United States Patent

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[73] Assignee **Phillips Petroleum Company**

[54] **SYNTHETIC ORGANIC FIBER —ASBESTOS FIBER FABRIC AND ASPHALT IMPREGNATED PRODUCT**
7 Claims, No Drawings

[52] **U.S. Cl.** ..... **117/126 AB,** 117/138.8 E, 117/138.8 N, 117/138.8 UA, 117/138.8 UF, 117/168, 161/170, 210/509
[51] **Int. Cl.** **B32b 19/02,** B01d 39/20
[50] **Field of Search** ..... 117/126 R, 168, 138.8 E, 138.8 N, 138.8 F, 138.8 UA; 106/282; 162/145; 210/509; 161/169, 170

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ABSTRACT: A mat or fabric is made of asbestos fiber incorporated with polyethylene, polypropylene, Nylon and/or polyvinylchloride staple, split film, fibers or other synthetic organic fiber or subdivided polymeric material or plastic. The composite product either alone or impregnated, as with an asphaltic material, is suited for use as insulation, construction material, molding, and the like.

SYNTHETIC ORGANIC FIBER —ASBESTOS FIBER FABRIC AND ASPHALT IMPREGNATED PRODUCT

This invention relates to a product comprising synthetic organic fiber, asbestos, and/or asphalt or other binding or sealing material. In one of its aspects it relates to a fabric comprising synthetic organic fiber, e.g., a polymer, asbestos fiber and/or asphalt or other binding or sealing material. In another of its aspects, the invention relates to a mat or fabric made or composed of asbestos fibers incorporated with a polymer, e.g., a polyolefin, such as polyethylene and/or polypropylene, Nylon, and/or polyvinylchloride staple, split-film or other fibrous material. The fiber or fibrous polymer-asbestos composite or combination in a now preferred form of the invention is composited or impregnated together with an asphaltic material or other binding or sealing material. The several products of the invention are useful for insulation, packaging materials, construction material and filter cloth.

The production of improved fabrics for mats or cloths is a constant desire in the art. A great deal has been done and reported in the production of composites to produce fabrics or other articles, mats, or cloths which will have certain desirable properties or characteristics. For example, it is a constant desire in the art to produce greatly improved resistance to fire on the part of such materials which, though they may possess other desirable properties, they may not possess desirable resistance to fire. Insulating materials used for insulation against heat must have certain minimum desirable fire resistance properties. The production of resilient materials as for packaging or vibration absorption is also desirable.

The incorporation into asbestos fiber so as to loosen or expand the felted body and to increase the ratio of interstitial space to space occupied by asbestos fibers of a sufficient number of stiff, elastic, hairlike bodies which hold the asbestos fibers from each other so as to render the asbestos felted sheet more absorptive of fluid asphalt is known. It is known to produce asbestos roofing papers or felt, which is emersed in asphalt at about 400° F. It is also known that fibrous mineral filler is more effective in affording high flow resistance than is a nonhigh fibrous mineral filler in the art dealing with asphalt saturated organic fiber felt. Further, it is known to add asbestos fiber to asphalt to retard liquid flow tendency of the material when heated. The properties, generally speaking, of certain organic synthetic materials are known.

We have now discovered that synthetic organic fiber-asbestos fiber can be combined to produce improved fabrics or mats or filter cloths. We have also found that such a material can be impregnated with asphalt and that there can be produced an asphalt-filled material which is quite uniform in texture in the sense that there are no pinholes present therein. Such composites can be produced with asbestos of white, filtration grade. This is of particular importance when one considers that the filtration grade asbestos used can have short as well as long fibers, i.e. the composite can be prepared from fibers which are, relatively speaking, short, considerably shorter than those of filtration grade, which are long enough to be woven into filter cloth. We have found by the use of the organic, synthetic fiber such as polypropylene fiber that short, asbestos fibers can be made into filtration "cloth." These short asbestos fibers are not suitable for use alone to be made into filter cloth. We have further found that the synthetic organic fiber-asbestos fiber material composited according to the invention, e.g. polypropylene fiber-asbestos fiber, can take up or absorb about twice as much asphalt as can conventional materials such as Kraft paper, cotton fiber, wool fibers and the like. It is noteworthy that synthetic organic fibers such as polyolefin fibers particularly polypropylene, are rot proof, while the conventional materials deteriorate in use.

