United States Patent

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[73] Assignee **Phillips Petroleum Company**

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[54] **POLYOLEFIN FIBERS IMPREGNATED WITH ASPHALTITE AND ASPHALT**
3 Claims, No Drawings

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[51] **Int. Cl.** **B32b 11/02**
[50] **Field of Search** 117/138.8, 168, 140, 30, 32; 106/277, 278; 161/236, 247; 94/9

[56] **References Cited**

UNITED STATES PATENTS

3,321,357	5/1967	Kennedy	161/236 X
3,388,723	6/1968	McNulty	161/236 X
3,474,625	10/1969	Draper et al.	117/168 X

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ABSTRACT: A fabric, e.g., polypropylene fabric, is impregnated with a refined asphalt and an asphaltite such as Gilsonite, thus preparing a composite suitable for use as liner in a pond, as pavement surfacing, e.g., parking lot, driveway, play area surface, roofing or other covering or waterproofing material, or for molding to produce a molded body such as, e.g., construction blocks and structural forms.

The asphaltite raises the ring and ball softening point of a straight asphalt system reducing cold flow and bettering weathering properties. The asphaltite can be used in cutbacks and emulsions and applied to one or more fabrics which can be the same or different and which can be variously arranged.

POLYOLEFIN FIBERS IMPREGNATED WITH ASPHALTITE AND ASPHALT

This invention relates to a fabric system. More specifically, it relates to a fabric system composed of a composited asphalt and a fabric. Still more specifically, it relates to such a system in which the fabric is made of a polyolefin or plastic. More specifically still, it relates to a molded body prepared using such a system.

In one of its concepts, the invention provides a fabric such as polypropylene impregnated with a refined asphalt and as asphaltite, e.g., Gilsonite. In another of its concepts the invention provides a liner, pavement surfacing, e.g., parking lot, driveway, play area, roofing or other covering of waterproofing composed of a polyolefin, e.g., polypropylene fabric impregnated with a refined asphalt and an asphaltite composition having a Ring and Ball softening point above that of the asphalt alone and having reduced cold flow and better weathering properties. In another of its concepts the invention provides an asphaltite used in a cutback and/or emulsion applied to one or more fabrics which can be the same or different and which can be variously arranged, thus preparing a composite or system which can be used as a liner, etc., as heretofore described.

I have found that the use of an asphaltite such as Gilsonite used along with a refined asphalt in a cutback or an emulsion to saturate a mat or a fabric or a fabric system such as a polypropylene fabric and used as herein described yields an excellent material with considerably improved wearing and other properties over those obtained when using a refined asphalt as heretofore. Thus, in one embodiment a cationic asphalt emulsion was spread onto a surface to prepare a parking lot. A polypropylene mat or fabric was imbedded in the asphalt emulsion as it had been spread on the surface. Then the mass was covered with a cutback Gilsonite and allowed to cure. Then it was used for parking lot surface. In this experiment it was found that the surface by every ordinary observation or test held up against weathering, use, etc.

The use of asphalt cutback and emulsions is known. The use of asphalt to impregnate a porous material, e.g., sandstone, artificial stone and the like is known. More specifically, it is known in U.S. Pat. No. 2,227,312, that the adherence of Gilsonite and its employment as an impregnating medium are augmented by the addition to the Gilsonite of a plasticizer which is a substance which is compatible with the Gilsonite does not undergo decomposition at the temperature at which the gilsonite bath is heated and may be, for example, an asphalt, a tar, a high boiling point oil, or similar substance. It is also known in U.S. Pat. No. 2,115,425, to admix the following ingredients in the proportions given to provide a composition for treating metallic surfaces such as railway car and automobile bodies, ships, structural steel buildings to protect against rust and corrosion, transmission of heat and sound as well as the creation or amplification of sound-producing vibrations within the structure.

