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(54) SYSTEM FOR INSTALLING A SERVICE SYSTEM IN ROAD TUNNELS

SYSTEM ZUM INSTALLIEREN EINES DIENSTSYSTEMS IN STRASSENTUNNELN

SYSTÈME D'INSTALLATION D'UN SYSTÈME DE SERVICE DANS DES TUNNELS ROUTIERS

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Description

[0001] The present invention relates to a system and a method for installing a service system in road tunnels.

[0002] As it is known, several measures must be taken in order to ensure an effective, safe use of road tunnels made of reinforced concrete.

[0003] A first requirement is to guarantee that no water streams are generated in case of rain or water penetration of different kind and origin, especially through the joints of the vault of the tunnel, which may dangerously drip in the center of the carriageway.

[0004] A second requirement is to periodically inspect the surface of the intrados of the tunnel in order to rapidly check the structural conditions and the presence of cracks and water infiltration points.

[0005] Another requirement is to ensure the visibility of the walls of the tunnel for the drivers by means of the light emitted by the headlights of the motor vehicles, even when the tunnel is insufficiently and poorly lit.

[0006] In order to satisfy similar requirements, the walls of a tunnel must be coated, covering the concrete surface of the intrados.

[0007] Currently, the most popular solution is to cover the two vertical sections of the intrados with a plurality of sheet metal panels, creating two continuous coating surfaces that extend on opposite sides until the base of the vault of the tunnel. Said panels are painted with light-reflecting paints that provide an efficient lighting of the tunnel as soon as they are hit by the light emitted by the headlights of the motor vehicles.

[0008] Moreover, said panels can hold the water infiltrations in the walls of the intrados and convey the water to the ground, in correspondence of suitable drainage channels provided on the two sides of the carriageway.

[0009] Nevertheless, such painted panels are not able to satisfy all the aforementioned requirements that are typical of a tunnel. As a matter of fact, the panels are impaired by two considerable drawbacks.

[0010] The first drawback consists in the fact that the panels do not permit a rapid and frequent check of the structural conditions of the sides of the intrados because the sides are concealed on the back of the panels.

[0011] The second drawback consists in the fact that the panels are not uniformly capable of receiving and correctly conveying the water streams produced through the vault of the tunnel, especially in correspondence of the joints of the intrados, towards the drainage channels provided in the ground.

[0012] Moreover, the provision and the installation of the painted panels have a high cost and difficulties may be encountered if said panels are to be mounted on an irregular surface of the intrados, adjusting to the radius of curvature of the intrados.

[0013] JPS54176223 discloses a system for the installation of a service system in road tunnels.

[0014] JP2018024978 discloses a concrete piece guard sheet capable of conveying water without freezing water leakage from a wall surface of a tunnel.

[0015] JP2008019705 discloses a system to enable the easy visible inspection of the inside of a water guiding passage, without removing a leakage receiving plate.

[0016] JP2016094772 discloses a method for preventing spalling in tunnels, for example in the repair of existing tunnels, which reinforces the inner surface of a lining wall to prevent spalling and also has a water conveying function against water leakage.

[0017] The purpose of the present invention is to remedy the drawbacks of the prior art by disclosing a system for the installation of a service system in road tunnels that is practical, inexpensive and capable of satisfying the management and maintenance requirements of a road tunnel.

[0018] Another purpose of the invention is to disclose such a system for the installation of a service system in road tunnels that is reliable and efficient.

[0019] The invention is as defined in the appended claims.

[0020] The inventive idea of the present invention is to disclose an especially efficient, inexpensive system for the installation of a multi-functional service system inside road tunnels.

[0021] Such a system provides for the installation of ducts on each one of the sides of a tunnel, said ducts being open on the back. Each duct can be mounted correspondingly to a joint provided between two portions of the concrete structure of the tunnel.

[0022] The ducts are advantageously used for collecting and conveying the water leakage from the intrados of the tunnel and for providing an autonomous lighting of the road tunnel from the reflection of the light generated by the motor vehicles.

[0023] Each duct is mounted in one of the joints of the tunnel, that is to say, in correspondence of an area with rainwater leakage. Therefore, the duct acts as a descending pipe of a gutter because it intercepts the water that leaks from the vault of the tunnel and conveys it by gravity towards an ending section suitably disposed at a slightly higher height than a rainwater drainage channel that is normally provided on each side of the carriageway of the tunnel.

[0024] The system of the invention also comprises at least one gutter suitable for being disposed between two ducts in order to convey the water into a duct. The function of said horizontal gutters is to intercept any water stream that may drip from the vault of the road tunnel in the intermediate sections between two consecutive joints of the intrados. Said gutters are suitably inclined in such a way that the water can be drained towards a duct.

[0025] Being only mounted in correspondence of the joints of the road tunnel, the ducts leave the remaining surface of the road tunnel uncovered, thus permitting a rapid, easy check of the road tunnel on a periodical basis.

[0026] The sections of the ducts can be made of sheet metal or extruded plastic materials. The sheet metal sections can be painted with light reflecting paints. The

plastic sections are obtained from plastic materials that are intrinsically capable of reflecting the light emitted by the headlights of the motor vehicles. In both cases, the ducts made of reflecting sections can reflect the light of the headlights of the motor vehicles, thus providing an autonomous lighting of the tunnel.

[0027] The section can have any length (or can be cut to measure from a piece of standard length). In view of the above, the operator in charge of installing the ducts can adjust the profile of the duct to the radius of curvature of the sides of the intrados. In particular, such an operation can be performed by sequentially installing a plurality of sections in inclined position, so that the duct can have a structure similar to a broken line that adjusts to the radius of curvature of the side of the intrados.

[0028] The higher the number of sections used for a duct, the more capable the duct will be to adjust to the curved profile of the side of the intrados. The modularity of the sections allows for varying the total height of the ducts at will, according to the dimensions of the tunnel.

