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METHOD OF PRODUCING A COMPOSITE LIQUID BITUMINOUS BINDER

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This invention relates to the manufacture of composite liquid bituminous binders designed for coating stone aggregate material normally used in making paving materials, and which are suitable for tack or seal coats and the like.

One object of the invention is the production of a composite liquid bituminous binder capable of being shipped in uninsulated tank cars or maintained in unheated storage.

Another object of the invention is the production of a composite liquid bituminous binder which can be inexpensively and conveniently manufactured at or near atmospheric temperatures.

A further object is to provide a composite liquid bituminous binder capable of coating damp or unheated aggregates.

A still further object is the production of a composite liquid binder relatively free from film stripping defects.

In carrying out the invention, the following is a procedure that has been found to give good results:

A non-volatile liquid flux oil, hereinafter fully described, in an amount equal to from 10% to 50% of the final product is placed in a suitable mixing vessel, preferably provided with power driven stirrers, whereupon, a volatile liquid solvent, hereinafter fully described, in an amount equal to from 20% to 60% of the final product is likewise placed in the mixing vessel and the power stirrers operated; thus producing a non-viscous flux oil cutback. The making of this liquid flux oil cutback will require but a few minutes. Subsequent the above operation, a powdered asphalt, hereinafter fully described, in an amount equal to from 15% to 40% of the final product is slowly added to the mixing vessel while the power stirrers are kept in continuous operation, and the mixing continued until the above named three components start to produce a slightly viscous liquid at which moment the mixing operation terminates and the resultant mixture represents the end product, and may be placed in storage or used as desired. It is important that the above mixing operation be performed at or near normal atmospheric temperatures so as to permit partial but not total dissolution of all of the powdered asphaltic particles contained in the liquid flux oil cutback.

The non-volatile liquid flux oil I chose to use as the first component of my composite liquid bituminous binder is a substantially non-volatile, highly aromatic and non-paraffinic oil and is produced as the extract in the selective solvent extraction process in the production of lubricating oils. It should approximately meet the following general requirements:

Gravity A. P. I. at 60° F.	15 max.
Viscosity S. S. F. at 122° F.	20–90
Flash COC ° F.	150
Viscosity gravity constant, 210° F.	0.90

The above described liquid flux oil I have found to be particularly adapted for use in my composite liquid

bituminous binder or to increase the fluxing power of some other companion oil. This liquid flux oil is the so-called extract produced by treating oils with selective solvents which are capable of separating the non-paraffinic, aromatic or naphthenic oil constituents contained in the oil from the paraffinic constituents. One well known solvent which is adapted to separate the oil in this manner is liquid sulfur dioxide. Other solvents are nitrobenzene, phenol, furfurol etc. The separation of the oil into non-paraffinic and paraffinic constituents may be accomplished by mixing the oil with the selective solvent at an appropriate temperature sufficient to dissolve only the aromatic constituents contained in the oil and allowing the mixture to stratify into two distinct layers. One of the layers, i. e. the raffinate layer, contains the more paraffinic hydrocarbons while the other layer, i. e. the extract layer will contain the bulk of the solvent in which are dissolved the more aromatic relatively less paraffinic hydrocarbons. By separating the two layers and stripping the solvent contained in each layer, two entirely different oils are produced. The oil produced from the raffinate phase will exhibit a very high paraffinicity, while the oil obtained from the extract phase will exhibit a very low degree of paraffinicity. The oil obtained from the extract phase is the flux oil I especially desire to use as my first component of my composite liquid bituminous binder and has heretofore, in these specifications, been referred to as a non-volatile liquid flux oil.

The liquid solvent I have chosen for the second component of my composite liquid bituminous binder is essentially a petroleum distillate and may be, depending on the type of finished product I wish to make, a gas oil or light fuel oil, kerosene, naphtha etc. The evaporation rate of the liquid solvent chosen could, it is obvious, produce slow, medium or rapid curing characteristics as an asphalt cutback solvent.

The powdered asphalt I have chosen as the third component of my composite liquid bituminous binder should meet the following general characteristics, or requirements:

Specific gravity	1.00 min.
Softening point (R. & B.)	250–300
Penetration at 77° F	0–5
Flash	450 min.

The powdered asphalt may be prepared from natural asphalt such as gilsonite or from petroleum asphalt, and it can be easily reduced to the desired fineness by means of a suitable impact mill, as for example a #14 Williams Hammer Mill. I have found that the asphalt should be reduced to about the following screen analysis:

	Mesh
100% passing	30
60% passing	80
40% passing	100
20% passing	200

In making my composite liquid bituminous binder as hereinbefore described it is essential that the components be combined at or near normal atmospheric temperatures so as to not completely dissolve all of the powdered asphaltic particles during the mixing operation. I believe that perhaps all of the powdered asphalt passing the 100 mesh goes into complete solution and that perhaps the powdered asphalt retained on the 80 mesh remains for a long time in a state of solid or semi-solid condition in the liquid flux oil cutback previously mentioned.

As specific examples of some of the many composite liquid bituminous binders I have made, the following table indicates the percentage by weight of each component I use, the approximate residue from distillation to 680° F.,

and the approximate resultant penetration of the residue at 77° F. I have not attempted to indicate what type of liquid solvent was used in this table.

Liquid flux oil	Liquid solvent	Powdered asphalt	Residue	Penetration
Percent	*Percent*	*Percent*	*Percent*	
17	50	33	50	30–40
20	50	30	50	40–50
25	42	33	58	50–60
33	34	33	66	100–150
30	40	30	60	100–150
40	30	30	70	200–300

The composite liquid bituminous binder above described provides a binder that is readily miscible with stone aggregate materials in any suitable mixing device, and the mixing may be conducted at temperatures of from 50° F. to any higher normal atmospheric temperature. It should be noted that any of the conventional grades of asphaltic cutbacks now in current use require a pug mill mixing temperature for the aggregates to be between 200° F. and 300° F.

What I claim is:

1. A method of producing a composite liquid bituminous binder suitable for shipping or storing prior to adding it to mineral aggregate to form paving material, which comprises blending a viscous non-volatile hydrocarbon flux oil with a volatile petroleum distillate to form a non-viscous flux oil cutback, and mixing therewith at atmospheric temperature, a powdered hard asphalt, discontinuing the mixing when the mixture starts to become viscous so as to produce a pumpable suspension of said powdered asphalt in said non-viscous flux oil cutback, the proportions of non-volatile flux oil, volatile petroleum distillate and powdered asphalt in the final composition being 10 to 50%, 20 to 60%, and 15 to 40%, respectively.

2. A method according to claim 1 in which the flux oil is an extract fraction obtained by selective solvent extraction of a petroleum lubricating oil distillate, the powdered asphalt comprises a fines fraction which is smaller than 100 mesh and a coarse fraction which is larger than 80 mesh, and the mixing is discontinued when the fines fraction is dissolved and the coarse fraction is undissolved.

3. A method according to claim 1 in which the powdered asphalt comprises a fines fraction which is smaller than 100 mesh and a coarse fraction which is larger than 80 mesh.

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