July 11, 1933. E. C. WALLACE 1,918,155

ROAD SURFACING

Original Filed Oct. 30, 1929

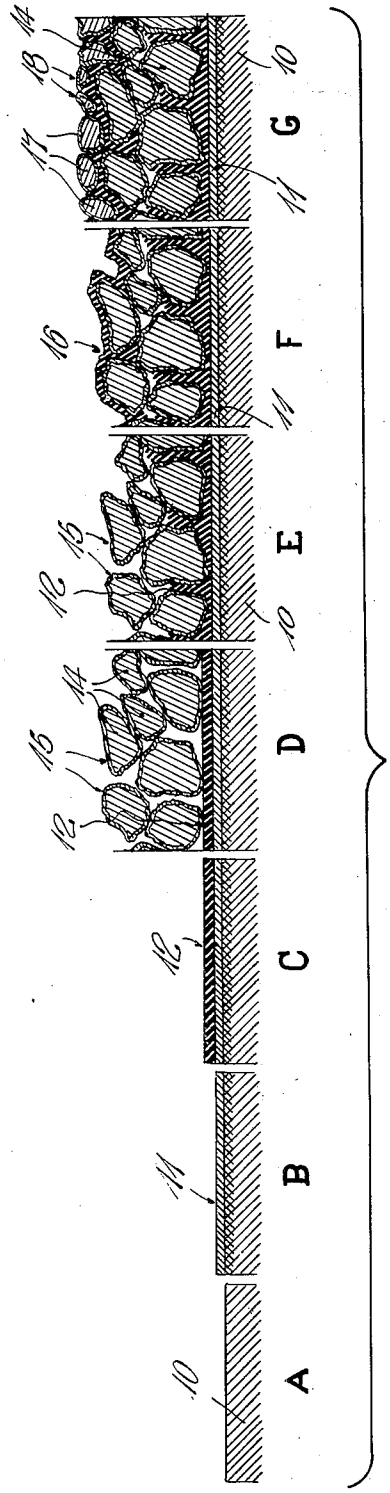


FIG. 1

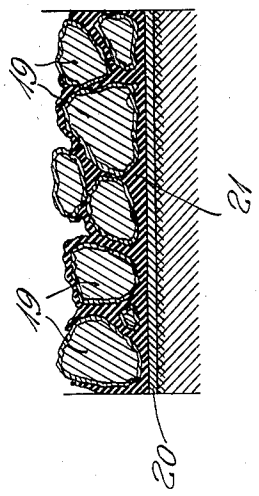


FIG. 2

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UNITED STATES PATENT OFFICE

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ROAD SURFACING

Continuation of application Serial No. 403,657, filed October 30, 1929. This application filed December 21, 1931. Serial No. 582,461.

The object of this invention is to provide a road surfacing which, though relatively light and cheap, has superior qualities and is well adapted for use either in new construction where a relatively light and inexpensive pavement is desired on roads, bridges and the like, or as a new surfacing to be applied over previously laid worn pavements or roads, to protect and prolong the life thereof, or to provide thereon a non-skid or anti-slip surface.

This application is a continuation of my application Serial No. 403,657 filed October 30, 1929.

In my Patent No. 1,740,718, application for which was co-pending with the aforesaid application of which this is a continuation, I have described a method of road construction by the so-called "penetration" process, an essential feature of which method is the coating with oil of stone elements used in constructing the pavement prior to the application thereto, by the penetration method, of a coating of bituminous cement. I have found that the treatment of the stone with oil in this manner greatly facilitates the spreading and distribution of the subsequently applied bituminous cement over the surfaces of the stone particles throughout the body of the layer and greatly improves its adhesion to the stone particles. This improved result I believe to be due to a decrease in surface tension of the cement at the points where it comes in contact with the oiled stone. The asphalt is softened at the surfaces where it comes in contact with the stone without a material softening of the body of bituminous cement as a whole. By this method I am enabled, as stated in said patent, to use bituminous cement of harder consistency than has heretofore been used in the construction of roads by the penetration method, with resulting advantages, also I am enabled to lay a thin layer requiring use of small stone with correspondingly smaller interstices through which the asphalt cement must pass.

