

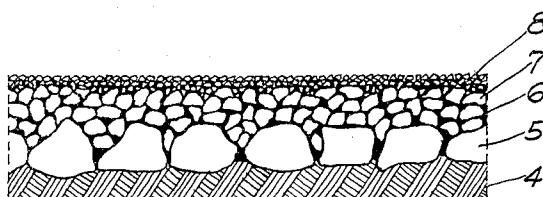
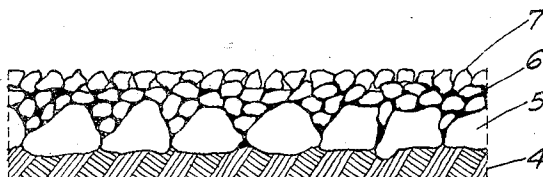
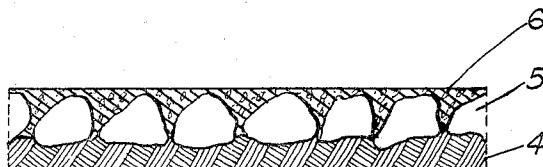
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METHOD OF CONSTRUCTING ASPHALT MACADAM SURFACE COURSES

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METHOD OF CONSTRUCTING ASPHALT MACADAM SURFACE COURSES

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This invention relates to an improved method of constructing asphaltic macadam surface courses such as road-ways, tennis courts, play grounds, factory floors and the like, where a lasting surface is required to prevent excessive erosion and wearing due to traffic and extreme weather conditions.

The present general method of constructing asphalt macadam courses is to cement layers of compacted stone aggregate with asphalt, the asphalt being generally applied to the compacted stone aggregate at elevated temperatures to render the asphalt sufficiently mobile so that an even distribution is obtained to coat the stone aggregate as completely as possible without the use of excess amounts, in order that no surplus asphalt will rise to the surface of the pavement.

Much trouble has been experienced in the construction and maintenance of asphalt macadam roads, due to hot weather conditions where too much low melting point asphalt has been used, or an uneven distribution of the asphalt over the compacted stone aggregate may cause the surfaced course to become soft and to shift or become wavy. Also a surfaced course which has been constructed and subjected to traffic conditions in hot weather may "bleed" and become sticky due to excess amounts of low melting point asphalt having been used in the construction, thereby requiring a re-application of fine aggregate such as sand or stone dust to adsorb the excess asphalt. It is well known in the art of constructing surface courses such as streets or road-ways that these difficulties may be overcome by employing what is known as asphaltic concrete which is a mixture of stone aggregate containing the required amount of a high melting point asphalt, just sufficient to completely coat the stones of the aggregate without using excess amounts. Asphaltic concrete is made by mixing asphalt with coarse and fine stone aggregate in a mixing device at an elevated temperature sufficient to expel all water from the stone aggregate and maintain the asphalt in a fluid condition, after which the asphaltic concrete or surface

course mixture in a heated condition is transported and spread upon the prepared dry surface or road-way to be paved and then immediately, while hot, compacted by heavy rollers. Therefore the cost for surfacing road-ways or other courses with asphaltic concrete is much greater than with asphalt macadam pavement.

Now we have discovered an improvement in surfacing courses by means of which a road-way, street, or other course, may be constructed by the asphalt macadam surfacing method, in which a pavement superior in tensile strength as compared to the asphalt macadam pavement can be constructed and one which is approximately equal in durability to asphalt concrete surfaced courses at a cost which is approximately not greater than the cost of constructing the well-known asphalt macadam pavement.

Our improvement consists in the use of an asphalt containing finely divided diatomaceous earth, which after mixing will remain suspended in hot melted asphalt and may be spread by means of spray nozzles or other mechanical pressure spreaders upon a prepared surface of compacted stone aggregate, the diatomaceous earth being in quantities sufficient to raise the melting point of the asphalt to such a degree that the finished pavement will not "bleed" or become soft or sticky and will not shift or buckle in hot weather. We have determined that the quantity of diatomaceous earth which has been pulverized to such a degree that the diatom shells are substantially separated from each other, ranges from approximately 2 per cent by weight to as high as 15 per cent by weight or higher, the percentage employed depending upon the penetration of the asphalt employed and the degree of penetration and tensile strength required to prevent the asphalt mixture from becoming soft or sticky in hot weather and from cracking in cold weather. The penetration of the asphalt or road oil employed may range from approximately 7.5 mm. to 25.0 mm. (New York Testing Laboratory penetrometer). For example, when an asphalt having a penetration of ap-

proximately 10.5 mm. is employed, approximately 10 per cent of finely pulverized diatomaceous earth is used which will lower the penetration to approximately 7.3 mm.; raise the melting point from 109 degrees F. to approximately 116 degrees F., and increase the tensile strength approximately 30 per cent.

