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(54) Multi-deck tunnel

(57) The tunnel multi deck is a roadway tunnel of circular cross section (1), with two-way separated, characterized by having two slabs (2) (3) along its full width, one placed roughly at the half height of the tunnel and the other placed slightly above the bottom of the tunnel, in order to create three overlapping galleries, isolated and independent: two identical roadway galleries (4) (5), one for each way of traffic, and a service gallery (6), at the bottom.

The slabs (2) (3) have openings (7), placed close to the circular wall of the tunnel (1), in one or in both sides, regularly spaced and protected with fireguard devices of box type (8), which are connected through closed vertical access galleries (10), to allow for safe passage of people from the roadway galleries (4) (5) to the service gallery (6).

The service gallery (6) is provided with emergency vehicles of shuttle-type (9), circulating suspended from the slab (3), to allow for the access of personnel and the evacuation of people in case of accident or fire inside the tunnel.

Lisbon, October 29, 2009

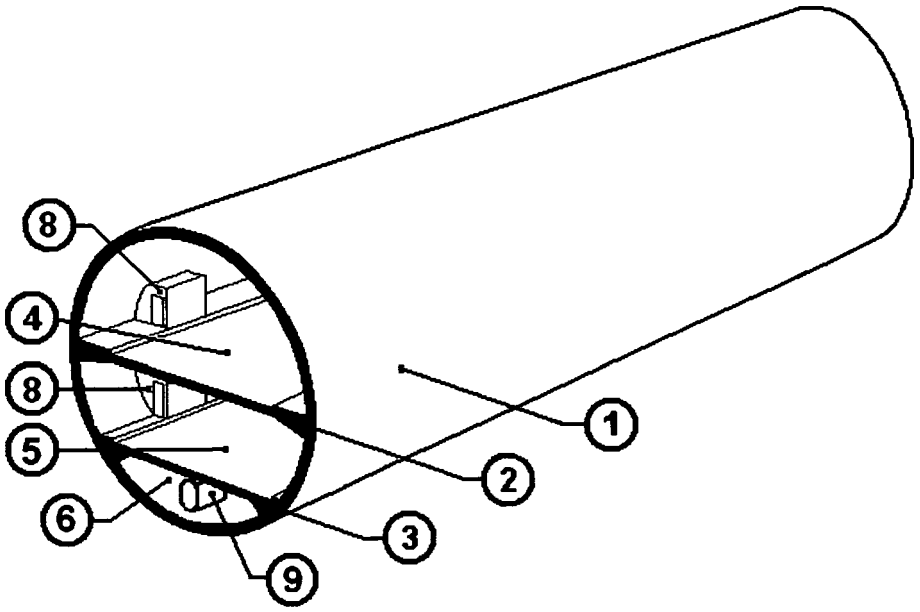

Figure 1

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Description

The former technique

[0001] The construction of roadway tunnels using tunnel boring machines is a solution increasingly used, for both, economic and environmental reasons. With this technique, the machine excavates the soil and places precast segments, in order to form the wall of the tunnel, which becames circular shaped. Subsequently, a filing on the bottom of the tunnel is executed in order to create a platform for the circulation of the vehicles, with the two-way traffic placed side by side.

[0002] In tunnels with more than one lane in each way, the diameter required is unacceptable for the existing tunnel boring machines. Furthermore, in the case of long tunnels, because of safety reasons, the solution is also problematic, being in general necessary to built two separated tunnels, one for each way of traffic. It will also be necessary to build evacuation galleries and/or shafts, regularly spaced along the tunnel, to allow for the evacuation of people in case of accident or fire inside the tunnel.

[0003] Document W02004094785 refers a circular tunnel with two independent roadway galleries, one for each way of traffic, but they are very much different, still being necessary to build a second tunnel. Document EP1191186A1 also refers a circular roadway tunnel with two levels provided with separating walls, but each level carries a single lane in each way, and the upper level only allows for the traffic of car passengers.

Technical domain of the invention

[0004] The present invention constitutes an innovative solution for the construction of roadway tunnels of circular section, with two-way traffic, allowing for the creation of two independent and identical roadway galleries, for all kinds of traffic, and a service gallery interconnected with them, in order to provide local access for the personnel and the evacuation of people in case of accident or fire inside the tunnel.

Description of the figures

[0005] This invention is illustrated in Figures 1, 2, 3, 4 and 5. Figure 1 shows a view of the tunnel. Figure 2 shows the current cross section of the tunnel. Figure 3 shows the cross section of the tunnel through a vertical access gallery. Figure 4 shows the longitudinal section of the tunnel. Figure 5 shows the plan of the tunnel at the upper roadway gallery.

