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(54) Prefabricated panels for lining road tunnels

(57) The instant invention concerns a panel to be used for covering the internal walls of road tunnels, made up of a prefabricated reinforced concrete structure (1) which is slightly curved towards the top and which incorporates a layer of ceramic tiles (2) or other equivalent material on the whole of its inside concave surface.

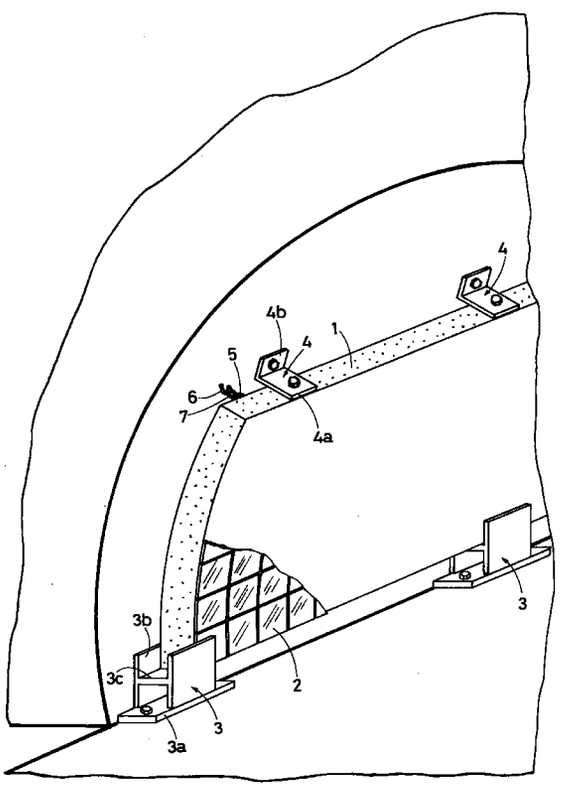

FIG. 1

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Description

The instant patent application for an industrial invention concerns a prefabricated panel which incorporates a front layer of ceramic tiles or equivalent material, to be used for covering the internal walls of road tunnels.

The product in question was designed in order to increase the intrinsic brightness of the internal walls of road tunnels and at the same time to improve their appearance as concerns the quality of the surface finish.

As is known, conventional road tunnels, being made of concrete structures, have internal walls which are unfinished and of a rather dark colour; for this reason, conventional tunnels are characterised by their practical inability to diffuse light and consequently visibility is very limited inside, not only at night but also during the daytime.

Consequently, at the present time, for safety reasons, it is not possible to do without very high powered electric lighting systems inside the road tunnels, which are extremely costly to maintain and supply.

In an attempt to solve this problem, if only in part,the opposite sides of the tunnels have been painted white up to a height of two-three metres; it is obvious that the clear colour of the tunnel sides would be expected to improve internal visibility and above all the ability to diffuse more light.

It should in any case, be observed that this solution has not been able to provide really efficient results in practical terms, since it is known that the sides of any road tunnel - even more so, if they have been painted white - tend to be constantly soiled by the exhaust fumes of the vehicles in transit, as well as by the dust, mud and water inevitably raised by said vehicles, and therefore, to lose any ability to diffuse light.

The panel, according to the invention provides a solution which is able to increase the intrinsic brightness of the tunnel inside walls and more importantly, to increase the ability of the tunnel itself to diffuse light.

As anticipated, the product in question is a concrete panel with a slightly curved shape, able to follow the normal curve of road tunnel walls; said panel can be produced in any required length, as long as this is in conformity with the requirements of transport and laying and of such a height as to be able to cover the higher sections of the tunnel inside walls.

In any case, it is simple to comprehend that by mounting a series of said panels side by side, it is possible to cover the whole length of the tunnel sides up to the required height, normally two-three metres.

As mentioned, these new concrete structures are charcterised by the fact that a front covering of ceramic tiles is incorporated, these having a particularly shiny and glossy surface; taking into consideration the aim of the product, it is clear that tiles in white or other light colours would be preferable.

So it is easy to understand that once this ceranic covering has been mounted on the sides of road tunnels, it produces the effect of efficiently diffusing the light produced by the fixed lighting systems, and by the headlights of the vehicles in transit and, therefore the intrinsic brightness inside tunnels is considerably increased.

This means that a tunnel fitted with the panels according to the invention could be lit in an entirely satisfactory manner, even if much lower powered lighting systems are used, than those necessary to light conventional tunnels, and thus with the advantage of considerably saving electric energy.