The asbestos fabric loaded with asphalt emulsion very readily and did not show pinholes as had been obtained employing polyolefin, e.g. polypropylene fabric alone. The impregnated fabric or composite resists flow exceptionally well at temperatures as high as 140° F. and are therefore especially valuable for application on inclined surfaces, e.g. steep roofing.

Further, we have found using a fabric such as Loktuft (a trademark for polypropylene fabric) treating the same with added asbestos and asphalt raised melt flow from an original 120° F. to approximately 180° F. over use of asphalt on the fabric alone. This was done using an asphalt-asbestos mix which penetrated the Loktuft which is a nonwoven fabric, instead of packing on its surface. It is also possible to mix the asbestos with the nonwoven material and to then add the asphalt.

The short asbestos fibers to which reference has been made herein are only ¼-inch to 3 inches in length and are intimately intermixed in the polypropylene staple as by some roughening up or mixing process and can be prepared by needle punching.

Particularly, we have found that a superior filter cloth can be prepared by the incorporation of asbestos fibers in nonwoven synthetic organic fabrics such as nonwoven polypropylene. The well-known filtering capability of the asbestos fibers combines with the desirable filtration properties of the organic fiber to give an improved filter effectiveness in applications wherein either the organic fiber, e.g., polypropylene or the asbestos can be used separately. However, the fabric will provide the release properties that the mass filter media do not possess without undue loss and expensive backwashing problems. Longer filter service can be obtained for any liquid which must be separated from solids. The fabric of the invention can be effectively used for cartridge types either baffled or packed. Moreover, the organic fiber or split-film material, e.g., split-film polypropylene provides support for the asbestos fibers in drum, vacuum, precoat, or other type filters used for clarification operations wherein asbestos is particularly well suited and desired.

Economies can be realized by combining asbestos and a synthetic organic fiber at a lesser cost on a weight basis than can be obtained by asbestos alone. Although a polyolefin material such as polypropylene as herein described is a now preferred synthetic organic fiber, the other materials known in the art as are mentioned herein and others can be used to effect the overall concepts of the invention; thus, in addition to those already named, fluorocarbon resin fibers can be used in the system; for example, in a nonwoven system as a carrier and to augment asbestos filtration.

A particularly noteworthy advantage of the combination of the synthetic organic fiber and the asbestos is found in the heat-sealing of the asbestos fibers, especially short asbestos fibers into the synthetic organic fiber mass. This is particularly advantageous where maximum durability and resistance to handling, etc., and/or strenuous use is desired.

Where heat-sealing is practiced and impregnation with asphalt is also desired, the heat-sealing is preferably practiced prior to the impregnation with asphalt.

It is an object of this invention to produce an improved mat. It is a further object of this invention to provide an improved fabric. It is a still further object of this invention to provide an improved asbestos-containing product. It is a still further object of this invention to provide an improved mat or fabric containing asbestos fibers and having improved asphalt absorption and retention properties. A further object of the invention is to provide an improved filter cloth. A further object of the invention is to provide an improved insulation or construction material. A further object is to provide a resilient or vibration absorption material. It is a still further object of the invention to provide a fabric or mat which can be heat-sealed to provide improved properties. It is a still further object of this invention to provide a composite containing asbestos fibers which can be heat-sealed. A still further object of this invention is to provide such a composite which can be sealed, at least partially, employing asphalt or some other bonding or sealing material. It is a still further object of this invention to provide a composite comprising asbestos which can be molded or heat treated to retain a desired shape.

Other aspects, concepts and objects of this invention are apparent from a study of this disclosure and the appended claims.