[0029] The sections of the duct can be also used to install an electrically powered lighting system and a fire fighting system in the tunnel. In fact, the front surface of each duct can be used to install one or more rows of LEDs that are directed towards the motor vehicles and can be easily visible for the drivers.

[0030] The sections of the duct can be used for concealing the power supply cables used to supply the LEDs.

[0031] Each duct can be used to install one or more water-spraying nozzles of a fire fighting system. A water supply pipe for said nozzles can be housed in a concealed manner on the back of the duct.

[0032] For the sake of clarity, the description of the present invention continues with reference to the appended drawings, which have a merely illustrative, not limiting value, wherein:

Fig. 1 is a diagrammatic top view of a road tunnel with two lanes equipped with the system for the installation of a service system according to the invention;
Fig. 2 is a cross-sectional view taken along the sectional plane II-II of Fig. 1;
Fig. 2A is an enlarged view of a duct enclosed in the circle A of Fig. 2;
Fig. 3 is a partially interrupted front view, which shows a section of an intrados of the road tunnel of Fig. 1, wherein joints between portions of concrete structure are visible;
Fig. 4 is an axonometric view of a section of the duct of the system according to the invention;
Fig. 5 is a top view of the section of Fig. 4;
Fig. 6 is a sectional view of the section, taken along the sectional plane VI-VI of Fig. 5;
Fig. 7 is a sectional view of a section fixed to the intrados, taken along the sectional plane VII-VII of Fig. 2; and
Fig. 8 is a sectional view taken along the sectional plane VIII-VIII of Fig. 3.

[0033] With reference to Figs. 1 and 2, a road tunnel (100) is illustrated. The road tunnel (100) comprises a concrete structure (101) that generates a tunnel on a carriageway (103). The concrete structure (101) has an arch-shaped cross-section with two sides or intradoses (102) and a vault (104).

[0034] With reference to Fig. 3, the concrete structure (101) of the tunnel may comprise a plurality of portions that are joined by means of joints (J) that extend along a vertical plane.

[0035] The system (200) of the invention comprises a plurality of sections (1). Said sections (1) are fixed to the intrados (102) of the tunnel, being stacked one on top of the other in such a way to generate a duct (C) for the flowing of water that substantially extends in vertical direction, in projecting position relative to the intrados (102).

[0036] Preferably, the duct (C) is disposed correspondingly to the joint (J) between two portions of the concrete structure (101) of the tunnel.

[0037] With reference to Figs. 4, 5 and 6, each section (1) has a substantially V-shaped cross-section. The section (1) comprises a first wing (1a) and a second wing (1b) substantially disposed at 90° and joined in a longitudinal corner (1c). The first and the second wing (1a, 1b) respectively have longitudinal bases (1a', 1b') that lie on the same plane in order to be fixed to the intrados (102) of the tunnel.

[0038] The first wing (1a) is longer than the second wing (1b). An angle of (α) of approximately 150° - 170° is provided between the first wing (1a) and its longitudinal base (1a'). An angle of (β) of approximately 100° - 130° is provided between the second wing (1b) and its longitudinal base (1b').

[0039] With reference to Fig. 7, the two longitudinal bases (1a', 1b') of the section (1) are suitable for being brought in contact with the surface of the intrados (102) in such a way that the wings (1a, 1b) project from the intrados.

[0040] The two longitudinal bases (1a', 1b') of the section (1) are provided with through holes suitable for being crossed by screw means (V) or other ordinary fixing means suitable for penetrating in the surface of the intrados (102).

[0041] With reference to Fig. 5, the section (1) has a longitudinal axis (L). The section (1) has a first end (10a) that is cut along an orthogonal plane to the longitudinal axis (L) of the section (1), and a second end (10b) provided with a V-shaped notch, in such a way to form a fork (F) between the first wing (1a) and the second wing (1b). The fork (F) has a vertex on the longitudinal corner (1c) between the first and the second wing (1a, 1b).

[0042] With reference to Fig. 2A, when two sections (1) are to be vertically stacked, the first end (10a) of a section (1) is inserted from up downwards inside the fork (F) of the second end (10b) of another section.

[0043] Before firmly fixing the two sections (1) with the screws (V), the installer can determine the mutual incli-

nation between the two sections (that is to say, the inclination between the longitudinal axes (L) of the two sections) by rotating the first end (10a) of the upper section relative to the fork (F) of the lower section. In view of the above, each section can be suitably disposed in order to perfectly adjust to the radius of curvature of the side of the tunnel. With reference to Fig. 2, each duct (C) has the profile of a broken line and can perfectly adjust to the profile of the side of the tunnel.

[0044] The duct (C) intercepts the water that drips from the vault of the road tunnel (100) and conveys it towards the sides of the tunnel into drainage ducts (CD) that are normally provided on the sides of the carriageway (103).

[0045] The length of the first wing (1a) of the section (1) is higher than the length of the second wing (1b), in such a way that the first wing (1a) is directed towards the traveling direction of the motor vehicles, as shown in Fig. 1. Otherwise said, when a motor vehicle (V) travels in a lane of the carriageway, with reference to the intrados on the right-side of the motor vehicle, the motor vehicle firstly encounters the first wing and successively the second wing of the section.

[0046] Because of such an assembly, the light of the headlights of the motor vehicles is reflected with higher efficacy in the first wing (1a) of the section (1). Because of the inclination of the first wing (1a) with respect to the longitudinal base (1a'), the light emitted by the headlights of the motor vehicle is reflected by the first wing (1a) towards the lane wherein the motor vehicle is traveling, thus lighting the road tunnel.

[0047] The section (1) can be made of sheet metal or thermoplastic materials, and in any case with materials capable of reflecting the light of the headlights of the motor vehicles.