Moreover, it is obvious that the ceramic covering of the panel according to the invention is also likely to get soiled during vehicle transit and therefore its ability to diffuse light will be reduced; however the absolute smoothness and perfect surface uniformity of this covering make periodical cleaning operations much simpler and faster.

To this end, it may be possible to use service vehicles equipped with large brushes on a vertical axis and water jets mixed with solvents, which move through the tunnel and are able to carry out the continuous washing and cleaning of the ceramic covering on the sides of the tunnel.

Also of importance is the fact that the panel according to the invention, provides a more attractive surface finish to the sides of tunnels, due to the fact that it succeeds in hiding any ugly surface imperfections often observed on the unfinished walls of tunnels, and also any cable or piping which is often fitted inside tunnels.

For further clarity of explanation, the description proceeds with reference to the attached drawing, reproduced for illustrative and not limitative purposes, in which Fig.1 is an axonometric representation of a sample panel mounted to the inside wall of a tunnel.

With reference to the attached drawing the product in question is made up of a concrete panel (1); in actual fact said panel (1) is not perfectly flat, but is slightly curved towards the top to conform with the normal curved shape of the tunnel sides onto which it will have to mounted.

This panel (1) which is normally greater in length than in height, at its front concave surface incorporates a layer (2) of ceramic tiles or equivalent material.

In a preferred embodiment, said layer of tiles (2) is incoporated with the concrete panel (1) in the same phase as the latter is consolidated; to this end, it is necessary that the layer (2) of tiles be arranged in the same mould used to form the panel (1), before casting the concrete,

From the same figure 1, it can be noted that the panel in question (1) is mounted in a stable position slightly forward with respect to the side of the tunnel by means of supports (3) and stirrups (4).

In fact, the lower longitudinal edge of the panel (1), must be inserted within a series of "H" shaped supports

(3) fitted to the road immediately in front of the tunnel sides.

Each of said supports (3) is made up of a base plate (3a), with a pair of holes within which to fit the screws for fixing to the ground, from which there protrude vertically and in the longitudinal direction, two ribs (3b), parallel to each other, and linked about half way up, by a small horizontal wall (3c).

Said horizontal wall (3c) and the two sections of vertical ribs (3b), can be considered a small fork intended to sustain at the horizontal wall (3c), the lower edge of the panel (1) and to prevent it, by means of the two opposite vertical walls (3b), from moving either forwards or backwards.

Should the two identical panels (1) have to be fitted side by side, a single support (3) can be used for both; in this case, half of its horizontal wall (3c) will be used to support the righthand panel and half to support the lefthand panel.

It is pointed out that these special supports (3) were designed in order to sustain the lower longitudinal edge of the panel (1) at a certain height from the ground, in such a way as to allow any water which may drip from the sides of the tunnel to collect below the panel and to drain away in the sewage systrem of the tunnel itself.

The upper longitudinal edge of the panel according to the invention (1) is fixed to the wall of the tunnel by means of "L" shaped stirrups (4) with perforated ribs, of which the first rib (4a) is fixed to the top of the panel (1) and the second rib (4b), perpendicular to the first, is fixed to the wall of the tunnel.

The fixing of the panel according to the invention (1), is completed as a precautionary measure, by means of two loops, one (5) fixed to the back of the panel - not far from the top - and the other (6) fixed to the wall of the tunnel; these two rings are used to pass through and fix a steel cable (7) which prevents the panel or any part of it, from ending up in the middle of the road, should the panel be hit accidentally and damaged by a vehicle in transit.

In any case, it is obvious that while remaining within the scope of the instant invention, different fixing and support means for the panel from those just described could be used; in fact it would even be possible for the lower longitudinal edge of the panel to be positioned directly on the ground.

Even if this description has so far been presented with exclusive reference to a panel made of reinforced concrete, it is specified that the instant inventive concept could find just as efficient and practical an embodiment - even if this would be more costly - if the front covering layer were to be applied to a bearing panel made of plastic material, metal or any other suitable material apart from reinforced concrete.

Claims

1. Panel with a front layer of ceramic tiles or other equivalent material, to be used for covering the internal walls of road tunnels, characterised by the fact that it consists of a prefabricated panel (1) made of reinforced concrete which is slightly curved towards the top and which incorporates, over the entirety of its internal concave surface, a layer (2) of ceramic tiles or other suitable material;

2. Panel with a front layer of ceramic tiles or other material, to be used for covering the internal walls of road tunnels, according to Claim 1, characterised, in an alternative embodiment, by the fact that its bearing structure is made of any suitable material apart from reinforced concrete.