Detailed description of the invention

[0006] The tunnel boring machine excavates the soil and places precast segments, which are clamped together, in order to form the wall of the tunnel (1), which is circular shaped.

[0007] Inside the tunnel, two slabs (2) (3) are executed, along its full width, one placed roughly at the mid high of the tunnel and the other placed slightly above the bottom of the tunnel, creating three overlapping galleries, isolated and independent: two identical roadway galleries (4) (5), one for each way of traffic, and a service gallery (6).

[0008] In the slabs (2) (3) openings (7) are arranged, placed closed to the circular wall of the tunnel (1), in one or in both sides, regularly spaced, and protected with fireguard devices of box type (8), provided with escape doors. The fireguard devices (8) on each side, are connected through closed vertical access galleries (10), which are provided with interior stairs, in order to allow for safe passage of people between the roadway galleries (4) (5) and the service gallery (6). The vertical access galleries (10) can be extended through the circular wall of the tunnel (1).

[0009] Inside the service gallery (6), emergency vehicles of shuttle type (9) are installed, which may circulate suspended from the slab (3), to provide local access of personnel and the evacuation of people in case of accident or fire inside the tunnel.

Lisbon, October 29, 2009

Claims

1. Roadway tunnel of circular wall (1), **characterized by** having two slabs (2) (3), one placed roughly at the half height of the tunnel and the other placed slightly above the bottom of the tunnel, in order to create two independent and identical roadway galleries, and a service gallery, which disposes of openings (7), regularly spaced and placed along the circular wall (1), in one or both sides, protected with fire devices of box type (8), provided with escape doors.

2. Tunnel according to claim 1, **characterized by** the fireguard devices of box type (8), on each side, to be connected through closed vertical access galleries (10), which are provided with interior stairs, to allow for safe passage of people between the roadway galleries (4) (5) and the service gallery (6).

3. Tunnel according to claims 1 and 2, **characterized by** the service gallery (6) to be provided with emergency vehicles of shuttle type (9), which may suspended from the bottom slab (3), to allow for local access and the evacuation of people.