The melted asphalt heated to a temperature ranging from approximately 400 to 500 degrees F. is introduced into an insulated mixer of any well-known type. Preferably a mechanical mixer is employed such as a mixer with revolving paddles or one which employs a circulating agitation through a pump, or, the diatomaceous earth may be mixed with the melted asphalt at the aforesaid temperatures in a tank wagon spreader by a circulating agitation. The diatomaceous earth is preferably heated to a temperature above the boiling point of water to expel free water, and below the temperature of the heated fluid asphalt. Preferably, a temperature of approximately 250 to 300 degrees F. is employed, although it is to be understood that the diatomaceous earth may be added to the hot asphalt without being heated. The object of heating the diatomaceous earth before addition to the heated asphalt is mainly to prevent loss of heat of the mixture.

We are aware that it is well-known in the art to mix diatomaceous earth with the heated fluid asphalt and then mix the same with heated stone aggregate to produce asphaltic concrete and while hot to transport and use this hot concrete mixture to pave graded road-ways.

An object of this invention is to pave roadways or other prepared surfaces without requiring the extra cost of mixing hot asphalt containing diatomaceous earth with heated stone aggregate in a mill and then transporting the hot concrete mixture to the course to be surfaced.

Another object of the invention is to construct improved asphalt macadam surface courses by spraying hot melted asphalt containing diatomaceous earth through a pressure distributor upon compacted stone aggregates in quantities sufficient to cement the layers of stone to produce a pavement which will not become soft or sticky in hot weather, or crack in cold weather.

Another object of the invention is to construct a durable asphalt macadam pavement of increased tensile strength and flexibility at a minimum cost.

A preferred example of the application of our invention will now be given as carried out in the paving of a road-way, reference being made to the accompanying drawing in which:—

Figure 1 represents the first stage in the making of the pavement.

Figure 2 shows a second stage with the intermediate size stone aggregate after rolling and compacting and

Figure 3 the finished roadway with fine stone aggregate compacted and cemented into the voids of the intermediate stone aggregate.

4 shows a graded roadway with coarse stone aggregate 5 compacted and cemented in place by the asphalt diatomaceous earth mixture 6. These are arranged as shown in Figure 1 and after rolling, the stone aggregate 7 is applied and compacted and in the last stage, illustrated in Figure 3, the aggregate 8 is added and compacted and cemented into the voids of the intermediate stones 7.

The road-way is first graded to the desired level, compacted by rolling and cleaned of all loose and foreign material. Clean coarse aggregate 5 is then spread upon the base in a uniform loose layer of correct thickness and rolled with a power driven roller until compacted to a uniform surface. Upon the rolled, dry, coarse aggregate surface, hot asphalt at a temperature ranging from approximately 300 to 500 degrees F. containing approximately 10 per cent by weight of suspended pulverized diatomaceous earth, designated as 6 is uniformly applied by means of spray nozzles or other mechanical pressure distributors at the rate of approximately 1 to 3 gallons of the asphalt mixture per square yard. If the distributor is provided with heating means the asphalt containing the diatomaceous earth is circulated and agitated throughout the entire heating process. A pouring pot or hose attachment to a distributor or a spray nozzle is used to supply the asphalt-diatomaceous earth mixture to places unavoidably missed by the distributor. Immediately after the hot asphalt-diatomaceous earth mixture has been applied to the coarse stone aggregate and preferably while warm, a uniform layer of dry intermediate stone aggregate 7 is spread over its surface in quantities sufficient to completely fill the surface voids of the coarse aggregate, after which any excess intermediate aggregate is removed so as to procure a uniform distribution. Immediately after the distribution of the intermediate aggregate, the road surface is again rolled until the intermediate stone aggregate is completely embedded into the coarse aggregate and asphalt-diatomaceous earth mixture 6 to such a degree that there will be substantially no voids in the road surface and the surface is hard, smooth and shows no movement under the roller.

After the intermediate aggregate has been rolled the pavement is swept clean and treated with a second application of asphalt containing approximately 10 per cent by weight of diatomaceous earth at a temperature of

approximately 300 to 500 degrees F., being substantially the same as employed in the first treatment, although higher or lower percentages of diatomaceous earth may be used, depending upon the grade of asphalt employed and the thickness of the seal or top coat specified. The quantity of hot asphalt-diatomaceous earth mixture may range from $\frac{1}{2}$ to 1 gallon or more per square yard for the seal coat.

After this second application of hot asphalt containing diatomaceous earth, and preferably while still warm, fine dry stone aggregate or sand, fine dry stone aggregate or sand containing diatomaceous earth, or pulverized diatomaceous earth, is evenly distributed over the surface of the pavement under construction and rolled until thoroughly bonded to the road. As required, additional fine aggregate, preferably containing pulverized dry, diatomaceous earth, is spread and swept over the surface during the rolling in quantities sufficient to take up all excess asphalt. Upon completion of the pavement or road way a very light uniform covering of fine aggregate or dry, pulverized diatomaceous earth, is permitted to remain on the road surface, after which the road surface may be again rolled after a period ranging from 5 to 10 days, thereby completing the construction of the pavement.