Gilsonite	19%
Midcontinent asphalt	11%
Sardine fish oil pitch	16%
Light mineral oil (oleum spirits) and naphtha	36%
Asbestos fiber	4%
Sawdust	14%

It is also known in U.S. Pat. No. 2,353,027, to treat a cotton binder or fabric with an asphalt cutback oil and to spread sand on top. This patent also discloses covering fibrous fabric material with a good coating or asphalt and cut stone which is then rolled and finally given a top coat of asphalt. It also discloses for lining canals that the base is generally given a prime coat of road oil and a coating of a fluid asphalt. The coated fabric is then laid and covered with asphalt upon which a seal-coat of asphalt together with a mineral, such as stone chips, is added. Further in U.S. Pat. No. 1,796,861, it is known to saturate roofing shingles with a saturant of a relatively hard asphalt and to then coat the shingles with an asphalt which is softer than the saturant.

It is an object of this invention to provide a fabric containing system having improved qualities particularly well suited for liners for ponds, parking lot, driveway and play area surfacing, roofing or other covering of waterproofing. It is another object of this invention to provide such a system having a raised ring and ball softening point which is higher than that of a straight asphalt system. It is a further object of this invention to provide such a system having reduced cold flow and better weathering and wearing properties. A still further object of this invention is to provide a molded body produced using such a system.

According to the present invention, there is provided a mat or fabric system in which an asphaltite such as Gilsonite is used along with a refined asphalt in a cutback or emulsion to saturate the mat or fabric which can be and preferably now is composed of a polyolefin or preferably polypropylene. This composite has been found to possess excellent properties as disclosed elsewhere herein.

Also according to this invention, there is provided a molded body made by heat curing or otherwise curing in a mold a system as herein described.

In an embodiment of the invention a parking lot surface was prepared first by spreading a cationic asphalt emulsion onto the surface of the ground. A polypropylene fabric was then imbedded in the emulsion. Then the mass was covered with a cutback Gilsonite and allowed to cure. This surface on extended use under controlled experimental conditions was found to possess excellent wearing and weathering properties.

The polyolefin fabrics which can be used are various. However, presently preferred is a fabric or mat made of polypropylene, especially polypropylene produced by the so-called low-pressure process. "Loktuft," a nonwoven fabric of polypropylene fiber available from Revonah Spinning Mills, Trenton and Castor Avenues, Philadelphia, Pa. 19134, is a now preferred fabric which is available in rolls of about 6 feet width and lengths of about 200 to 300 lineal feet. This fabric has a weight of about 4 to 6 ounces per square yard, a tensile strength in the "warp" direction of 80–90 pounds and a tensile strength in the fill or woof direction of about 90–100 pounds. This fabric will hold up to four times as much asphalt material as will burlap mats, cotton fibers, woven cloth, etc. Loktuft, weighing 5 ounces per square yard, holds about one-half gallon of asphaltic material. Other forms of polypropylene or polyolefin can be used according to the invention. For example, various length fibers composing a nonwoven mat or woven fabrics can be used. The polyolefin of which Loktuft is made is known in the trade as a Marlex (Trademark) polyolefin. Such a polyolefin can be prepared according to a process set forth in U.S. Pat. No. 2,825,721, John P. Hogan and Robert L. Banks, issued Mar. 4, 1958. The disclosure of said patent is incorporated herein by reference. The polyolefins of said patent are known as high-density polyolefins. Although various polymers and copolymers of the several olefins described in said patent can be used, as can be others, to execute the various embodiments of the invention here described or variants thereof, it is now preferred to use a polypropylene material as described.

Thus, I have now found that fibers or fabrics or baths of polyolefins, particularly those of polymers of mono-1-olefins having from two to eight carbon atoms per molecule, preferably a polymer of propylene, including both homopolymers and copolymers, can be impregnated with an asphalt and an asphaltite as described herein.

Asphaltites are generally characterized by the following characteristics or properties.

Specific Gravity at 77° F.,	1.03 to 1.20
Ring and Ball Softening Point, °F.,	210 to 625
Solubility in Carbon Disulfide, %,	35 to 100
Solubility in 88° B. Naphtha, %,	Up to 60
Penetration at 77° F. (100 g., 5 sec.),	0 to 20

Various asphaltites: Gilsonite, Glance Pitch (Manjak), Grahamite, etc., are well known in the art.

