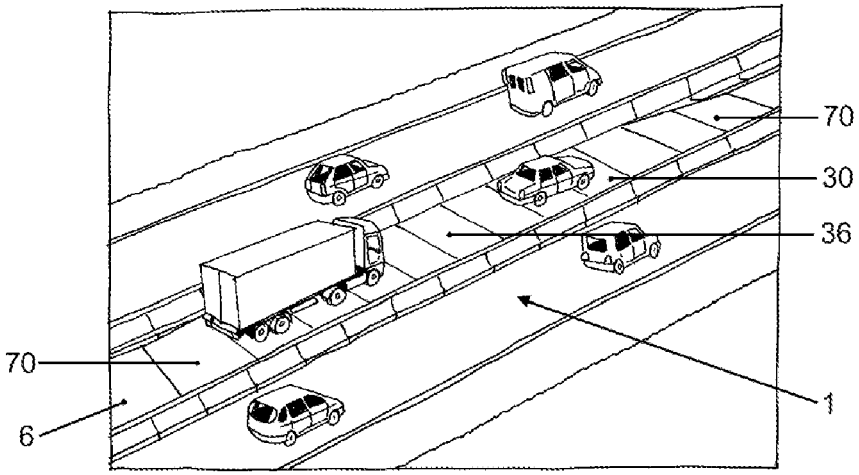

FIG. 1C

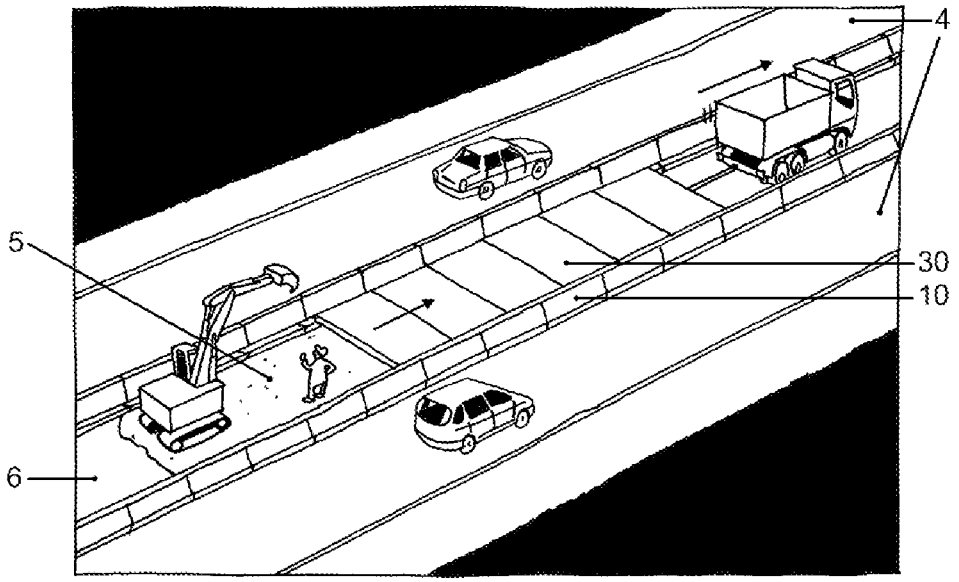

FIG. 1D

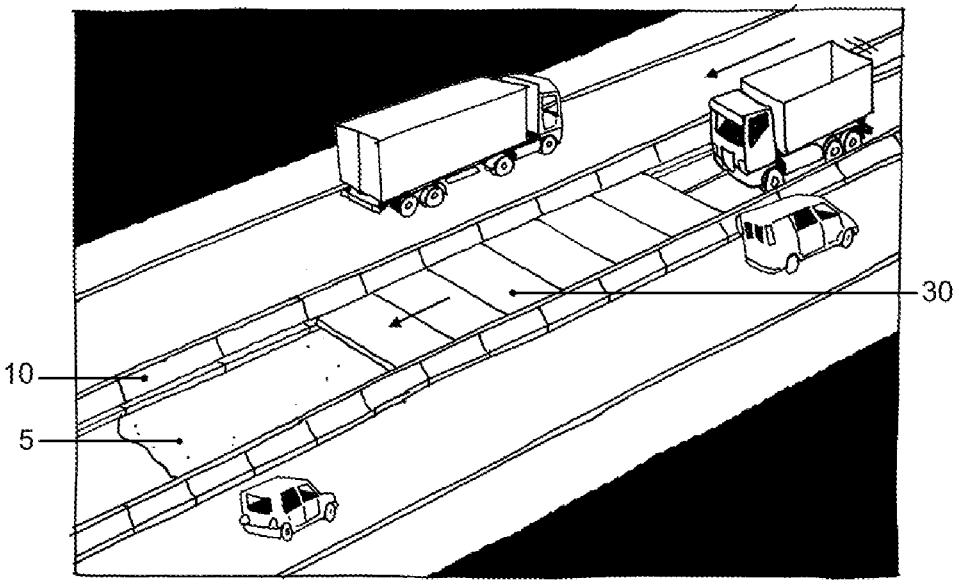

FIG. 1E

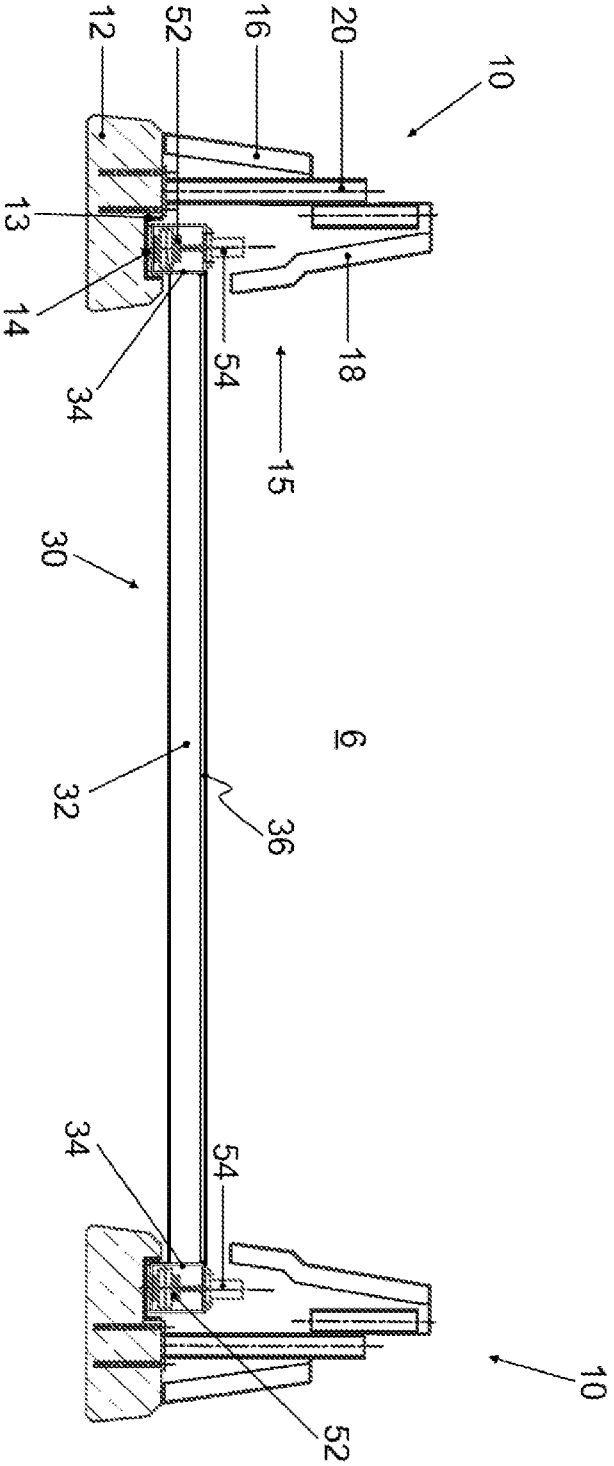

FIG. 2

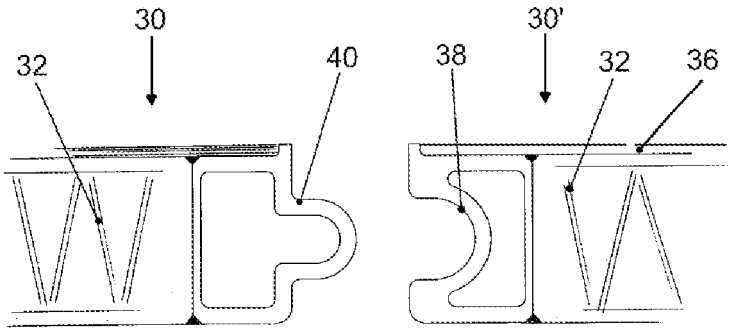

FIG. 3

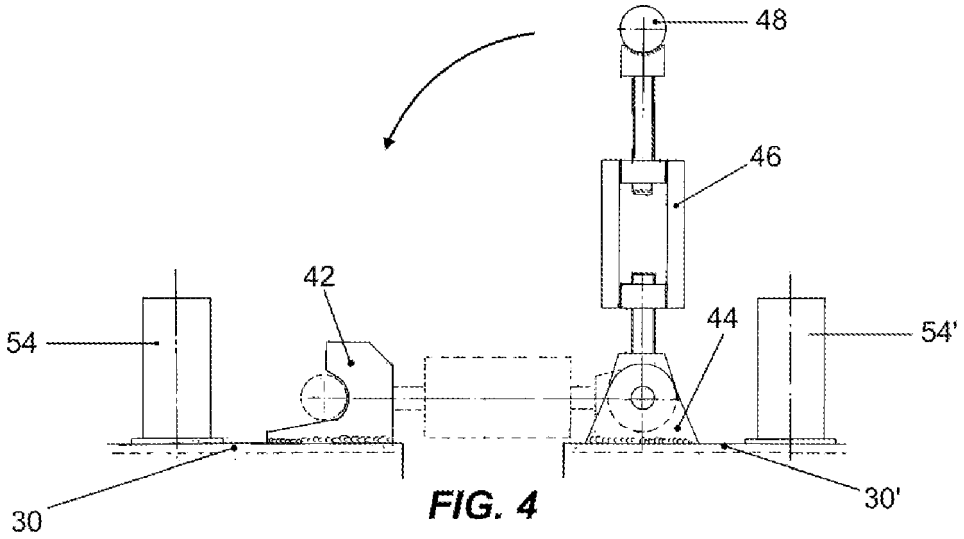

FIG. 4

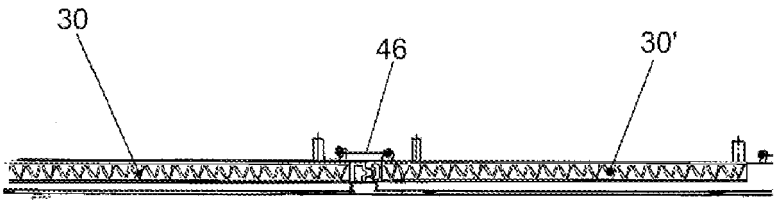

FIG. 5

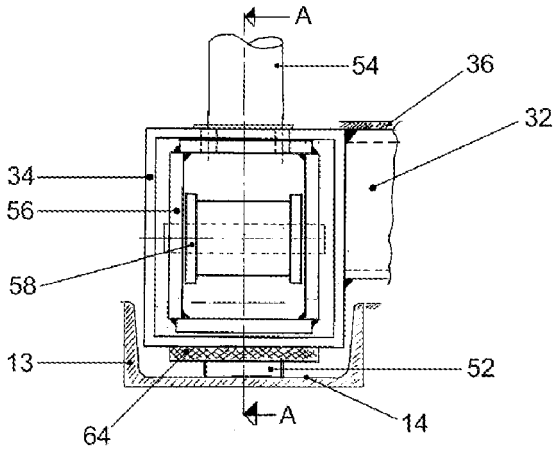

FIG. 6

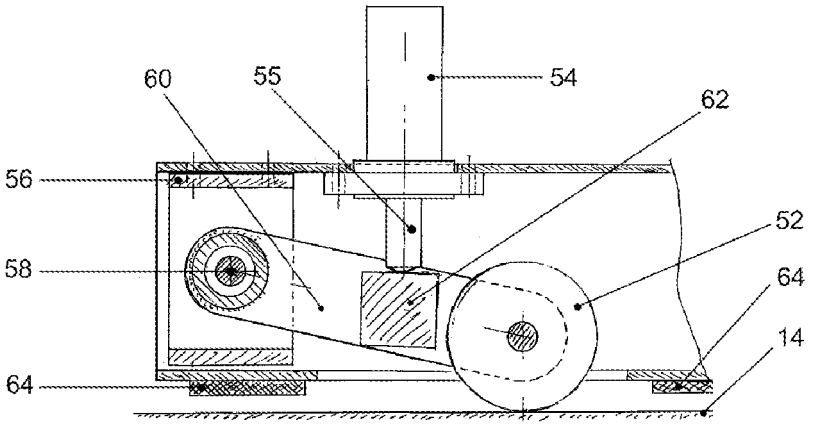

FIG.7