[0048] With reference to Figs. 3 and 8, the system (200) also comprises one or more gutters (2) suitable for being fixed to the intrados (101) in the space comprised between two ducts (C). The gutters (2) are preferably suitable for being mounted at different heights in parallel position in order to intercept all the water that drips from the vault.

[0049] Each gutter (2) is disposed in a slightly inclined position relative to a horizontal plane, in such a way that the water intercepted by the gutter (2) flows towards a duct (C).

[0050] The surface of each one of the ducts (C) can be also used for the installation of a plurality of LEDs and/or fire fighting nozzles. In such a case, the space between the duct (C) and the intrados (102) can be used for the concealed installation of the power and/or water supply cables.

Claims

1. System (200) for installing a service system in a road tunnel (100); wherein the tunnel comprises a concrete structure (101) with an arc-shaped cross-section provided with two sides (102) and a vault (104);

   said system (200) comprising a plurality of sections (1) wherein each section (1) of the plurality of sections (1) has a longitudinal axis (L) and a basically "V"-shaped cross-section, and each section (1) comprises a first wing (1a) and a second wing (1b) substantially disposed at 90° and joined in a longitudinal corner (1c); the first and the second wing (1a, 1b) respectively having longitudinal bases (1a', 1b') that lie on the same plane in order to be fixed to the sides of the tunnel; said sections (1) stacked one on top of the other in such a way to generate a duct (c) for the flowing of water, wherein said duct (C) substantially extends in vertical direction on the sides of the tunnel, in projecting position relative to the sides (102) of the tunnel;
   each one of said sections (1) having a first end (10a) that is cut along an orthogonal plane to the longitudinal axis (L) of the section,
   wherein each one of said sections (1) has a second end (10b) with a "V"-shaped notch that originates a fork (F); wherein the fork (F) of a first section (1) is suitable for receiving the first end (10a) of a second section, permitting the vertical stacking of the two sections and an inclination of the longitudinal axis of the second section relative to the longitudinal axis (L) of the first section;
   wherein the fork (F) is formed between the first wing (1a) and the second wing (1b), and the fork (F) has a vertex on said longitudinal corner (1c) between said wings (1a, 1b),
   wherein, in each section, the first wing (1a) is longer than the second wing (1b).

2. The system (200) according to claim 1, wherein an angle (α) of approximately 150° - 170° is provided between the first wing (1a) and the longitudinal base (1a'), and an angle (β) of 100°- 130° is provided between the second wing (1b) and the longitudinal base (1b').

3. The system (200) according to claim 1 or 2, wherein said sections (1) are made of a light-reflecting material.

4. The system (200) according to any one of the preceding claims, comprising at least one gutter (2) suitable for being installed on the sides (102) of the tunnel, in such a way to convey the water inside one of said two ducts (C).

5. The system (200) according to any one of the preceding claims, comprising LEDs provided on said sections (1) and power supply cables of the LEDs provided inside said duct (C).

6. The system (200) according to any one of the preceding claims, comprising water-spraying nozzles provided on said sections (1) and water supply pipes of the nozzles provided inside said duct (C).

7. Method for installing a service system in a road tunnel (100), wherein the tunnel comprises a concrete structure (101) with arc-shaped cross-section with two sides (102) and a vault (104),

said method comprising the following steps:

- providing a plurality of sections (1) wherein each section (1) has a longitudinal axis (L) and a basically "V"-shaped cross-section, and comprises a first wing (1a) and a second wing (1b) substantially disposed at 90 °and joined in a longitudinal corner (1c); the first and the second wing (1a, 1b) respectively having longitudinal bases (1a', 1b') that lie on the same plane in order to be fixed to the sides of the tunnel,
- fixing said sections (1) to the sides (102) of the tunnel, stacked one on top of the other in such a way to generate a duct (C) for the flowing of water, wherein said duct (C) substantially extends in vertical direction on the sides of the tunnel, in projecting position relative to the sides (102) of the tunnel; wherein each section (1) has a first end (10a) that is cut along an orthogonal plane to the longitudinal axis (L) of the section,

wherein each section (1) has a second end (10b) with a "V"-shaped notch that originates a fork (F); wherein the fork (F) of a first section (1) is suitable for receiving the first end (10a) of a second section, permitting the vertical stacking of the two sections and an inclination of the longitudinal axis of the second section relative to the longitudinal axis of the first section;
wherein the fork (F) is formed between the first wing (1a) and the second wing (1b), and the fork (F) has a vertex on said longitudinal corner (1c) between said wings (1a, 1b), and
wherein the sections (1) are fixed to the sides of the tunnel with screw means (V) engaged in the longitudinal bases (1a', 1b') and in the sides of the tunnel,
wherein, in each section, the first wing (1a) is longer than the second wing (1b), and
wherein the sections (1) are disposed in such a way to direct the first wing (1a) towards the forward travelling direction of the motor vehicles in the tunnel, so that when a motor vehicle moves forward in a lane of the carriageway, with reference to the side of the tunnel on the right side of the motor vehicle, the motor vehicle firstly encounters the first wing and successively the second wing.

8. The method of claim 7, wherein the sections (1) are inclined mutually in such a way that the duct (C) has a broken line structure.

9. The method according to claim 7 or 8, comprising the installation of at least one gutter (2) on the intrados (102) of the tunnel, in such a way to convey water inside one of said two ducts (C).

10. The method according to any one of claims 7 to 9, comprising the installation of LEDs on said sections (1) and the provision of power supply cables of the LEDs inside said duct (C).

11. The method according to any one of claims 7 to 10, comprising the installation of water-spraying nozzles on said sections (1) and the provision of water supply pipes of the nozzles inside said duct (C).