The refined asphalts which are suitable for use according to the invention can be described as follows:

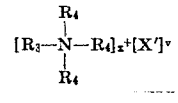
Specific gravity at 77° F.,	0.95 to 1.05
Ring and Ball Softening Point, °F.	100 to 180
Solubility in carbon disulfide, %,	About 100
Solubility in 88° B. Naphtha, %,	70 to 75
Penetration at 77° F. (100 g., 5 sec.)	30 to 200

The asphalt cutbacks are prepared according to known practices in the art as follows:

Depending upon the desired rate of cure: rapid curing—RC; medium curing—MC; or slow curing—SC, the asphalts are cutback with: naphtha; kerosene; or gas oil, respectively. Several grades of the cut backs are made, depending upon desired viscosity, as is known in the art. The asphalt and cutting stock are blended in desired proportions in a heated tank until homogeneous.

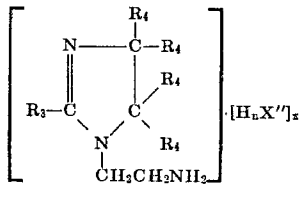
The asphalt emulsions employed can be prepared by any method known to those skilled in the art, for example, by preparing a soap solution comprising water, either soft or hard, and an emulsifying agent which can be either cationic, anionic, or nonionic. The soap solution is then mixed as in a colloid mill with the asphalt phase, the latter having been preferably heated to reduce the viscosity thereof. Usually the emulsifiers and any modifiers or promoters are dispersed in the water to form a soap solution which is then warmed to a temperature in the approximate range of 90°–200° F., preferably 90°–125° F. The asphalt can be heated to a temperature in the range 150°–300° F., preferably 250°–300° F. The warm soap solution and not asphalt are then proportioned to a colloid mill to emulsify the mixture during which milling the temperature of the mixture can be in the range of 100°–21 0° F., preferably 150°–200° F. The completed emulsion is then cooled to a temperature below 150° F. before being used or transferred to storage. The method of preparing an emulsion will have some effect on the properties thereof and the intended application or utility of the emulsion will dictate which particular method one should use to get the desired properties.

The emulsifying agents which are particularly useful are salts of organic bases characterized by the presence of at least one basic nitrogen atom in the cation portion and where the latter contains a long chain aliphatic hydrocarbon radical of at least 12 and as many as 24 carbon atoms, preferably a straight-chain fatty aliphatic group. A particularly useful subclass of such cationic emulsifying agents are the tetra-substituted quarternary ammonium compounds such as those of the formula:



(1)

Where R_3 is a long alkyl chain of at least 12 and as many as 24 carbon atoms, and the R_4's are shorter alkyl radicals or benzyl radicals, the presence of which is sufficient to impart oil solubility and emsulsifying properties to the salt material, X′ is a hydroxyl or an anion such as nitrate, sulfate, secondary phosphate, acetate, benzoate, salicylate and preferably a halogen, such as chlorine or bromine, v is the valence of said hydroxyl or anion, x is an integer equal to said valence. Another particularly useful subclass or cationic emulsifying agents is the salts of heterocyclic nitrogen bases such as alkyl pyridine, alkyl quinoline, alkylisoquinoline and alkyl imidazoline, a particularly useful group of the latter being represented by the general formula:



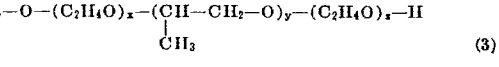
(2)

where R_3 is an aliphatic radical selected from the group consisting of alkyl and alkenyl radicals, preferably having 12 to 24 carbon atoms, R_4 is selected from the group consisting of hydrogen and alkyl radicals, preferably having one to four carbon atoms, and X″ is an anion such as nitrate, sulfate, secondary phosphate, acetate, benzoate, salicylate and preferably a halogen, such as chlorine and bromine, n is an integer equal to the valence of the anion and x is an integer of one to three. Primary, secondary and tertiary mono-amines and diamines are also useful, particularly the fatty acid diamines of the general formula $R_3NH(CH_2)_mNH_2$, where R_3 is as defined above in formula (2) and m is an integer in the range of 1 to 3.

