This application relates to compositions for coating aggregates for road building and the like, and to improve compositions for road building, and, more particularly, to compositions which provide for coating of aggregates for road building in an economical manner while avoiding so-called "stripping."

Aggregates for road building are generally coated with suitable asphalt mixes which include bitumens which effect the coating of the aggregates. The aggregates used are, of course, sand, gravel, and other suitable and well known aggregates.

To avoid "stripping" the asphalt mixes are provided with additives which have in recent years mainly comprised cationic surfactant and in previous years have comprised anionic surfactant. None of the products presently used or previously used have been fully effective, though the best results could be achieved with large amounts of cationic surfactant. Although satisfactory results can be obtained with large amounts of cationic surfactant, such large amounts are often not used due to the expense involved.

It is accordingly a primary object of the present invention to provide a composition for coating aggregates for road building and the like wherein the additives used are inexpensive and can be used in relatively small amounts while achieving the results which could hitherto be achieved only using large amounts of cationic surfactant. Consequently, with the compositions of the present invention an effective action is achieved in an economical manner.

It is another object of the present invention to provide a composition for coating aggregates for road building and the like which has a universal action; that is, it can be used with all different types of asphalt mixes for the coating of all different types of aggregates.

It is yet another object of the present invention to provide for the coating of aggregates of different sizes and shapes, as well as different sizes; that is, aggregates which are smooth, rough, hard, soft, porous, and mixtures thereof, while achieving an improved adhesion of the bitumen to these aggregates in an inexpensive and universally acceptable manner.

Other objects and advantages of the present invention will be apparent from further reading of the specification and of the appended claims.

With the above and other objects in view, the present invention mainly comprises as a composition for coating aggregates for road building and the like, a bitumen and at least one non-ionic surfactant.

In accordance with a preferred embodiment of the present invention, the composition comprises a bitumen and both a cationic non-ionic surfactant, and a lipophilic nonionic surfactant. In accordance with the present invention, the bitumen need be mixed with as little as 0.1–5% by weight of the non-ionic surfactant or surfactants to achieve a perfect adhesion of the bitumen to any type, shape and/or size of aggregate for road building.

The most suitable hydrophilic surfactants are those which are ethers of an aromatic alcohol and ethylene oxide. These hydrophilic surfactants are capable of producing oil-in-water emulsions very quickly and are therefore effective in providing for complete coating of the aggregates with the bitumen, using even a very small amount of such surfactant.

The hydrophilic non-ionic surfactants used according to the present invention are heat stable, acid and alkaline resistant, dispersible in water, soluble in oils, mineral oils and aromatic solvents.

The preferred lipophilic non-ionic surfactants which are used according to the present invention are those which are esters of a long chain fatty acid and an alcohol, most preferably sorbitol, sucrose, dextrose and the like.

These surfactants are insoluble in water, soluble in organic solvents, oils, etc., heat stable, acid and alkaline resistant. These surfactants also produce oil-in-water emulsions, but whereas the hydrophilic surfactants produce such oil-in water emulsions very quickly but only temporarily, the lipophilic surfactants produce such oil-in-water emulsions more slowly but of the highest degree of stability. Consequently, when both a hydrophilic surfactant and a lipophilic surfactant are used according to the present invention, there is rapid and complete coating of the aggregate and the aggregate possesses its permanent adhesivity as a result. Neither water from within the composition nor from without the composition will result in "stripping."

In accordance with still another embodiment of the present invention there is used in the composition for the coating of the aggregates for road building and the like a bitumen, and in addition to the non-ionic surfactant (which is preferably a mixture of a hydrophilic non-ionic surfactant and a lipophilic non-ionic surfactant) either an anionic surfactant or a cationic surfactant, or both. As a matter of fact, it is one advantage of the present invention that if anionic or cationic surfactants are present in the bitumen mixes which are used for the coating of the aggregate, these do not interfere with the effectiveness of the non-ionic surfactants which are used according to the present invention, but on the contrary, the non-ionic surfactants of the present invention improve the effectiveness of the anionic and/or cationic surfactants.

As indicated previously, it is an advantage of the present invention that the composition for the coating of the aggregates can be used with aggregates of all different types, including any different types of mineral aggregates, all different shapes, all different sizes and all different mechanical properties such as smooth, rough, hard, soft, porous and other ingredients as well as mixtures thereof.

It is due to the fact that aggregates which are used are often wet and retain moisture, and that bitumen mixes contain volatile substances such as kerosene or gasoline, that it has been discovered that the best results are achieved by the use of a mixture of a hydrophilic non-ionic surfactant plus a lipophilic non-ionic surfactant. Thus, the nature of the bitumen, as well as of the aggregate, is never clearly determined and the composition of the necessary volatile substances in the bitumen are never uniform. In addition, there are impurities which may themselves act as emulsifying agent and result in "stripping" and even in preventing coating of wet aggregates.