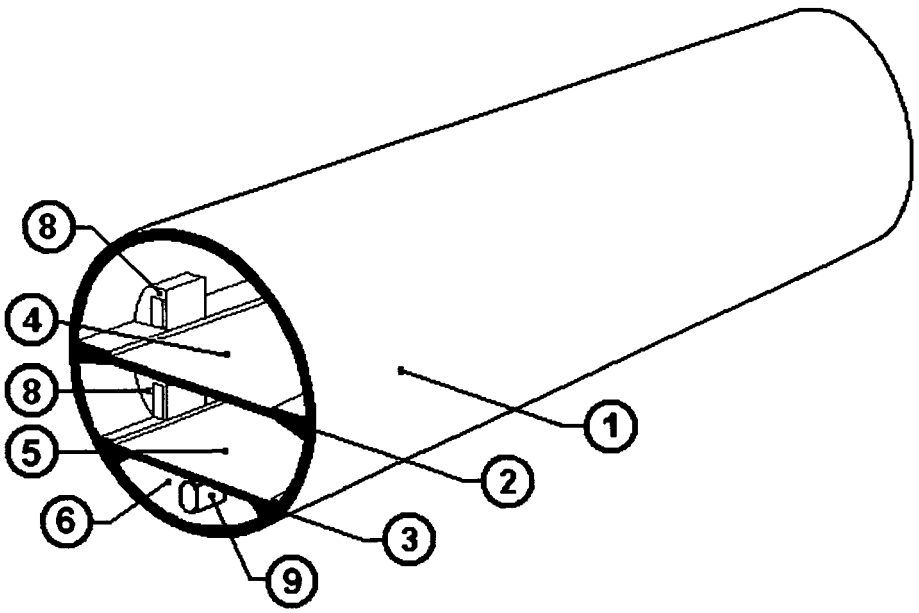

Figure 1

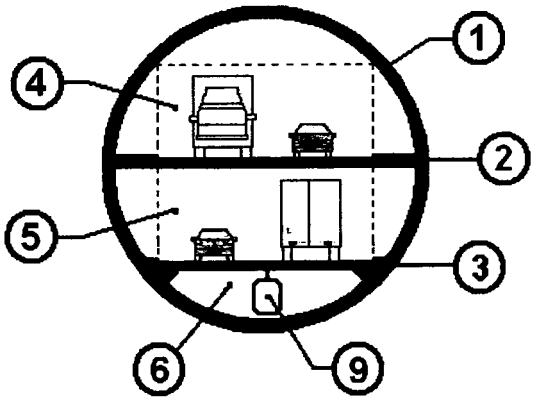

Figure 2

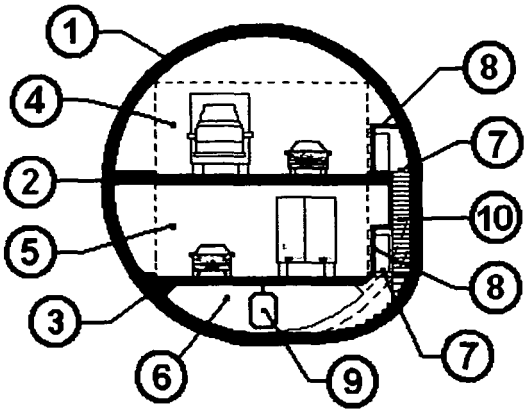

Figure 3

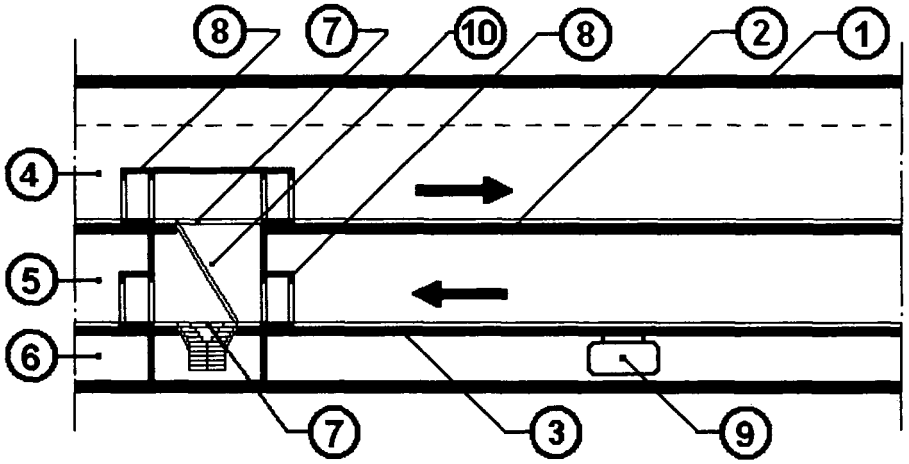

Figure 4

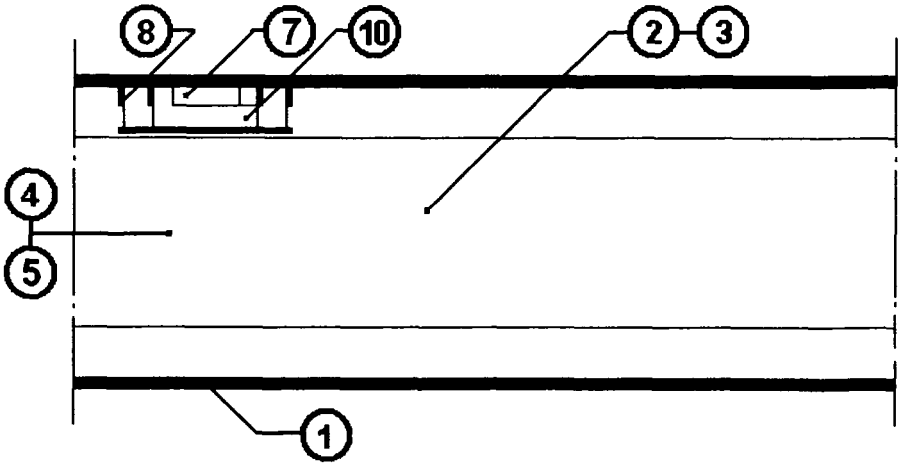

Figure 5

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EUROPEAN SEARCH REPORT

Application Number
EP 09 07 5489

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	WO 2009/002199 A1 (POMPEU SANTOS SILVINO [PT]) 31 December 2008 (2008-12-31) * the whole document *	1-3	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 May 2010	Morrish, Susan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 07 5489

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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12-05-2010

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

REFERENCES CITED IN THE DESCRIPTION

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- WO 2004094785 A **[0003]**
- EP 1191186 A1 **[0003]**