

UNITED STATES PATENT OFFICE

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PUMPABLE POWDERED ASPHALT
SUSPENSIONHarold F. Dague, South Gate, Calif., assignor to
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Calif., a partnershipNo Drawing. Application January 12, 1948,
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4 Claims. (Cl. 106—277)

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This invention relates to improvements in asphalt paving emulsions.

Powdered asphalt is a desirable ingredient in paving mixes because of its high melting point and low penetration. The term "powdered" asphalt as used herein shall refer to manufactured asphalts and to natural asphalts and asphaltites, such as gilsonite, grahamite, glance pitch, etc. Powdered asphalts are bulky, fluffy and difficult to use because of the dust problems and losses which occur and of the fact that it is impossible to uniformly incorporate powdered asphalt into a bituminous mixture. Heretofore, powdered asphalts have been used in bituminous mixes, but in order to obtain satisfactory results, it was necessary to dry the aggregate. Such mixes had to be laid quickly in order to avoid presetting, and in most instances while the mixture was hot, and rolling of such mixes was difficult because of the adherence of the material to the rollers. Moreover, such mixes could be laid only upon dry surfaces; they could not be laid in wet weather or on wet surfaces.

Prior attempts to use powdered asphalt in aqueous suspensions have not been successful. The addition of water to a powdered asphalt results in an unmanageable mass. Even a mixture composed of equal parts of powdered asphalt and water is a stiff, cheesy mass which is not practical to handle in use. It is necessary to employ 67% to 75% water in such a mixture in order to render it pumpable, but such aqueous suspensions are not stable, and the excessive amounts of water render the use of such mixtures impractical.

This application is a continuation-in-part of my abandoned application 646,490.

The object of the present invention is, as a composition of matter, a relatively stable, homogeneous suspension of powdered asphalt in an aqueous medium either alone or in combination with flux oils. Such product, containing a relatively high proportion of powdered asphalt, is readily pumpable and compatible with paving ingredients and mixes.

These and other objects and advantages of the present invention will become apparent to those skilled in the art from more detailed descriptions and examples given hereafter.

It is to be understood that although the compositions and mixes described herein may be utilized for various purposes, they are particularly adapted for use in wear coats, paving surface, mastic roofing, flooring and allied adaptations. The word "paving" as used hereafter is used generically and includes roofings, floorings, etc.

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As previously stated, powdered asphalts are difficult to handle because of their bulk, dusting properties, etc. The addition of water to powdered asphalts results in an unmanageable mass. A mixture composed of 50% water and 50% powdered asphalt is a stiff, cheesy mass which is not practical to handle in use and certainly not pumpable, therefore, incapable of being readily transported or moved from a mixing tank to another piece of equipment. It has been discovered, however, that in the event an oil-soluble, anionic, surface-active emulsifier is added to water in small proportions, relatively large quantities of powdered asphalt may be suspended in the water, and the resulting mixture is smooth, homogeneous and easily pumpable.

In some instances, small amounts of hydrated lime or quick lime may be added for the purpose of controlling the pH balance of the mixture and for controlling or overcoming the pH of the water used, it being observed that some waters are hard and render it difficult to obtain a stable suspension without the use of lime.

Suitable surface-active agents for use in carrying out this phase of the invention are sulfonated castor oil, petroleum sulfonates, glycols and other polar anionic, preferably oil soluble, compounds and mixtures for a peptizing action and lower the surface tension of the water. A surface-active agent which has been found to give extremely good results may be derived from crude sulfonates and those complex mixtures of sulfonic and naphthenic acids, as well as additional products of sulfonic acid and hydrocarbon compounds which result from the acid treatment of petroleum oils. The terms "green" and "mahogany" acids are occasionally used in referring to certain of these sulfonic and naphthenic acids. A suitable surface-active agent, consisting of a mixture of soaps of sulfonic acids and of metals from the group of calcium, lead, aluminum and zinc, may be made in the following manner, although other metallic soaps may also be formed in a similar manner. As received from petroleum refineries, the sulfonates are in the form of sodium compounds and may contain from 5% to 60% or more of aqueous components. The water content is preferably first reduced to between about 0% and 20% by weight by heating the crude sulfonates. When the final product is to contain calcium soaps, calcium chloride is added to the crude sodium sulfonates (preferably containing a water content of between 5% and 20% by weight) the amount of calcium chloride added being sufficient to combine with saponifiable components in the original mixture of crude sulfonates. The cal-