It has been found that when using a mixture of a hydrophile and a lipophilic non-ionic surfactant according to the present invention, the coating is achieved quickly and the adhesion remains permanent. The following are examples of compositions according to the present invention.

The scope of the invention is not, however, meant to be limited to the specific samples:

Example 1

Bitumen is mixed with 0.1% by weight of ether formed from ethylene oxide and nonylphenol (Renex 648 supplied by Atlas Powder Company). This bitumen can be used for the coating of any type of aggregate for road building.
Example 2

Bitumen is mixed with 2.0% by weight of ether formed from ethylene oxide and nonylphenol (Renex 648 supplied by Atlas Powder Company). This bitumen can be used for the coating of any type of aggregate for road building.

Example 3

Bitumen is mixed with 2% of Renex 648 and 0.2% of sorbitan trioleate. This sorbitan trioleate is a lipophilic agent whereas the Renex 648 is a hydrophilic agent. This composition is a particularly effective composition for the coating of aggregates for road building.

A composition for road building is prepared of bitumen plus 2% by weight of the ether of ethylene oxide and nonylphenol (Renex 648), 1% of sorbitan trioleate and 0.1% of soap (which is an anionic surfactant).

Example 4

A composition for coating aggregates is prepared of 1% of the ether of ethylene oxide and nonylphenol, and 2% of any suitable cationic agent such as a quaternary ammonium compound.

Example 5

This example provides for an additive which can be mixed with bitumen in amount of 1%-5% by weight. A mixture is prepared of 33 parts by weight of sorbitan trioleate (SPAN 65 of Atlas Powder Company), and 5 parts by weight of the ether of ethylene oxide and nonylphenol (Renex 648) distributed in 62 parts by weight of paraffin wax, which acts as a carrier.

Example 6

This example also provides an additive which can be mixed with bitumens in amounts of 1%-5% by weight, and the resulting mixture can be used for the coating of all types of aggregates for road building. A mixture is prepared of 33 parts by weight of sorbitan trioleate, 33 parts by weight of N-soya-N-ethyl morpholinium ethosulfate (cationic agent), 5 parts by weight of the ether of ethylene oxide and nonylphenol, and 29 parts by weight of paraffin wax as carrier.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Composition for coating aggregates for road building and the like, comprising a bitumen, an ether of an aromatic alcohol and ethylene oxide as a hydrophilic non-ionic surfactant, and an ester of a long chain fatty acid and an alcohol as a lipophilic non-ionic surfactant, said non-ionic surfactants being present in an amount sufficient to prevent stripping of the aggregate-bitumen composition.

2. Composition for coating aggregates for road building and the like, comprising a bitumen, an ether of an aromatic alcohol and ethylene oxide as a hydrophilic non-ionic surfactant, and an ester of a long chain fatty acid and an alcohol selected from the group consisting of sorbitol, sucrose and dextrose as a lipophilic non-ionic surfactant, the total amount of said surfactants being between about 0.1 and 5% by weight.

3. Composition for coating aggregates for road building and the like, comprising a bitumen, an ether of an aromatic alcohol and ethylene oxide as a hydrophilic non-ionic surfactant, and an ester of a long chain fatty acid and an alcohol as a lipophilic non-ionic surfactant, the total amount of said surfactants being between about 0.1 and 5% by weight.

4. Composition for coating aggregates for road building and the like, comprising a bitumen, an ether of an aromatic alcohol and ethylene oxide as a hydrophilic non-ionic surfactant, and an alcohol as a lipophilic non-ionic surfactant, the total amount of said surfactants being between about 0.1 and 5% by weight.

5. Road building composition, comprising an aggregate for road building, a bitumen, an ether of an aromatic alcohol and ethylene oxide as hydrophilic non-ionic surfactant, and an ester of a long chain fatty acid and an alcohol as lipophilic non-ionic surfactant, said non-ionic surfactants being present in an amount sufficient to prevent stripping of the aggregate-bitumen composition.

6. Composition for coating aggregates for road building and the like, comprising a bitumen, an ether of an aromatic alcohol and ethylene oxide as hydrophilic non-ionic surfactant, an ester of a long chain fatty acid and an alcohol as lipophilic non-ionic surfactant, and a cationic surfactant, the total amount of said surfactants being between about 0.1 and 5% by weight.

References Cited

UNITED STATES PATENTS

1,340,855 5/1920 Weiss 106—273
2,632,712 3/1953 Lemmon et al. 106—269
2,877,129 3/1959 Hardman 106—279
2,901,369 8/1959 Pordes 106—273
3,110,604 11/1963 McConnaughey 106—277
3,126,350 3/1964 Borgefeld 106—277

ALEXANDER H. BRODMERKEL, Primary Examiner.
MORRIS LIEBMAN, Examiner.
J. B. EVANS, Assistant Examiner.