Representative cationic emulsifying agents which can be used in this invention include cetyltrimethylammonium bromide, cetyldimethylammonium bromide, "tallow" trimethylammonium chloride (the term "tallow" referring to the radical of a mixture of fatty acids derived from tallow), n-dodecyltrimethylammonium chloride, n-dodecyltrimethylammonium bromide, n-dodecyltriethylammonium hydroxide, n-tetradecyltrimethylammonium chloride, n-hexadecyltripropylammonium iodide, n-octadecyltri-n-butylammonium nitrate, n-octadecyltriethylammonium chloride, n-hexadecyltrimethylammonium chloride, n-eicosyltrimethylammonium chloride, n-tetracosyltrimethylammonium acetate, n-pentadecylethyldimethylammonium chloride, n-docosylpropyldimethylammonium chloride, n-tricosyl-n-decyldiethylammonium benzoate, n-tetradecyl-n-heptyldimethylammonium chloride, n-octadecyl-n-decyldimethylammonium chloride, n-heptadecyldipropylmethylammonium chloride, n-nonadecyldi-n-octylmethylammonium chloride, n-hexadecylethyldimethylammonium chloride, n-dodecylbenzyldimethylammonium chloride, n-pentadecylbenzyldiethylammonium fluoride, n-octadecylpropyldimethylammonium salicylate, n-dodecyl-n-butylbenzylmethylammonium bromide, n-nonadecyldiethylmethylammonium sulphate, n-eicosyltrimethylammonium orthophosphate, 1-(2-aminoethyl)-2(4-tetradecenyl)-4,5-di-n-butyl-2-imidazoline, 1-(2-aminoethyl)-2(1,1-diethyl-5,7-dodecadienyl)-4,5-dimethyl-2-imidazoline, 1-(2-aminoethyl-2-n-octadecyl-4-ethyl-2-imidazoline, 1-(2-aminoethyl)-2-n-eicosyl-2-imidazoline, 1-(2-aminoethyl)-2-(1,1-dimethyl-decyl)2-imidazoline, 1-(2-aminoethyl)-2-(12-heptadecenyl)-2-imidazoline, 1-(2-aminoethyl)-2-(5,7-heptadecadienyl)-2-imidazoline, and the like, including mixtures thereof.

There are a number of commercially available cationic emulsifying agents which can be used, including: Nalcamine G–39M, which is a mixture of 1(2-aminoethyl)-2-n-aliphatic-2-imidazolines where the aliphatic groups are heptadecenyl and heptadecadienyl; Hyamine 1622, octylphenoxyethoxyethyldimethylbenzylammonium chloride; Hyamine 2389, methyldodecylbenzyltrimethylammonium chloride; Hyamine 10-X, octylcresoxyethoxyethyldimethylbenzylammonium chloride; Nalquate G–8–12, 1-(2-oxyethyl)-2-n-alkyl-1 (or 3) - benzyl-2-imidazolinium chlorides; Diam 11–C (n-alkyl-1,3-propylene amines); Aliquat 26 nonotallowtrimethylammonium chloride; Alimine 26, primary tallow amine; Duomeen T, N-alkyltrimethylenediamine; and the like. In addition, an acid, such as hydrochloric acid, sulfuric acid, acetic acid or sulfamic acid, can be incorporated into the asphalt emulsion to enhance the surface active properties of the cationic emulsifying agent and impart an acid pH below 7 to the emulsion. Generally, pH's in the range of 2 to about 6.5, preferably 3 to 5, are suitable for these acidic emulsions. The amount of the acid will generally be 0.1 to 1, preferably 0.2 to 1, weight percent of the emulsion, but can be considered and calculated as part of the cationic emulsifying agent. Sulfamic acid is especially useful where the asphalt used is of an aromatic nature and has an oil fraction which has an A.P.I. gravity not exceeding 15.5, and preferably not exceeding 15, and is useful where the asphalt emulsion must pass the modified miscibility test or the cement mixing test, which are described hereinafter.