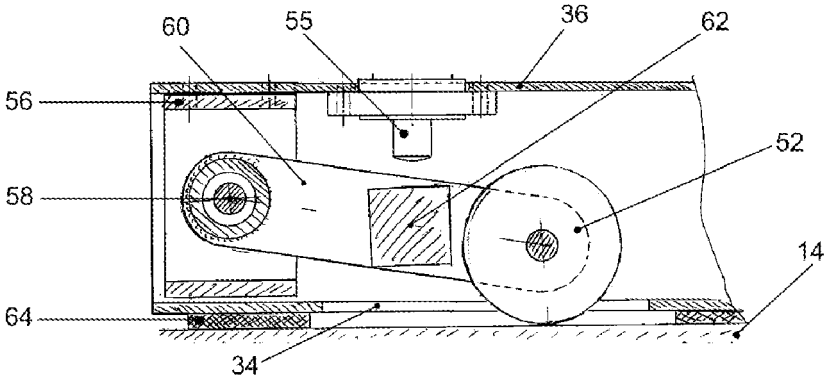

FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 09 17 2943

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	US 3 811 147 A (DIX R) 21 May 1974 (1974-05-21) * claim 1; figures 1-4 * -----	1	INV. E01C9/08
A	US 4 376 596 A (GREEN M L [US]) 15 March 1983 (1983-03-15) * claim 1; figures 1-5 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

E01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 April 2010	Fernandez, Eva

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
L : document cited for other reasons

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1

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12-04-2010

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US 3811147 A	21-05-1974	NONE	
US 4376596 A	15-03-1983	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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