Patentansprüche

1. System (200) zum Installieren eines Servicesystems in einem Straßentunnel (100); wobei der Tunnel eine Betonstruktur (101) mit einem bogenförmigen Querschnitt umfasst, die mit zwei Seiten (102) und einem Gewölbe (104) versehen ist;

wobei das System (200) eine Vielzahl von Abschnitten (1) umfasst, wobei jeder Abschnitt (1) der Vielzahl von Abschnitten (1) eine Längsachse (L) und einen im Wesentlichen V-förmigen Querschnitt aufweist und jeder Abschnitt (1) einen ersten Flügel (1a) und einen zweiten Flügel (1b) umfasst, die im Wesentlichen im Winkel von 90° angeordnet und in einer Längskante (1c) verbunden sind; wobei der erste und der zweite Flügel (1a, 1b) jeweils Längsgrundlinien (1a', 1b') aufweisen, die auf der gleichen Ebene liegen, um an den Seiten des Tunnels befestigt zu werden; wobei die Abschnitte (1) aufeinandergestapelt sind, so dass eine Rinne (C) für fließendes Wasser gebildet wird, wobei die Rinne (C) sich im Wesentlichen in vertikale Richtung auf den Seiten des Tunnels, in vorstehender Position in Bezug auf die Seiten (102) des Tunnels erstreckt;
wobei jeder Abschnitt (1) einen ersten Endabschnitt (10a) aufweist, der entlang einer rechtwinkligen Ebene zur Längsachse (L) des Abschnitts geschnitten wird,
wobei jeder der Abschnitte (1) einen zweiten Endabschnitt (10b) mit einer V-förmigen Kerbe aufweist, die eine Gabel (F) bildet; wobei die Gabel (F) eines ersten Abschnitts (1) dazu ge-

eignet ist, den ersten Endabschnitt (10a) eines zweiten Abschnitts aufzunehmen und ein vertikales Stapeln der beiden Abschnitte sowie eine Neigung der Längsachse des zweiten Abschnitts in Bezug auf die Längsachse (L) des ersten Abschnitts zu erlauben;
wobei die Gabel (F) zwischen dem ersten Flügel (1a) und dem zweiten Flügel (1b) gebildet ist und die Gabel (F) einen Scheitelpunkt auf der Längskante (1c) zwischen den Flügeln (1a, 1b) aufweist,
wobei in jedem Abschnitt der erste Flügel (1a) länger ist als der zweite Flügel (1b).

2. System (200) nach Anspruch 1, wobei zwischen dem ersten Flügel (1a) und der Längsgrundlinie (1a') ein Winkel (α) von ungefähr 150° bis 170° vorliegt und zwischen dem zweiten Flügel (1b) und der Längsgrundlinie (1b') ein Winkel (β) von 100° bis 130° vorliegt.

3. System (200) nach Anspruch 1 oder 2, wobei die Abschnitte (1) aus einem lichtreflektierenden Material hergestellt sind.

4. System (200) nach einem der vorstehenden Ansprüche, umfassend mindestens eine Traufe (2), die dazu geeignet ist, auf den Seiten (102) des Tunnels installiert zu werden, so dass das Wasser ins Innere einer der beiden Rinnen (C) geleitet wird.

5. System (200) nach einem der vorstehenden Ansprüche, umfassend LEDs, die auf den Abschnitten (1) bereitgestellt sind, und Stromversorgungskabel der LEDs, die im Inneren der Rinne (C) bereitgestellt sind.

6. System (200) nach einem der vorstehenden Ansprüche, umfassend Wassersprühdüsen, die auf den Abschnitten (1) bereitgestellt sind, und Rohre zur Wasserversorgung der Düsen, die im Innern der Rinne (C) bereitgestellt sind.

7. Verfahren zum Installieren eines Servicesystems in einem Straßentunnel (100), wobei der Tunnel eine Betonstruktur (101) mit einem bogenförmigen Querschnitt umfasst, die mit zwei Seiten (102) und einem Gewölbe (104) versehen ist,

wobei das Verfahren die folgenden Schritte umfasst:

- Bereitstellen einer Vielzahl von Abschnitten (1), wobei jeder Abschnitt (1) eine Längsachse (L) und einen im Wesentlichen V-förmigen Querschnitt aufweist und einen ersten Flügel (1a) und einen zweiten Flügel (1b) umfasst, die im Wesentlichen im Winkel von 90° angeordnet und in einer Längskante (1c) verbunden sind; wobei der erste und der zweite Flügel (1a, 1b) jeweils Längsgrundlinien (1a', 1b') aufweisen, die auf der gleichen Ebene liegen, um an den Seiten des Tunnels befestigt zu werden,
- Befestigen der Abschnitte (1) an den Seiten (102) des Tunnels, die aufeinandergestapelt sind, so dass eine Rinne (C) für fließendes Wasser gebildet wird, wobei die Rinne (C) sich im Wesentlichen in vertikale Richtung auf den Seiten des Tunnels, in vorstehender Position in Bezug auf die Seiten (102) des Tunnels erstreckt; wobei jeder Abschnitt (1) einen ersten Endabschnitt (10a) aufweist, der entlang einer zur Längsachse (L) des Abschnitts rechtwinklig liegenden Ebene geschnitten wird,

wobei jeder Abschnitt (1) einen zweiten Endabschnitt (10b) mit einer V-förmigen Kerbe aufweist, die eine Gabel (F) bildet; wobei die Gabel (F) eines ersten Abschnitts (1) dazu geeignet ist, den ersten Endabschnitt (10a) eines zweiten Abschnitts aufzunehmen und ein vertikales Stapeln der beiden Abschnitte sowie eine Neigung der Längsachse des zweiten Abschnitts in Bezug auf die Längsachse des ersten Abschnitts zu erlauben;
wobei die Gabel (F) zwischen dem ersten Flügel (1a) und dem zweiten Flügel (1b) gebildet ist und die Gabel (F) einen Scheitelpunkt auf der Längskante (1c) zwischen den Flügeln (1a, 1b) aufweist; und
wobei die Abschnitte (1) an den Seiten des Tunnels mit Schraubenmitteln (V) befestigt sind, die die Längsgrundlinien (1a', 1b') und die Seiten des Tunnels in Eingriff nehmen,
wobei in jedem Abschnitt der erste Flügel (1a) länger ist als der zweite Flügel (1b) und
wobei die Abschnitte (1) so angeordnet sind, dass der erste Flügel (1a) in die Vorwärtsfahrtrichtung der Kraftfahrzeuge im Tunnel gerichtet ist, so dass, wenn ein Kraftfahrzeug sich auf einer Spur vorwärtsbewegt, in Bezug auf die Seite des Tunnels rechts des Kraftfahrzeugs, das Kraftfahrzeug erst auf den rechten Flügel und anschließend auf den linken Flügel trifft.