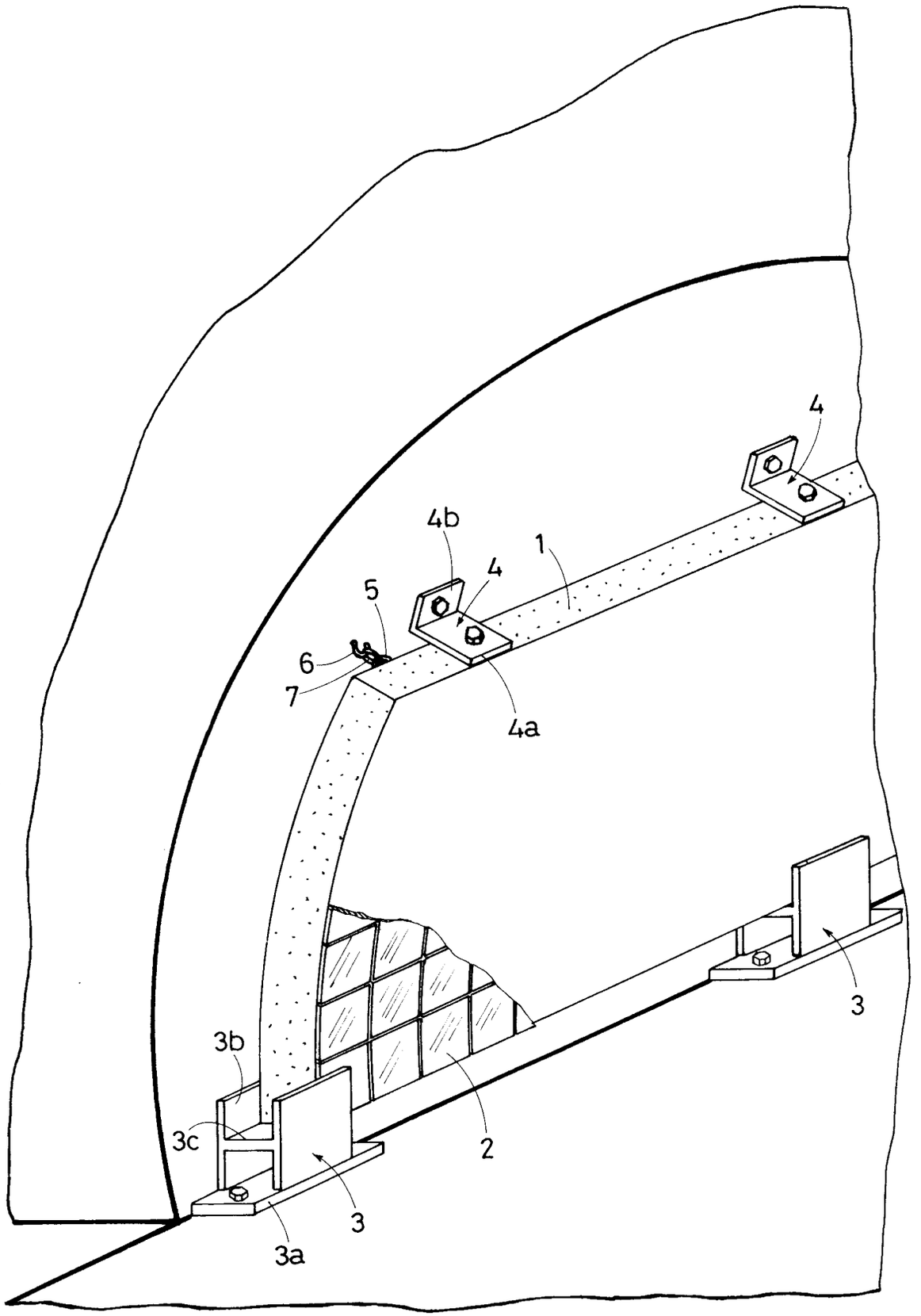

FIG. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 95 83 0222

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	FR-A-1 401 214 (LINO FOCHESATO) * the whole document *	1	E21D11/00
Y		2	
Y	EP-A-0 608 472 (NISSHIN CHEMICAL) * the whole document *	2	
A	GB-A-1 184 651 (ESCOL PANEL) * the whole document *	1,2	
A	EP-A-0 278 326 (BITRA AG)	1,2	
A	NL-A-9 100 713 (TRICALA CO.)	1,2	
A	FR-A-2 063 774 (LE PROYECTEUR STANDARD) * the whole document *	1,2	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 October 1995	Fonseca Fernandez, H

CATEGORY OF CITED DOCUMENTS

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