Suitable nonionic emulsifying agents include those of the general formula:



(3)

where R is selected from the group consisting of hydrogen, aryl, and alkylaryl radicals; and x, y and z are integers, such that (1) when x is zero, y is also zero, z is in the range of 6 to 11, inclusive, and said R is one of said aryl and alkylaryl radicals, and (2) when x and y are each greater than zero, the sum of x and z is in the range of 20 to 40, inclusive, and y is in the range of 40 to 60, inclusive.

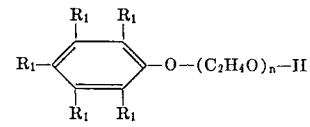
Representative examples of the nonionic emulsifying agents include: phenoxypenta(ethyleneoxy)ethanol, phenoxyocta(ethyleneoxy)ethanol, phenoxyennea(ethyleneoxy)ethanol, phenoxydeca(ethyleneoxy)ethanol, 4-methylphenoxypenta(ethyleneoxy)ethanol, 2,3,6-triethylphenoxyhepta(ethyleneoxy)ethanol, 4(1,1,3,3-tetramethylbutyl)phenoxyhepta(ethyleneoxy)ethanol, 4(1,3,5-trimethylhexyl)phenoxyhexa(ethyleneoxy)ethanol, 4-nonylphenoxyhepta(ethyleneoxy)ethanol, 2,3,4,5,6-penta-n-pentylphenoxyennea(ethyleneoxy)ethanol, 2(1,3,5-trimethylhexyl)-4(1,3-dimethylbutyl)phenoxypenta(ethyleneoxy)ethanol, 4(3,5,5-trimethylheptyl)phenoxyhexa(ethyleneoxy)ethanol, 3(3,5,7,7-trimethyl-5-ethylnonyl)phenoxyhepta(ethyleneoxy)ethanol, 4(1,1,3,3,5,5,7,7-octamethyldecyl)phenoxyenna(ethyleneoxy)ethanol, 4-n-pentacosylphenoxypenta(ethyleneoxy)ethanol, 3,5-di-n-decyl-4-n-pentylphenoxydeca(ethyleneoxy)ethanol, betahydroxyethyleneoxytetraconta(propyleneoxy)octadeca(ethyleneoxy)ethanol, beta-hydroxyethoxyoctadeca(ethyleneoxy)tetracontra(propyleneoxy)ethanol, beta-hydroxyethoxyennea(ethyleneoxy)pentaconta(propyleneoxy)deca(ethyleneoxy)ethanol, betahydroxyethoxynonadeca(ethyleneoxy)hexaconta(propyleneoxy)nonadeca(ethyleneoxy)ethanol, beta-hydroxyethoxytetradeca(ethyleneoxy)pentatetraconta(propyleneoxy)tetradeca(ethyleneoxy)ethanol, phenoxyethyleneoxypentapentaconta(propyleneoxy)octatriaconta(ethyleneoxy)ethanol, 4-methylphenoxydeca(ethyleneoxy)nonatetraconta(propyleneoxy)eicosa(ethyleneoxy)ethanol, 4(1,3,5-trimethylhexyl)phenoxyhexa(ethyleneoxy)pentacontra(propyleneoxy)triconta(ethyleneoxy)ethanol, 4-n-pentacosylphenoxypentacosa(ethyleneoxy)pentaconta(propyleneoxy)deca(ethyleneoxy)ethanol, 2,4,5-trimethylphenoxydeca(ethyleneoxy)pentaconta(propyleneoxy)pentacosa(ethyleneoxy)ethanol, 2(1,3,5-trimethylhexyl)4(1,1,3,3-tetramethylbutyl)-phenoxyeicosa(ethyleneoxy)hexatetraconta(propyleneoxy)penta(ethyleneoxy)ethanol, 4-n-pentacosylphenoxyeicosa(ethyleneoxy)hexaconta(propyleneoxy)nonatriaconta(ethyleneoxy)ethanol, and the like, and mixtures thereof.