8. Verfahren nach Anspruch 7, wobei die Abschnitte (1) zueinander geneigt angeordnet sind, so dass der Rinne (C) die geometrische Struktur einer unterbrochenen Linie aufweist.

9. Verfahren nach Anspruch 7 oder 8, umfassend mindestens eine Traufe (2) auf der Innenfläche (102) des Tunnels, um Wasser ins Innere einer der beiden Rinnen (C) zu leiten.

10. Verfahren nach einem der Ansprüche 7 bis 9, umfassend das Installieren von LEDs auf den Abschnitten (1) und das Bereitstellen von Stromversorgungskabeln der LEDs im Innern der Rinne (C).

11. Verfahren nach einem der Ansprüche 7 bis 10, umfassend das Installieren von Wassersprühdüsen auf den Abschnitten (1) und das Bereitstellen von Rohren zur Wasserversorgung der Düsen im Innern der Rinne (C).

Revendications

1. Système (200) pour l'installation d'un système de service dans un tunnel routier (100) ; où le tunnel comprend une structure en béton (101) en forme d'arc en section transversale ayant deux intrados (102) et une voûte (104) ;

ledit système (200) comprenant une pluralité de profilés (1) où chaque profilé (1) de la pluralité de profilés (1) a un axe longitudinal (L) et a une forme pratiquement en « V » en section transversale, et chaque profilé (1) comprend une première aile (1a) et une seconde aile (1b) disposées essentiellement à 90° et reliées en un angle longitudinal (1c) ; la première et la seconde aile (1a, 1b) ayant des respectives bases longitudinales (1a', 1b') disposées sur le même plan de façon à être fixées à l'intrados du tunnel ; lesdits profilés (1) étant empilés l'un sur l'autre de façon à créer un canal (C) pour le ruissellement de l'eau, où ledit canal (C) se déploie essentiellement à la verticale sur l'intrados du tunnel, en débordant par rapport à l'intrados (102) du tunnel ;
chacun des susdits profilés (1) ayant une première extrémité (10a) coupée selon un plan orthogonal à l'axe longitudinal (L) du profilé,
où chacun des susdits profilés (1) a une seconde extrémité (10b) avec une entaille en forme de « V », qui origine une fourche (F) ;
où la fourche (F) d'un premier profilé (1) est apte à accueillir la première extrémité (10a) d'un second profilé, en permettant en empilage à la verticale des deux profilés et une inclinaison de l'axe longitudinal du second profilé par rapport à l'axe longitudinal (L) du premier profilé ;
où la fourche (F) est formée entre la première aile (1a) et la seconde aile (1b), et la fourche (F) a un sommet sur ledit angle longitudinal (1c) entre lesdites ailes (1a, 1b),
où, dans chaque profilé, la première aile (1a) est plus longue de la seconde aile (1b).

2. Système (200) selon la revendication 1, où entre la première aile (1a) et la respective base longitudinale (1a') il y a un angle (α) d'environ 150°-170° et entre la seconde aile (1b) et la respective base longitudinale (1b') il y a un angle (β) de 100° - 130°.

3. Système (200) selon la revendication 1 ou 2, où lesdits profilés (1) sont réalisés avec une matière qui réfléchit la lumière.

4. Système (200) selon l'une quelconque des revendications précédentes, comprenant au moins une gouttière (2) apte à être montée sur l'intrados (102) du tunnel de manière à acheminer l'eau dans l'un des susdits canaux (C).

5. Système (200) selon l'une quelconque des revendications précédentes, comprenant des diodes disposées sur lesdits profilés (1) et des câbles d'alimentation électrique des diodes disposées dans ledit canal (C).

6. Système (200) selon l'une quelconque des revendications précédentes, comprenant des buses de distribution d'eau disposées sur lesdits profilés (1) et des tuyaux d'alimentation hydraulique des buses disposés dans ledit canal (C).

7. Méthode pour l'installation d'un système de service dans un tunnel routier (100), où le tunnel comprend une structure en béton (101) en forme d'arc en section transversale ayant deux intrados (102) et une voûte (104),

ladite méthode comprenant les phases suivantes :

- utiliser une pluralité de profilés (1) où chaque profilé (1) a un axe longitudinal (L) et une forme pratiquement en « V » en section transversale et comprenant une première aile (1a) et une seconde aile (1b) disposées essentiellement à 90° et reliées en un angle longitudinal (1c) ; la première et la seconde aile (1a, 1b) ayant des respectives bases longitudinales (1a', 1b') disposées sur le même plan de façon à être fixées aux intrados du tunnel ;
- fixer lesdits profilés (1) à l'intrados (102) du tunnel, empilés l'un sur l'autre, avec la concavité orientée vers l'intrados, de façon à créer un canal (C) pour le ruissellement de l'eau dans ledit canal ; où ledit canal (C) se déploie essentiellement à la verticale sur l'intrados du tunnel, débordant par rapport à l'intrados (102) du tunnel ; où chaque profilé (1) a une extrémité (10a) coupée selon un plan orthogonal à l'axe longitudinal (L) du profilé,

