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PROCESS OF PAVING

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My invention relates to the production of more satisfactory and durable top surfaces on pavements. My invention is especially concerned with, but not entirely limited to, the production of better wearing surfaces on pavements of the soil-stabilization type.

In producing a pavement by soil-stabilization, the soil is first tested to determine what ingredients must be added to it to produce a pavement of the desired character; those ingredients are added to and thoroughly mixed with the soil, and the resulting mixture is thoroughly compacted. To obtain the desired degree of compaction a sheep's foot roller is ordinarily used; and when it is necessary to produce a smooth top surface, the final rolling is with a smooth roller.

In producing such a pavement, the surface layer is subjected to materially higher unit pressures than are the lower portions of the mixture, with the result that it is compacted to a greater degree and loses water more rapidly than the lower portions of the pavement. Because of this, the surface layer frequently becomes dry and separates from the lower layers, thus starting failures which extend into such lower layers. Attempts have been made to remedy this contention by applying a coating of bitumen, usually in the form of an emulsion, to the top layer of the pavement after compaction has been completed; but such treatment, while it does tend to prevent failure in the top layer, does not improve the bond between the top layer and the base.

It is the primary object of my invention to overcome the above noted disadvantages of soil-stabilization pavements and to produce such a pavement having a top layer which is relatively free from a tendency to fail and which is satisfactorily bonded to the base. From a broader aspect, it is an object of my invention to improve the wearing qualities of the surface portions of pavements generally.

In carrying out my invention, I proceed as in the ordinary manner of producing a pavement by soil-stabilization through the step of compacting the stabilized soil mixture, as by the use of a sheep's foot roller. I do not, however, make any attempt to obtain an especially smooth top surface on the compacted mixture. Having mixed the soil and added ingredients, and having tamped the mixture, I then remove the surface layer to a depth of one or two inches, mix that surface layer with bituminous binder, redistribute it over the surface of the base, and roll it to compaction. The removal of the top layer, the addition of the binder, and the redistribution and compaction of the resulting mixture is performed fairly promptly after the original tamping of the stabilized soil and be-

fore any substantial curing of the latter has occurred.

As a result of my process, the re-mixed top layer is firmly bonded to the base, cures with the base, and is not brittle and subject to failure and "dusting off" under traffic.

Preferably, the binder used in the remixing of the surface layer of the pavement is an asphaltic emulsion. A satisfactory emulsion rather generally applicable is one, hereinafter referred to as emulsion A, containing 50% of 85 penetration asphalt, 1% saponified rosin or other emulsifying agent, and 49% water. However, the composition and nature of the binder, is capable of extensive variation. In fact, the binder need not be in the form of an emulsion, but may consist of any asphalt, cut-back, or tar which has a natural affinity for mixing with wet aggregate or which has been treated with substances, such as metal salts, rosins, animal or vegetable oils, or bentonite, capable of creating in the bituminous material a satisfactory affinity for mixing with wet aggregates.

After the surface layer of the pavement has been remixed, spread, and compacted, a seal coat may be applied if desired. A hard aggregate covering bound upon the top layer of the pavement as by such a seal coating will add to the wearing qualities of the surface.

The composition of the pavement to which my process is applied may vary considerably. Thus, the soil used may be stone, gravel, sand, cinders, clay, or combinations of such ingredients, or any type of earth. The cement employed may be Portland cement, natural cement, limestone dust, quarry waste, clay, bentonite, mixtures of bentonite with limestone dust or Portland cement, etc. In certain instances it may be desirable to incorporate an emulsion in the pavement-base. This is especially desirable when clay is used as the cement, as the emulsion will prevent a second swelling of the clay. This same result can be obtained through the use of rosin, "Vinsol" (a relatively hydrocarbon-insoluble natural resin), oils, and similar products.

I set forth below several examples of the application of my process.

Example 1.—A given soil is tested and found to require 6% to 10% of Portland cement to give proper binding and density. The soil, over the surface to be paved, is pulverized and mixed with the dry cement, after which the requisite amount of water is added and mixing is continued. This mixing, both dry and wet, may be performed by blade or other types of surface mixtures. After mixing has been continued long enough to insure uniformity of composition, the mixture is distributed and compacted, preferably through the use of a sheep's foot roller, to

form a slab. After compaction, the top one or two inches of the compacted mixture is scraped from the slab, and is mixed with 6 to 10% of emulsion A. If desired, the emulsion may be spread upon the top layer prior to its removal from the base, so that some mixing will occur during the removal of the top layer. After the emulsion has been thoroughly incorporated, the mixture is distributed evenly over the base slab and rolled to compaction.

