Sept. 24, 1929. F. S. HONBERGER 1,729,256

PROTECTED CONCRETE BLOCK FOR PAVING AND THE LIKE

Filed Sept. 13, 1926

Fig. 1.

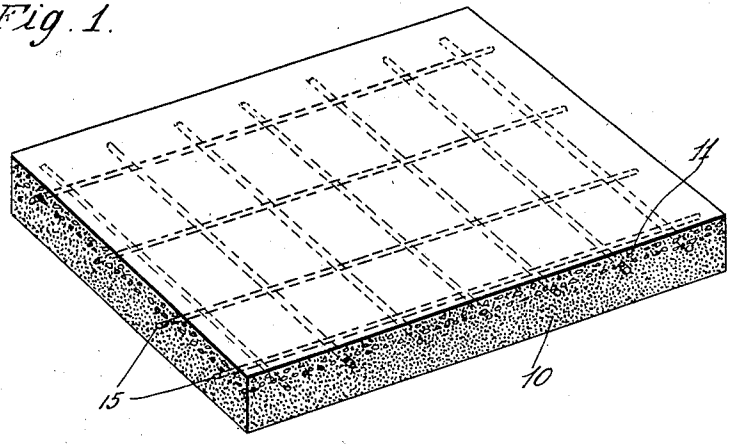
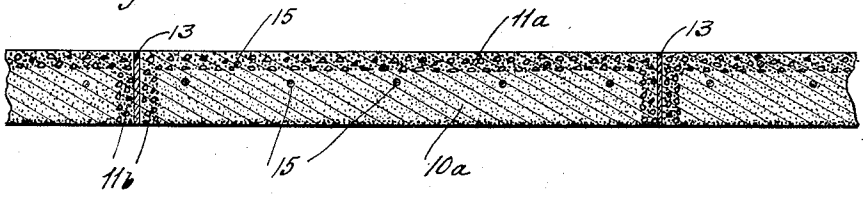


Fig. 2.



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UNITED STATES PATENT OFFICE

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PROTECTED CONCRETE BLOCK FOR PAVING AND THE LIKE

Application filed September 13, 1926. Serial No. 134,994.

This invention has reference to the art of impregnated concrete articles or bodies, impregnated for instance with a substance that renders the concrete water-proof and immune to chemical or other deteriorative actions and preserves the original strength and other qualities of the concrete.

I have described in my two Letters Patents No. 1,555,208, entitled Method and apparatus for treating concrete, issued September 29, 1925, and No. 1,555,209, entitled Method of treating concrete, issued September 29, 1925, certain methods that have been successively employed for impregnating a concrete or other porous body with asphalt or similar substances, so that the asphalt impregnates and fills the interstitial spaces of the concrete preventing the entry of any gases or liquids that may have deteriorative action. The method described in these patents is one that involves subjection of the pre-cast concrete body to a heated liquid bath of asphalt or the like, and the forcing of the asphalt into the concrete body by differences in pressure inside and outside the body. For instance the asphalt may be forced in either by lowering the vapor or air pressure within the concrete body or by applying external pressure to force the asphalt in, or by both methods.

However, as I have said in a companion application filed August 28, 1926, bearing Serial Number 132,073, entitled Protected concrete pile and method of making same, it is more or less necessary, or at least desirable, that concrete to be easily impregnated to any substantial depth, should have some substantial porosity. Although an extremely dense concrete can be impregnated deeply by the method above referred to, high pressure differences must be used or the time element of impregnation becomes excessive; whereas a concrete with an appreciable porosity can be impregnated at low pressures in a short time. Engineering specifications, especially as regards certain works, require a comparatively dense concrete. However, it is well recognized that in practice concrete cannot be made uniformly so dense as to prevent entrance of liquids and gases into interstitial spaces; and thus the densest concrete needs protection as well as does concrete that is more porous.

The general object of the invention concerned in this application is to provide a concrete formation that can be made to suit any desired specifications and at the same time can be entirely fully protected against all kinds of deterioration and also, for instance, against such abrasive wear as takes place on a roadway.

Said companion application deals with this same general invention and covers the broader subject matter common to both applications, with specific subject matter relating particularly to a concrete pile constructed in accordance with this invention and having a surrounding envelope or sheath of relatively porous impregnated concrete. The present application, on the other hand, is directed more particularly to elements or articles in the form of blocks or slabs having characteristically a facing of relatively porous impregnated or protected concrete. Specifically the more particular subject matter of this application is a concrete paving slab composed of what may be termed two integral or monolithic courses, the lower of which is designed to have in a maximum degree those qualities of strength requisite in a slab used for roadway purposes, and the upper course of which is composed of a substantially porous concrete interstitially impregnated with asphalt or the like so as to present an upper wearing surface that resists abrasion better than the plain concrete, and also to afford an impervious upper stratum or layer which protects the lower stratum or layer against deterioration. Further, and more specifically, the lower course may also be impregnated to some extent; enough for protection against the action of soil water and other substances.

With the foregoing in view I shall now proceed to a more detailed description of typical forms embodying the invention, reference for that purpose being had to the accompanying drawings, in which:

Fig. 1 is a perspective illustrating a typical form of paving slab in accordance with my invention; and

Fig. 2 is a section showing a modified form.