où chaque profilé (1) a une seconde extrémité (10b) ayant une entaille en forme de « V », qui origine une fourche (F) ; où la fourche (F) d'un premier profilé (1) est apte à accueillir la première extrémité (10a) d'un second profilé, en permettant l'empilage à la verticale des deux profilés et une inclinaison de l'axe longitudinal du second profilé par rapport à l'axe longitudinal du premier profilé :

où la fourche (F) est formée entre la première aile (1a) et la seconde aile (1b) et la fourche (F) a un sommet sur ledit angle longitudinal (1c) entre lesdites ailes (1a, 1b) ; et
où les profilés (1) sont fixés à l'intrados moyennant des moyens à vis (V) qui s'engagent dans les bases longitudinales (1a', 1b') et dans l'intrados du tunnel,
où, dans chaque profilé, la première aile (1a) est plus longue de la seconde aile (1b), et
où les profilés (1) sont disposés de manière à orienter la première aile (1a) vers la direction d'avancement des véhicules à l'intérieur du tunnel, de façon que lorsqu'un véhicule avance dans une voie de la chaussée, avec référence à l'intrados qui se trouve à la droite du véhicule, le véhicule rencontre d'abord la première aile et ensuite la seconde aile.

8. Méthode selon la revendication 7, où les profilés (1) sont disposés avec une inclinaison réciproque, de façon que le canal (C) assume une structure géométrique à ligne brisée.

9. Méthode selon la revendication 7 ou 8, comprenant l'installation d'au moins une gouttière (2) sur l'intrados (102) du tunnel de façon à acheminer l'eau dans l'un des deux susdits canaux (C).

10. Méthode selon l'une quelconque des revendications de 7 à 9, comprenant le montage de diodes sur lesdits profilés (1) et l'aménagement de câbles d'alimentation électrique des diodes dans ledit canal (C).

11. Méthode selon l'une quelconque des revendications de 7 à 10, comprenant le montage de buses de distribution de l'eau sur lesdits profilés (1) et l'aménagement de tuyaux d'alimentation hydraulique des buses dans ledit canal (C).