In addition, other nonionic emulsified agents may be used, including (a) those of the general formula:

$$R-O-(C_2H_4O)_x-(CH(CH_3)-CH_2-O)_y-(C_2H_4O)_z-H \quad (4)$$

where R is selected from the group consisting of hydrogen, aryl and alkaryl radicals; and x, y, and z are integers such that (1) when x is zero, g is also zero, z is in the range of 20 to 60 and R is one of said aryl and alkaryl radicals, and (2) when x and y are each greater than zero, the sum of x and z is i the range of 50 to 350, and y is in the range of 40 to 60; together with (b) a smaller proportion of a cationic emulsifying agent exemplified by the tetra-substituted quaternary ammonium compounds or the salts of heterocyclic nitrogen bases, and (c) naphtha.

The nonionic emulsifying agents, as shown by the general formula, represent a rather narrow class of compounds and they have a critical balance of hydrophobic component (the R and propyleneoxy groups) and hydrophilic component (ethyleneoxy groups) necessary to give the necessary mixing time. Within the general formula given earlier for these nonionic emulsifying agents, there are two preferred subclasses that can be represented by the following general formulas:

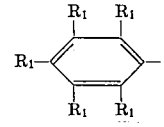


(5)

where R_1 is selected from the group consisting of hydrogen and alkyl radicals having one to 25 carbon atoms, the total number of carbon atoms in the alkyl radicals preferably does not exceed 25, and n is an integer in the range of 20 to 60; and

$$R_2-O-(C_2H_4O)_a-(CH(CH_3)-CH_2-O)_b-(C_2H_4O)_c-H \quad (6)$$

where a and c are integers greater than zero and whose sum is in the range of 50 to 350, b is an integer in the range of 40 to 60, and R_2 is selected from the group consisting of hydrogen and the hydrocarbon radical:



(7)

where R_1 is as defined above.

A particularly preferred nonionic emulsifier is Triton X-305, which is a mixture of octaphenoxypoly(ethyleneoxy)ethanol having 30 ethyleneoxy groups in the poly(ethyleneoxy) chain.

Suitable anionic emulsifying agents employed include the sulfonates, particularly the alkyl aryl sulfonates, such as: p-dodecylbenzene sodium sulfate, n- or iso-p-octylphenoxypoly(ethyleneoxy)ethanol sodium sulfonates, sodium isopropylnaphthalene sulfonate, sodium tetrahydronaphthalene sulfonate and methylnaphthylene sodium sulfonate (Petro Ag); and the sulfates: sodium cetyl sulfate (n-hexadecylsodiumsulfate), ammonium lauryl sulfate, sodium tridecyl sulfate; and the phosphates: alkylpolyphosphates, complex amidophospho salts, as well as esters and others such as: sodium diamyl sulfosuccinate and disodium-N-octadecyl sulfosuccinamate.

Although not essential, other materials may be employed in the asphalt emulsion, including such stabilizing agents as hydroxyethylcellulose, aluminum chloride, and calcium chloride.

The proportions in which the asphaltite and refined asphalt are employed will depend upon the ultimate result desired. This result will be influenced by relative cost, ease of application and importantly, the wearing and weathering properties desired for the use intended.

Ordinarily, a sufficient amount of the asphalt emulsion is first spread onto the surface to be covered that the fabric or mat laid thereinto will be substantially imbedded therein. The Gilsonite, suitably cut back for the use intended, is then placed upon the imbedded fabric and there is an interfacial mixing between the asphalt and the cutback Gilsonite. The degree of interfacial mixing taking place before complete curing can be controlled by the amounts of the two materials as well as the nature of the emulsion and the nature of the cutback Gilsonite. For the parking lot service herein described the cutback Gilsonite was prepared as follows:

Gilsonite was blended with naphtha (200° to 300° F., boiling range) to meet RC-2 (new designation RC-250) road oil viscosity specification: Saybolt Furol viscosity at 140° F. in the range of 100 to 200 seconds. The materials were added to a

heated tank and blended until homogeneous. The final viscosity was 125 seconds.