cium chloride may be added in the form of a concentrated solution with agitation. From 1 to 5 volumes of saponifying solution to 1 volume of crude sulfonates, or 50% by weight of calcium chloride of 10°-12° Bé. are illustrative conditions. The temperature is then raised over a period of 2 to 3 hours to between about 240° F.-300° F. and the mass is then allowed to stand and stratify. The aqueous phase containing water-soluble components is removed by decantation and the remaining pasty mass is then dried by air-blowing at temperatures of about 300° F. After air-blowing, the mass may be purified by thinning with a petroleum solvent and centrifuging. An exemplary product has a pH of between about 6 and 7, an ash content of less than 12% and includes a minor proportion of petroleum distillate.

A readily pumpable powdered asphalt suspension of the character here described may contain between about 50% and 65% by weight of powdered asphalt, between 50% and 30% of water and from about 0.5% to 3% of surface-active agent. It may also contain from 0% to 10% by weight of hydrated lime. Either cold or hot water may be used, although hot water is preferred. Such relatively stable suspension of powdered asphalt has numerous advantages; it permits ready transportation and distribution of powdered asphalt without dust losses. Such fluid suspension permits the homogeneous distribution of the powdered asphalt throughout a mass of aggregate, sand, or the like. It permits a uniform distribution of powdered asphalt on a surface sprayed or sprinkled with such suspension. In addition, the presence of surface-active agent facilitates the adherence of the powdered asphalt to the siliceous aggregate or other surface. The water content is readily evaporated or rolled out during the laying and actually facilitates the laying operation and does not deleteriously affect the strength of the finished pavement.

The above suspension of powdered asphalt and water may be used in cold bituminous mixes and the formation of wear coats and other paving surfaces at normal temperatures. For example, a flux oil (either alone or containing a surface-active agent of the character previously described) may be added to and mixed with a moist aggregate. The suspension of powdered asphalt in water (containing the surface-active agent) is then added to and mixed with the moist, flux-containing aggregate. The complete mixture may then be laid and rolled, or stock piled for long periods of time. During rolling it will be found that the excess water readily separates from the mixture, prevents the mixture from adhering to the rollers. The paving is dense, coherent, resistant to stripping action and desirable from every point of view. One ton of paving composition of the character stated immediately and hereinabove may contain approximately 80 lbs. to 100 lbs. of flux, 20 lbs. to 80 lbs. of powdered asphalt and between 5 lbs. and 20 lbs. of surface-active agent. Variations in the amount of powdered asphalt and flux are made in accordance with the hardness of the bituminous surface desired.

The powdered hard asphalt employed prefer-

ably passes a 60-mesh sieve completely, and 80% to 100% may even pass through a 100-mesh sieve. The use of relatively finely comminuted asphalt is recommended, since coarser grades do not amalgamate as well during laying and rolling. The resulting pavement or roofing will not exhibit stripping, even though it was laid at normal atmospheric temperatures.

I claim:

1. A readily pumpable powdered asphalt suspension of the character described, containing between about 50% and 65% by weight of powdered asphalt, between 50% and 35% of water, and from about 0.5% and 3% of an oil soluble, anionic surface-active sulfonate.

2. A readily pumpable powdered asphalt suspension of the character described, containing between about 50% and 65% by weight of a powdered asphalt, said asphalt passing a 60-mesh sieve and not less than 80% thereof passing a 100-mesh sieve, between about 50% and 30% by weight of water and from about 0.5% to 3% of an oil-soluble, anionic surface-active sulfonate.

3. A readily pumpable powdered asphalt suspension of the character described, containing between about 50% and 65% by weight of a powdered asphalt, said asphalt passing a 60-mesh sieve and not less than 80% thereof passing a 100-mesh sieve, between about 50% and 30% by weight of water and from about 0.5% to 3% of a polar, anionic, oil soluble material consisting of a mixture of soaps of sulfonic acids and of metals from the group of calcium, lead, aluminum, and zinc.

4. A bituminous mix arranged for use in laying paving at normal temperatures, composed of moist aggregate, flux oil containing a surface-active agent, and a readily pumpable aqueous suspension of powdered asphalt, said suspension containing between 50% and 65% of powdered asphalt, between 50% and 30% of weight by water, and between 0.5% and 3% by weight of an oil-soluble, anionic surface-active agent consisting of a mixture of soaps of sulphonic acids and of metals from the group of calcium, lead, aluminum and zinc.

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