In my said patent I have described a process which is particularly adapted for new construction, the pavement being built up by successive layers of oil-coated stone elements with intermediate layers of bituminous cement.

The present invention, while employing the advantageous principle of precoating the stone elements with oil, as described in the said patent, is more particularly designed for use as a surfacing on old roads or pavements, such as sheet asphalt, bituminous concrete, Portland cement concrete or old macadam or gravel roads, although it is also applicable and advantageous for new pavement construction.

In many cases, particularly where the work to be done is the resurfacing of old pavements, a single main layer of stone, bound together by bituminous cement, is adequate, there being added preferably, however, a thin finishing course of finer stone elements; and in such cases the preliminary treatment to which the present invention is directed is of especial value.

This preliminary treatment consists of cleaning the old surface by sweeping or otherwise, then heavily sprinkling or drenching it with oil and then, after an interval of thirty minutes or longer, applying a coat of the same bituminous cementing medium which is later applied to the layer of road metal.

This preliminary treatment may be varied by substituting a coat of thin cold paint, applied at the rate of ten (10) to eighteen (18) sq. yds. per gallon of paint and, after it has been allowed to dry until it becomes tacky, applying a thicker coat of paint which is preferably much more viscous and applied hot.

The subsequently applied coating of bituminous cement, which I call the "tack coat," is aided, by the previous application of the prime coat, to adhere firmly to the surface of the old pavement, or base and when a layer of oil-coated stone is now applied over this "tack coat", the latter constitutes a firm bond between the underlying surface and the newly applied layer of surfacing material, the stone of the new surfacing being compacted into and firmly anchored in the tack coat and the bituminous material of the tack coat being forced upwardly, to some extent, into the interstices between the stone

elements, its penetration into the interstices of the layer and its adhesion to the stone of the layer being facilitated by the previously applied oil treatment of the stones.

While the application of the prime coat is advantageous, it is not in all cases essential.

In the accompanying drawing Fig. 1 is a view illustrative of the succession of steps employed in producing a completed surface, and Fig. 2 is illustrative of an alternative method in which the steps of applying a bituminous coating over the main stone course and then applying thereover a surfacing of finer stone are omitted.

In the drawing, the base 10, in the area indicated at A, indicates the surface of the old pavement, or, where the method is applied for new construction, the prepared surface or base of the roadway, bridge, or the like. In the area B the condition after the application of the prime coat 11 is indicated. 12 in the area C indicates the tack coat consisting of a layer of bituminous cement which is applied after the prime coat. This consists of bituminous cement which is similar to that subsequently applied over the surface of the stone course. The tack coat is applied in a heated condition and preferably at the rate of one-eighth to one-half of a gallon per square yard. After this preliminary treatment a layer of oil-coated stone is deposited on the bituminous cement, the stones comprising this layer having preferably been previously coated with oil, although the oil coating may be applied after the stone layer is in position without departing from the scope of my invention. The oil used for coating the stone elements like that which may be used for prime coat is a mobile free-flowing hydrocarbon oil of which a substantial portion at least is non-volatile at atmospheric temperature. The oil must be miscible, however, in all proportions with the bituminous cementing medium employed. Although other oils may be used with effective results, experience both in laboratory and field work has shown that oil coming within the following range is satisfactory for the purpose:

Specific gravity	Volitility at 100° C	Viscosity at 25°C. Engler viscosimeter
0.82–0.95	10%–40%	75–100 secs.

The amount of oil required varies according to the size and character of the road metal. It will generally range from one to two and a half gallons of oil per cubic yard of stone, which is equivalent to six to eighteen gallons for each one hundred square yards of surface, depending upon the thickness and character of the road metal.

In some cases, particularly when the stone is porous, I prefer to dissolve a small proportion of asphalt (5–10%) in the oil before applying it to the stone, making a very thin solution which will not be absorbed so completely by the porous stone.

I preferably use only enough oil to coat the surfaces of the stone particles without excess, since any excess over this amount will act to soften the main body of the cement, and I prefer to use a harder cement than has heretofore been practicable in penetration processes.