In the particular application for parking lot service, the refined asphalt cationic emulsion was spread on the surface in the amount of about 0.3 to 0.5 gallons of emulsion per square yard. The Loktuft polyolefin fabric was then applied onto the emulsion and allowed to set in place. Finally, the cutback Gilsonite (RC–2) was spread thereover in the amount of 0.4 to 0.8 gallon per square yard as the final coat. This parking lot is still in service and shows no weathering or wearing due to automobile traffic thereover. A similarly produced parking area using cutback refined asphalt (RC–2) instead of cutback Gilsonite (asphaltite) has not given as good service. The poorer service is believed to be due to weathering of this latter system having the topping of cutback refined asphalt.

The Gilsonite used in the above-described operation had the following properties:

Specific Gravity at 77° F.,	1.08
Ring and Ball Softening Point, °F.	300
Solubility in CS_2, %,	95
Solubility in 88° B. Naphtha, %,	45
Penetration at 77° F. (100 g. 5 sec.)	10

The naphtha used was a straight run distillate having the following properties:

Boiling range, °F.,	205 to 300
API Gravity at 60° F.,	50

The final blend of Gilsonite plus naphtha had a viscosity, Saybolt Furol Viscosity, at 140° F. of 125 seconds.

The refined asphalt was produced from an asphaltic crude oil (Western Kansas crude oil) by distilling the crude oil to produce a residue topped crude oil (about 25 volume percent of the crude). This topped crude oil was then vacuum distilled to produce the refined asphalt (asphalt cement) which had the following properties:

Specific Gravity at 77° F.,	0.99
Ring and Ball Softening Point, °F.,	120
Solubility in CS_2, %,	99.9
Solubility at 88° B. Naphtha, %,	72
Penetration at 77° F. (100 g., 5 sec.)	90
Ductility (77° F., 5 cm./sec.), cm.	110+

The cationic asphalt emulsion which was prepared from this refined asphalt comprised:

Refined asphalt, vol. %	68
Water, vol. %	32*

*Included (based on 1,000 pounds of aqueous solution):

Hydrochloric acid (31% strength)	5 pounds
Duomeen-T*	12.5 pounds

*n-tallow trimethyl diamine, $RNH(CH_2)_3—NH_2$, where R is a straight chain tallow fatty acid.

The cationic asphalt emulsion had the following properties:

Saybolt Furol Viscosity at 122° F.,	sec.	48
pH of emulsion		6.0

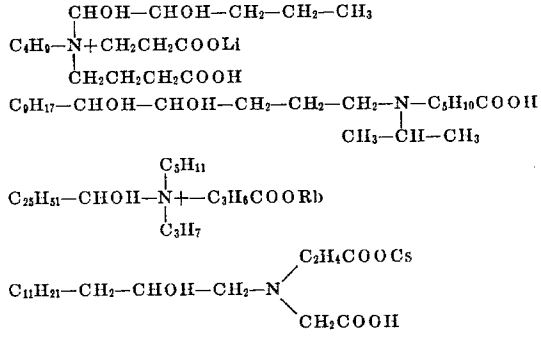
Although this specific system used the refined asphalt cationic emulsion, other emulsions such as nonionic, anionic, and amphoteric can be used. Also, instead of refined asphalt emulsions, cutbacks can be used such as the various rapid curing, medium curing and slow curing road oils.

The refined asphalt can be recovered from topped crude oil by solvent fractionation or extraction using such as liquid propane, butanes, pentanes, and mixtures thereof. Also, the refined asphalt can be oxidized, e.g., by air-blowing with or without a catalyst, to produce the desired penetration, ring and ball, etc., for the refined asphalt.

Also, the system or composite can be used with or without aggregate, with or without asbestos fibers, with or without chemical oxidizers or accelerators, and can be used for producing supporting walls, liners for ditches, molded construction blocks, molded forms, roofing rolls, shingles, wall dividers, etc. Roofing roll, for example, is produced by impregnating a rolled out roll of Loktuft with refined asphalt emulsion such as cationic emulsion, then coated with cutback asphaltic such as Gilsonite, preferably containing asbestos fibers, and a final coating of aggregate, which can be colored, ranging in size from about Number 8 U.S. Standard Sieve size to about one-fourth inch (granules) which is rolled into the final Gilsonite coating. This produces a rolled roofing which can withstand weathering and which can stand up under foot traffic which occurs in many roof installations.