While the process herein described is well adapted for carrying out the objects of this invention, various modifications and changes may be made without departing from the spirit of the invention, and the invention includes all such changes and modifications as come within the scope of the appended claims.

What we claim is:

1. A method of constructing asphalt macadam surface courses, comprising, spreading and compacting by rolling a layer of coarse stone aggregate on a course, spraying the compacted layer of coarse stone aggregate with hot liquid asphalt containing pulverized diatomaceous earth and cementing the compacted layer of coarse stone aggregate in place, then spreading a layer of intermediate size stone aggregate over the cemented layer of coarse stone aggregate, and compacting by rolling the layer of intermediate size stone aggregate until the intermediate size stone aggregate is embedded and cemented into the voids of the coarse stone aggregate, spraying the surface of the compacted cemented layers of stone aggregates with hot liquid asphalt containing diatomaceous earth, then spreading a layer of stone aggregate and diatomaceous earth over the surface of the sprayed cemented layers of stone aggregates, and bonding by rolling the layer of stone aggregate and diatomaceous earth to the surface of the cemented layers of stone aggregates on the course.

2. A method of constructing asphalt macadam surface courses, comprising, spreading and compacting by rolling a layer of coarse stone aggregate on a course, spraying the compacted layer of coarse stone aggregate with hot liquid asphalt containing pulverized diatomaceous earth and cementing the compacted layer of coarse stone aggregate in place, then spreading a layer of intermediate size stone aggregate over the cemented layer of coarse stone aggregate, and compacting by rolling the layer of intermediate size stone aggregate until the intermediate size stone aggregate is embedded and cemented into the voids of the coarse stone aggregate, spraying the surface of the compacted cemented layers of stone aggregates with hot liquid asphalt containing diatomaceous earth, then spreading a layer of diatomaceous earth over the surface of the sprayed cemented layers of stone aggregates, and bonding by rolling the layer of diatomaceous earth to the surface of the cemented layers of stone aggregates on the course.

3. A method of constructing asphalt macadam surface courses, comprising, spreading and compacting by rolling a layer of coarse stone aggregate on a course, spraying the compacted layer of coarse stone aggregate with hot liquid asphalt containing pulverized diatomaceous earth and cementing the compacted layer of coarse stone aggregate in place, then spreading a layer of intermediate size stone aggregate over the cemented layer of coarse stone aggregate, and compacting by rolling the layer of intermediate size stone aggregate until the intermediate size stone aggregate is embedded and cemented into the voids of the coarse stone aggregate, spraying the surface of the compacted cemented layers of stone aggregates with hot liquid asphalt containing diatomaceous earth, then spreading a layer of fine stone aggregate over the surface of the sprayed cemented layers of stone aggregates, and bonding by rolling the layer of fine stone aggregate to the surface of the cemented layers of stone aggregates on the course.

4. A method of constructing asphalt macadam surface courses, comprising, spreading and compacting by rolling a layer of coarse stone aggregate on a course, spraying the compacted layer of coarse stone aggregate with hot liquid asphalt containing approximately ten percent by weight pulverized diatomaceous earth, and cementing the compacted layer of coarse stone aggregate in place, then spreading a layer of intermediate size stone aggregate over the cemented layer of coarse stone aggregate, and compacting by rolling the layer of intermediate size stone aggregate until the intermediate size stone aggregate is embedded and cemented into the voids of the coarse stone aggregate, spraying the surface of the compacted ce-

mented layers of stone aggregates with hot liquid asphalt containing approximately ten percent by weight diatomaceous earth, then spreading a layer of stone aggregate and diatomaceous earth over the surface of the sprayed cemented layers of stone aggregates, and bonding by rolling the layer of stone aggregate and diatomaceous earth to the surface of the cemented layers of stone aggregates on the course.

5. A method of constructing asphalt macadam courses, comprising, spreading and compacting by rolling a layer of coarse stone aggregate on a course, spraying the compacted coarse stone aggregate with hot liquid asphalt containing diatom shells filled with the asphalt, in quantities sufficient to coat and cement the compacted coarse stone aggregate in place, spreading a layer of intermediate size stone aggregate over the cemented layer of coarse stone aggregate and rolling the layer of intermediate size stone aggregate until the intermediate size stone aggregate is embedded and cemented into the voids of the coarse stone aggregate, spraying the surface of the cemented layers of aggregates with hot asphalt containing diatom shells filled with the asphalt, then spreading fine stone aggregate containing diatomaceous earth over the sprayed surface, and rolling the layer of fine stone aggregate containing diatomaceous earth until compacted, cemented and bonded to the surface of the cemented coarser stone aggregates.

In testimony whereof we affix our signatures.

LANDON R. MASON.
FRED E. GRIFFITH.

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