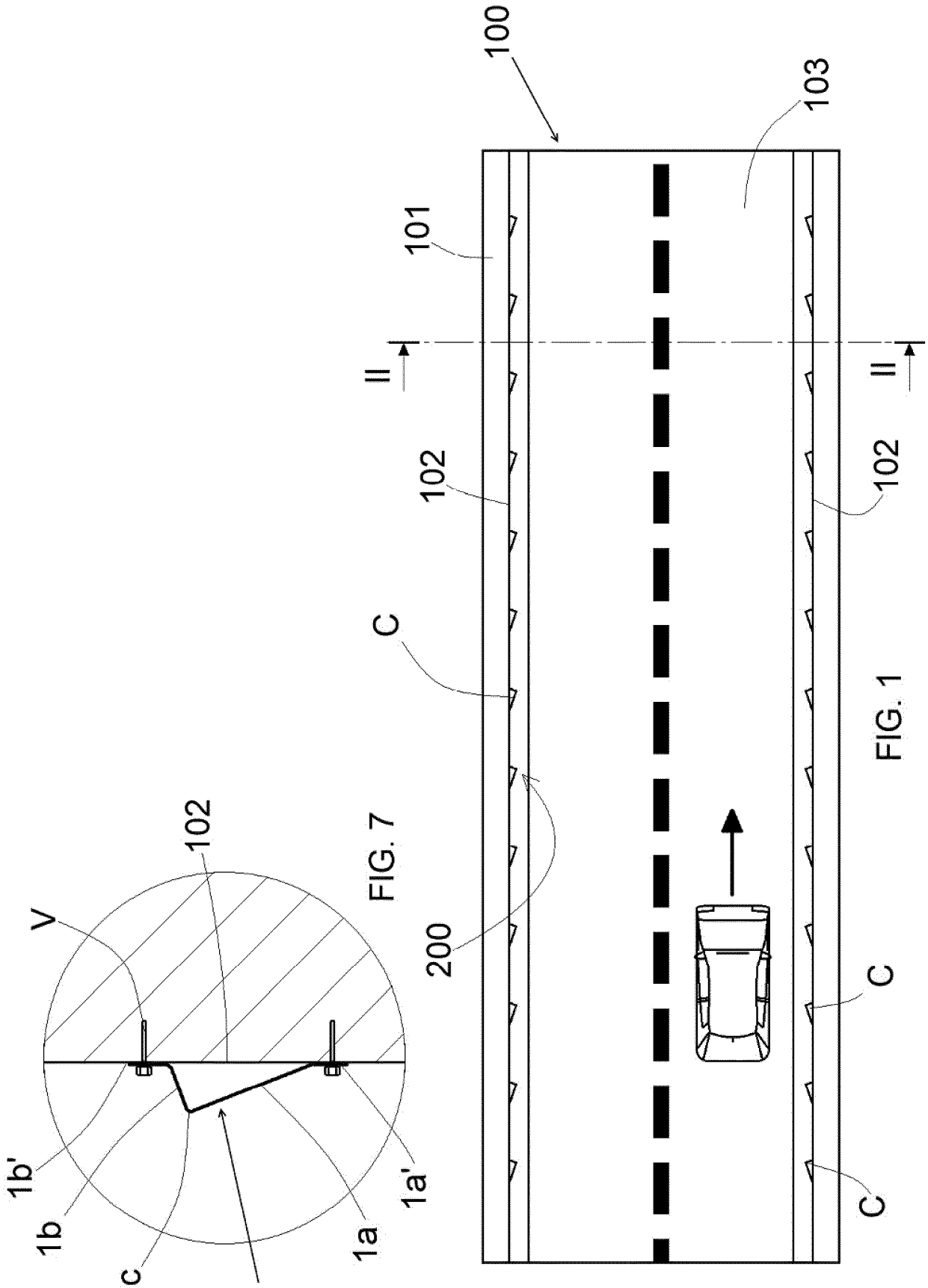

FIG. 1

FIG. 7

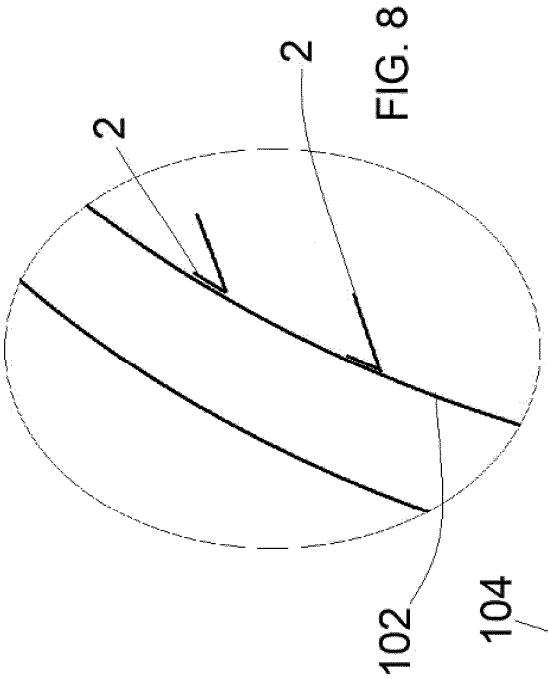

FIG. 8

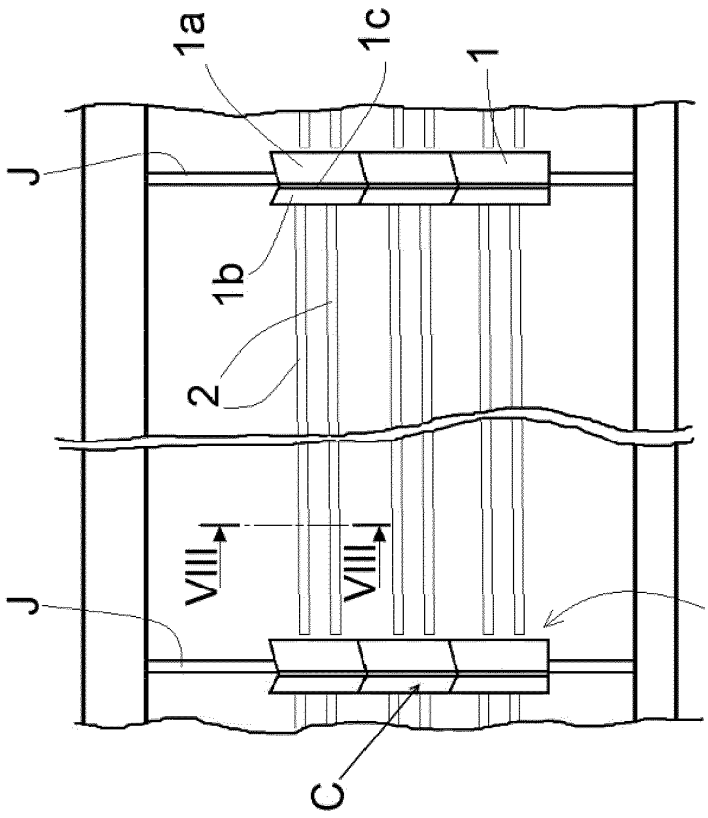

FIG. 3

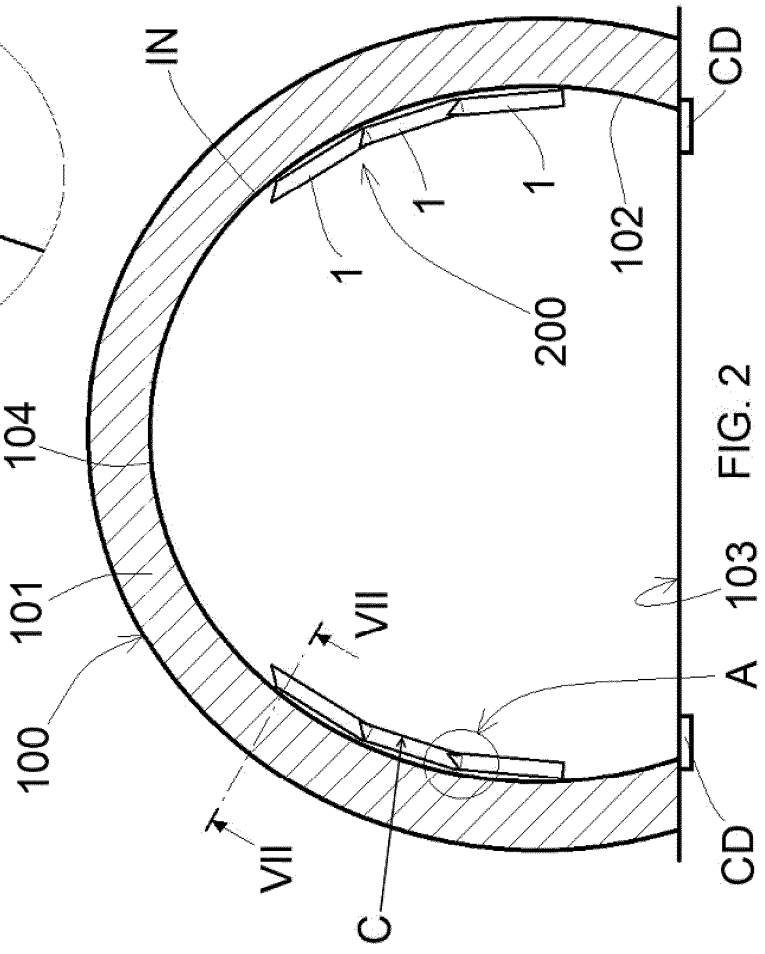

FIG. 2

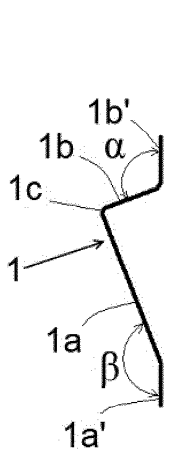