A block is made by placing into a rectangular mold, for example, a layer of cutback Gilsonite, then a layer of Loktuft, which is then impregnated with an asphalt emulsion. Several layers of Loktuft, impregnated with emulsion are added to build up the laminate of Loktuft. Finally a topcoat of cutback Gilsonite is added and the mold is cured. Curing can be at ambient temperatures, but can be effected at higher temperatures, e.g., up to about 150° to 200° F. Coloring aggregate can be added to the face to be exposed, for decorative purposes. In some molded blocks, the first layer of cutback Gilsonite can be eliminated.

Amphoteric emulsifying agents which can be used, and which are known in the art, can include such materials as:



and the like.

It is within the scope of the invention described herein to admix the asphalt and Gilsonite and to apply the mixture to the fabric matting or fibers. The various combinations in which this can be handled can readily be determined by one skilled in the art in possession of this disclosure. Suffice to say, he will take into consideration the ultimate and use as well as the ease of application, handling, etc. For example, it within the scope of the invention and the claims thereto to admix say an asphalt emulsion and cutback Gilsonite with fibers to prepare a mass which can be, so to speak, buttered or otherwise spread on a surface.

It will be understood by one skilled in the art in possession of this disclosure having studied the same that the surfacing of the invention can be covered with aggregate such as crushed stone, sand pebbles, etc. Pressure upon this aggregate will cause a mixing, as it were, of the refined asphalt and the asphaltite thus securing in a definite manner the advantages of the invention.

Reasonable variation and modification are possible within the scope of the foregoing disclosure and the appended claims to the invention the essence of which is that there has been provided a system composed of a refined asphalt, an asphaltite, and a fabric such as a polyolefin fabric mat or fiber composite.

I claim:

1. A composite structure consisting essentially of a nonwoven fabric of a polyolefin fiber impregnated with an asphaltite having the following properties:

Specific Gravity at 77° F.	1.03 to 1.20
Ring and Ball Softening Point, °F.	210 to 625
Solubility in Carbon Disulfide, %	35 to 100
Penetration at 77° F. (100 g., 5 sec.)	0 to 20;

and with an asphalt, the asphalt being a refined product having the following properties:

Specific Gravity at 77° F.	0.95 to 1.05
Ring and Ball Softening Point, °F.	100 to 180
Solubility in Carbon Disulfide, %	About 100
Penetration at 77° F. (100 g., 5 sec.)	30 to 200;

the asphaltite being used in a proportion which is effective to appreciably raise the ring and ball softening temperature of the refined asphalt.

2. A composite structure consisting essentially of a non-woven fabric of polypropylene fiber having a weight of about 4 to 6 ounces per square yard, a tensile strength in the warp direction of 80 to 90 pounds and in the woof direction of about 90 to 100 pounds, and having the capacity of holding a relatively large proportion of asphalt material as compared with its volume; impregnated with an asphaltite having the following properties:

Specific Gravity at 77° F.	1.03 to 1.20
Ring and Ball Softening Point, °F.	210 to 625
Solubility in Carbon Disulfide, %	35 to 100
Penetration at 77° F. (100 g., 5 sec.)	0 to 20;

and with an asphalt, The asphalt being a refined product having the following properties:

Specific Gravity at 77° F.	0.95 to 1.05
Ring and Ball Softening Point, °F.	100 to 180
Solubility in Carbon Disulfide, %	About 100
Penetration at 77° F. (100 g., 5 sec.)	30 to 200;

the asphaltite being used at a rate of about 0.4 to about 0.8 gallons per square yard and the asphalt being used at a rate of about 0.3 to about 0.5 gallons per square yard.

3. A composite according to claim 2 wherein the refined asphalt is used in an amount of about 0.3 to about 0.5 gallon of an emulsion thereof per square yard and the asphaltite is used in an amount of about 0.4 to about 0.8 gallon emulsion per square yard.

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