Preferably, also, I use an oil which is substantially non-volatile at atmospheric temperature, thus doing away with irregularities which result from the changing condition of an oil which is subject to evaporation at atmospheric temperatures.

The size of the particles of stone, gravel, or equivalent material forming the road metal will vary with the depth of the layer; the maximum size should never exceed that which will pass a ring of diameter equal to the depth of the layer. Where the road metal is laid thin, as over a hard surface road or for repair or reconstruction work, it is preferable to use smaller particles, such as those passing a ring of diameter approximately three-fourths the depth of the layer. It is also preferable to size the stone so that the smallest particles will be retained on a ring approximately 40% of the diameter of the ring through which the largest particles will pass. For example, where the depth of a layer of stone, after compaction, is to be about one and one-half inches, the stone should pass one and one-quarter inch screen and be retained on one-half inch screen. The greater the depth of the layer of road metal, the large the size of the stone particles which may be used therein.

When the pavement is compacted by rolling, the particles of stone are forced downward into the tack coat 12 causing the bituminous cement of the tack coat to rise to some extent between the particles of the stone, the coating of oil on the particles facilitating this action and also causing the bituminous cement to adhere more strongly to the particles of stone.

The thin coating of oil over the stone particles of the layer 14 in the area D is indicated at 15.

I now preferably apply another course of bituminous cement as indicated at 16 in the area F, over the surface of the stone layer 14, this cement being applied in liquid condition and the application being accomplished by spraying or by pouring and then applying on top of the layer 16 of bituminous cement a top dressing of oil-coated stone grit, sand or equivalent material, indicated in the drawing at 17, the elements of this layer having been previously treated with oil as in the case of the main course of stone. The whole mass is now compacted by rolling or otherwise. The oil on the surfaces of the stone

particles in the main course facilitates the flowing of the bituminous cement of the layer 16 over the surfaces of and through the spaces between the stone particles of both the main stone course below it and the finishing stone course above it.

The finishing layer 17 is applied in quantity sufficient to fill the surface chinks of the previous course and to form a very thin layer over the top thereof, and the size of the particles used in this layer, while smaller than that of the particles in the main stone course 14, is preferably such as to leave a rough textured or anti-skid surface.

In some cases the layer of bituminous cement 16 and the surfacing 17 may be omitted as indicated in Fig. 2, the surfacing being completed by compacting the stone layer 14 into the tack coat.

I claim:

1. The method of surfacing roads and the like which includes applying to surface to be covered, before any stone or other mineral matter is applied thereto, a covering of bituminous cement, then providing thereon a layer of stone elements coated with oil, and compacting the whole.

2. The method of surfacing roads and the like which includes first applying a prime coat of oil to the surface to be covered, then applying thereover a tack coat of bituminous cement, then providing thereon a course of stone elements coated with oil, and compacting the whole.

3. The method of surfacing roads and the like which includes first applying a prime coat of mobile free-flowing hydrocarbon oil to the surface to be covered then applying thereover a tack coat of bituminous cement then providing thereon a course of stone elements coated with a mobile free-flowing hydrocarbon oil, then compacting the whole.

4. The method of surfacing roads and the like which includes first applying a prime coat of liquid hydrocarbon to the surface to be covered, then applying thereover a tack coat of bituminous cement, then providing thereon a course of stone elements coated with hydrocarbon oil, then applying a coating of bituminous cement, then applying a coating of bituminous cement, then providing thereover a finishing course of mineral elements finer than those constituting the body of the first layer, and compacting the whole.

5. The method of surfacing roads and the like which includes first applying a prime coat of liquid hydrocarbon to the surface to be covered, then applying thereover a tack coat of bituminous cement, then providing thereon a course of stone elements coated with hydrocarbon oil in quantity sufficient to coat the surfaces thereof without substantial excess, and then compacting the same.

6. The method of surfacing roads and the like which includes first applying a prime coat of liquid hydrocarbon to the surface to be covered, then applying thereover a tack coat of bituminous cement, then providing thereon a course of mineral elements coated with oil, then applying thereover a coating of bituminous cement, then providing thereover a finishing course of oil-coated mineral elements and compacting the whole.

In testimony whereof I affix my signature.

EDWIN C. WALLACE.