In the drawings the paving slab shown in Fig. 1 has a lower course or layer 10 of concrete that has been mixed in accordance with any desired specifications. As a general rule this lower course 10 will, to the end of obtaining maximum strength, be comparatively dense and of little porosity. The reinforcing bars 15, if any, are desired, will preferably be cast within lower layer 10 or cast within both that lower layer and the upper layer 11. The upper layer 11 will be formed of concrete mix adapted to obtain a substantial degree of porosity for the purpose of allowing ready impregnation. The two layers are cast substantially at once so that they may set together to form a monolithic slab. For instance, the mix for the lower dense layer may be first placed in a suitable form and tamped if desired. Then the mix for the upper porous layer will immediately be laid and preferably tamped so as to put it into intimate contact with the mix of the lower layer throughout the whole area of contact. Then the two layers are allowed to set and are cured simultaneously; so that the resultant slab is one that is monolithic in all physical respects, but has an upper relatively porous layer and a lower layer of concrete of such characteristics as are desired for purposes of great strength.

At any time after the slab has set, but preferably after it has cured sufficiently to approach its mamixum strength, the upper layer is then impregnated with a suitable impregnating and protective substance, as for instance asphalt. This is done by placing the whole slab in a liquid hot bath of asphalt, and either forming an interior vacuum within the interstitial spaces by cooling the slab in the asphalt to cause the asphalt to be drawn into the porous layer, or by applying pressure to the asphalt to force it into the interstitial spaces, or by using both methods. Whatever details of method may be followed the final result is a two layer monolithic concrete slab with a lower layer of great strength and with an upper layer impregnated with the protective substance and preferably completely so impregnated. Preferably such slabs are made of hydraulic cement concrete. During the impregnation operation the lower dense layer may, and usually will, be to some slight extent also superficially impregnated with the protective substance; and it is beneficial that it may be to some extent so impregnated. It is characteristic, however, that while the upper porous layer is completely filled with the asphalt and other protecting substances, the lower layer will usually not be impregnated to any great depth.

When such slabs are used for pavement purposes they will be laid on any suitable foundation and the slight openings at their abutting edges may be filled with asphalt or the like. The complete pavement is then composed of the lower dense, structurally strong, layer, and the upper protective layer. This upper protective layer not only protects the entry from above of all substances that may be deteriorative of the concrete or of the reinforcing iron or steel contained within it, but the upper layer also presents an excellent wearing surface that is superior to either asphalt or asphalt concrete alone, or to hydraulic cement alone. Where roadways are laid exclusively of hydraulic cement concrete their surfaces are subject to much abrasive wear, the wear causing powdering of the surface. On the other hand, roadways laid exclusively of asphalt or asphaltic concrete are subject to distortion by pressures. With my improved roadway the concrete is protected against abrasive wear by the asphalt and the asphalt is protected against pressure distortion by the structurally strong concrete.

At the same time that the slab is protected against physical deterioration, it is protected fully against chemical disintegration, because it is, to some extent at least, impregnated over its entire outer surfaces. The dense layer is always to some extent impregnated along with the porous layer; and that impregnation, though it may be relatively slight, is sufficient to prevent contact with or entry of soil waters, alkalies, etc., which would otherwise react detrimentally on the concrete.

In Fig. 2 a slightly different structure is shown wherein the lower dense layer 10^a is not only surfaced at the top by the relatively porous and impregnated layer 11^a, but is also faced around the edges by edge extensions 11^b of the relatively porous impregnated layer. Such extensions of the protective layer prevent any deteriorative action reaching the lower unimpregnated layer through the slight cracks left between abutting edges of the slab. And as I have said before, these slight cracks as illustrated at 13 may be filled with asphalt or other suitable material.

I claim:

1. A hydraulic cement concrete pavement slab, consisting of a lower layer of relatively great denseness and little porosity, and an upper layer, monolithic with the lower layer, of relatively greater porosity and forming the upper wearing face of the slab, said upper layer being interstitially impregnated with asphaltum.

2. A hydraulic cement concrete pavement slab, consisting of a lower layer of relatively great denseness and little porosity, and an upper layer, monolithic with the lower layer, of relatively greater porosity and forming the upper wearing face of the slab, said upper layer being impregnated interstitially with a normally solid water-proofing material.

3. A hydraulic cement concrete pavement slab, consisting of a lower layer of relatively

great denseness and little porosity, and an upper layer, monolithic with the lower layer, of relatively greater porosity and forming the upper wearing face of the slab, said upper layer being completely interstitially impregnated with asphaltum and thus presenting a wearing surface composed of a composite of concrete and asphaltum.

4. A hydraulic cement concrete pavement slab, consisting of a lower layer of relatively great denseness and little porosity, and an upper layer, monolithic with the lower layer, of relatively greater porosity and forming the upper wearing face of the slab, said upper layer being impregnated interstitially with a normally solid water-proofing material, and the lower layer of the slab being superficially impregnated with the same material.

5. A hydraulic cement concrete pavement slab, consisting of a lower layer of relatively great denseness and little porosity, and an upper layer, monolithic with the lower layer, of relatively greater porosity and forming the upper wearing face of the slab, said upper layer being completely interstitially impregnated with asphaltum and thus presenting a wearing surface composed of a composite of concrete and asphaltum, and the lower layer of the slab being superficially impregnated with asphaltum.

6. A hydraulic cement concrete pavement slab, consisting of a lower layer of relatively dense concrete, and an upper layer, monolithic with the lower layer, of relatively porous concrete, the slab being impregnated with asphaltum over its entire superficial surface and the upper porous layer having its interstitial spaces impregnated with asphaltum.

In witness that I claim the foregoing I have hereunto subscribed my name this 1st day of September, 1926.

FRANK S. HONBERGER.