Example 2.—In this example, the paving composition comprises a binder of clay and asphaltic emulsion. The composition of the emulsion used may vary widely, one which I have found satisfactory containing 55% of 150 penetration asphalt, 8% kerosene, 1% saponified rosin, and 36% water. This emulsion is hereinafter identified as emulsion B. The paving composition of this example is made up as follows:

	Pounds per sq. yd.
Sand	500
Clay	100
Emulsion B	30

After thoroughly mixing and compacting of these ingredients, I remove the top 200 pounds per square yard and mix it with 10 pounds per square yard of emulsion A. This mixture is then distributed evenly over the base and compacted. An emulsion of the type identified above as emulsion B might be used in remixing the top layer of the pavement, but I prefer to use an emulsion containing a harder bitumen, such as the emulsion identified above as emulsion A, for the harder asphalt improves the wearing and binding of the surface layer.

Example 3.—500 pounds per square yard of gravel—say 60% of 1½ inch to ¾ inch particles and 40% sand—and 100 pounds of limestone dust (100 to 200 mesh) are mixed with 30 pounds per square yard of emulsion B, and the resulting mixture is distributed and compacted. Following compaction, the top two inches of the slab is removed and mixed with 10 pounds per square yard of emulsion (A or B), and the resulting mixture is spread, rolled, sealed with ½ gallon of emulsion A per square yard and covered with 10 pounds per square yard of crushed (½ inch to ¼ inch) stone.

Example 4.—600 pounds per square yard of quarry-run stone—say 60% of 1½ inch to ¾ inch particles and 40% of particles ¾ inch and smaller—and 50 pounds per square yard of Portland cement are mixed with an appropriate quantity of water, and the resulting mixture is distributed and compacted. The top 200 pounds per square yard is then scraped off, mixed with 20 pounds per square yard of emulsion (A or B), redistributed over the base, and compacted. The pavement thus produced may have applied to it a sealing coat and crushed stone as in Example 3 above.

In some cases it may be found advisable before distributing the remixed surface layer over the base to prime the top surface of the base with a bituminous emulsion. This is especially the case where no bituminous binder is incorporated in the base.

I claim as my invention:

1. A process of paving by soil stabilization, comprising adding to soil ingredients necessary to

produce a stable pavement, such ingredients including Portland cement, mixing the soil and added ingredients spreading and compacting the mixture to form a slab, removing the surface portion of said slab, mixing such removed surface portion with a bituminous binder to form a second mixture, distributing said second mixture over the base slab, and compacting it, the steps of forming, distributing, and compacting said second mixture being completed before said Portland cement of the base slab has cured.

2. A process of paving by soil stabilization, comprising adding to soil ingredients necessary to produce a stable pavement, such ingredients including Portland cement, mixing the soil and added ingredients, spreading and compacting the mixture to form a slab, removing the surface portion of said slab, mixing such removed surface portion with a bituminous emulsion to form a second mixture, distributing said second mixture over the base slab, and compacting it, the steps of forming, distributing, and compacting said second mixture being completed before said Portland cement of the base slab has cured.

3. The process set forth in claim 1, with the addition of the step of priming the base slab with a bituminous binder before distributing the second mixture over it.

4. A process of paving by soil stabilization, comprising adding to soil ingredients necessary to produce a stable pavement, such ingredients including a binder, mixing the soil and added ingredients, spreading and compacting the mixture to form a slab, removing the surface portion of said slab, mixing such removed surface portion with a bituminous binder to form a second mixture, distributing said second mixture over the base slab, and compacting it, the steps of forming, distributing, and compacting said second mixture being completed before said binder of the base slab has cured.

5. A process of paving by soil stabilization, comprising adding to soil ingredients necessary to produce a stable pavement, such ingredients including a bituminous binder, mixing the soil and added ingredients, spreading and compacting the mixture to form a slab, removing the surface portion of said slab, mixing such removed surface portion with a bituminous binder to form a second mixture, distributing said second mixture over the base slab, and compacting it, the steps of forming, distributing, and compacting said second mixture being completed before said bituminous binder of the base slab has cured.

6. The process set forth in claim 5 with the addition that the bitumen contained in the binder employed in the first mixture is softer than that contained in the binder employed in the second mixture.

7. A process of paving, comprising the steps of spreading a mixture of aggregate and a binder, compacting such mixture to form a slab, removing the surface portion of such slab, mixing such removed surface portion with a bituminous binder to form a second mixture, distributing said second mixture over said slab, and compacting it, the steps of forming, distributing, and compacting said second mixture being completed before said binder of the base slab has cured.

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