FIG. 6

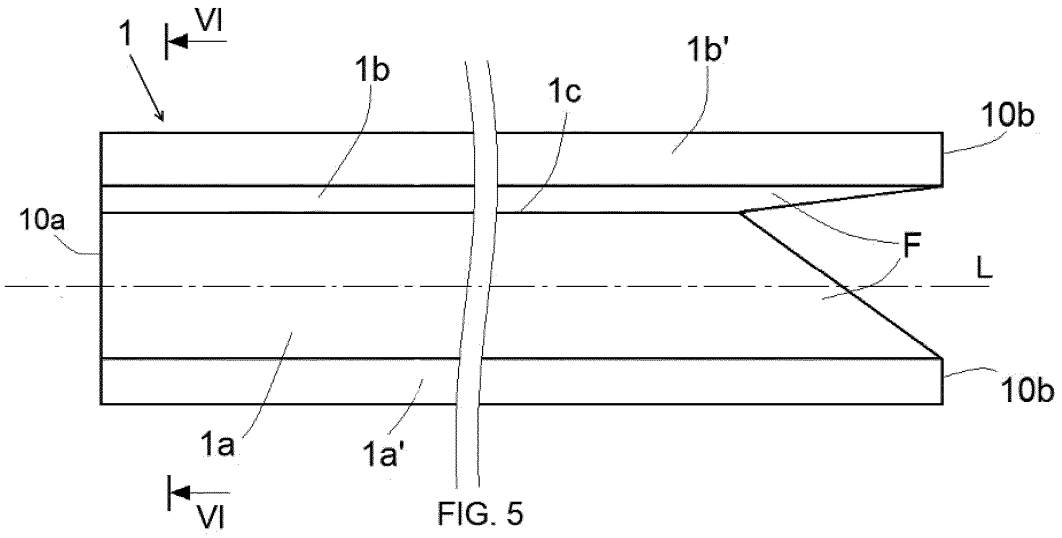

FIG. 5

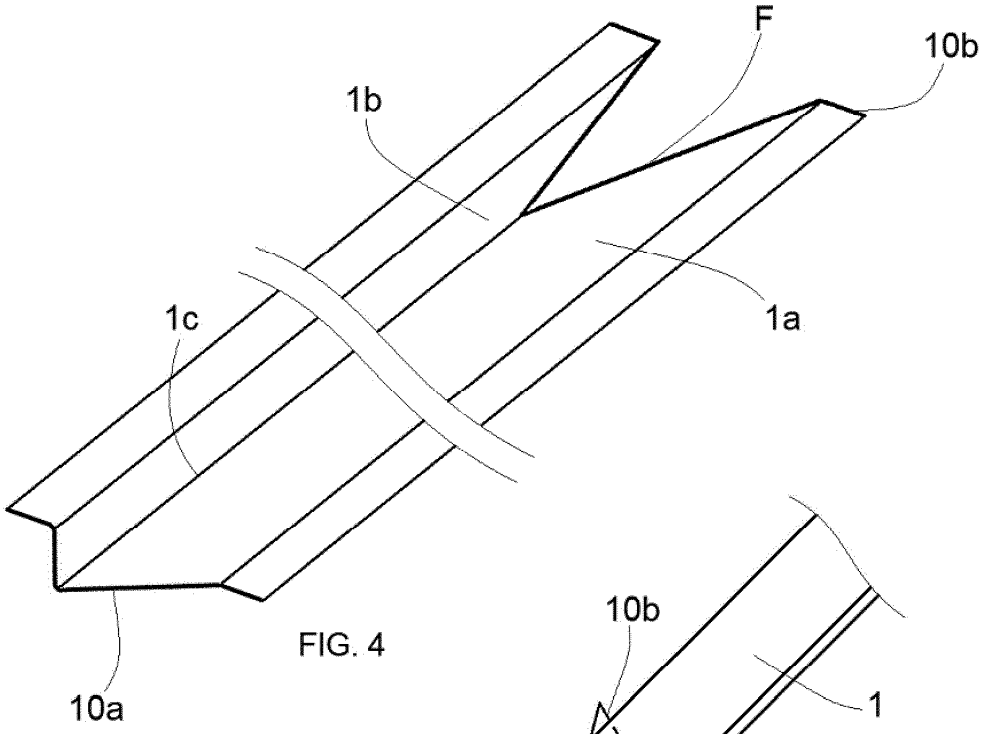

FIG. 4

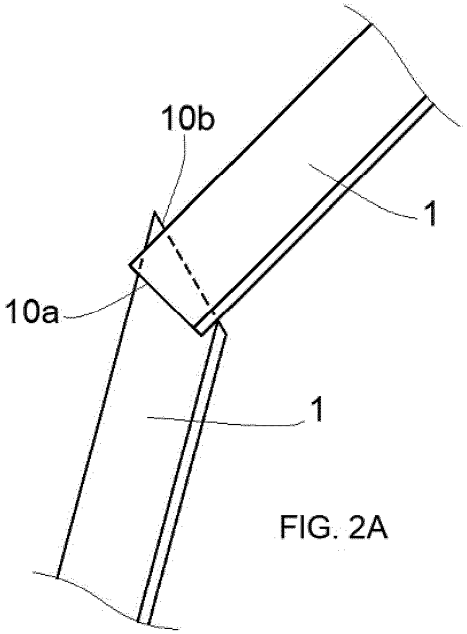

FIG. 2A

REFERENCES CITED IN THE DESCRIPTION

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