According to the present invention, there is provided an improved composite containing asbestos fibers, the asbestos fibers being incorporated together with a synthetic organic fiber.

According to the present invention, there is provided an improved composite which has been bonded together and, at least partially, filled interstitially by adding thereto a bonding or sealing material and/or by heat sealing the same.

Herein and in the claims the term "fiber" includes any fibers or filamentatious material including split-film; for example, a tow, produced by stretching and fibrillation.

Further, according to the present invention there is provided an improved composite material suitable for various uses as herein described and delineated, the composite comprising in addition to synthetic organic fiber an asbestos and impregnating material such as an asphalt.

The synthetic organic fibers which are applicable for use in this invention are various. Generally, the fibrous materials now known in the art are all of them useful to an extent, albeit those herein more particularly described are now preferred.

Further, though the invention is applicable for use to obtain its excellent results when the longer filtration grade asbestos fibers are available it is of especially noteworthy value when only short fibers as herein described are available. It is known that in the free world only Rhodesia and South Africa possess filtration grade asbestos fibers. These African fibers are long enough to be woven into filter cloth. However, the short fibers which are available from other asbestos mines cannot be used alone to prepare filtration cloths.

Referring now to the term "pinholes," the following examples illustrate a composite according to the invention as well as one not according to the invention; that is, a composite not containing asbestos.

EXAMPLE I

An asbestos-polypropylene fabric prepared according to the invention was asphalt loaded by dipping. This fabric contained approximately 50 percent polypropylene Loktuft fabric as herein described and 50 percent AAA asbestos having a weight of approximately 7 ounces per square yard. After dipping and curing the asphalt impregnated sample had a thickness of approximately 1 millimeter. When raised to the light, no pinholes were visible to the naked eye.

EXAMPLE II

Polypropylene fabric not containing any asbestos fibers was asphalt loaded with the same asphalt by dipping in same manner as in example I. After dipping and curing, the product had a thickness of approximately 1 millimeter. When held to the light, there could be observed quite a scattering of pinholes. That is to say, light could be seen through holes which were like unto those which might have been produced by indiscriminately jabbing a pin through the fabric to obtain as many as 10 and perhaps more holes of well-defined shape in an area of about 9 square millimeters.

It is noteworthy that the fabric of example I possessed about 3 times the resistance to manual bending as did the fabric of example 2.

EXAMPLE III

A composite of 50 percent polyvinylchloride and 50 percent asbestos was prepared and found to possess a 5 ounce per square yard weight for an end product fabric in pressure free form having an approximate thickness of 3 millimeters and in tightly compressed form of less than about one-half millimeter.

This fabric was fluffier in texture and appearance than was a 50 percent polypropylene 50 percent asbestos fabric which weighed 6.6 ounces per square yard and which in pressure free form had a thickness of about 2 millimeters and which in compressed form had a thickness of less than about one-half millimeter.

A similar fabric was made of 50 percent split-film polypropylene and 50 percent AAA asbestos. This fabric had a weight of 6.1 ounces per square yard and a 2 millimeter thickness in pressure free form. In compressed form it had a thickness of less than about one-half millimeter. Other similar examples prepared from other synthetic organic films, fibers or nonwoven fabrics or split-film give similar properties which can be observed.

EXAMPLE IV

The composites of the preceding paragraphs will all of them take up asphalt into which they can be dipped. Or, the asphalt can be otherwise applied as may be desired as by spraying, preferably as an emulsion.

EXAMPLE V

A fabric according to example I is applied to a filter screen backing plate and is found to retain particles of solid which are of the order of submicron in size.

In application Ser. No. 666,994, filed Sept. 11, 1967, now U.S. Pat. No. 3,505,260, there are described and claimed blends of finely divided fibers of a homopolymer or copolymer of ethylene or propylene and asphalt, the blend containing approximately "10–85" weight percent asphalt and approximately "15–90" weight percent of the finely divided fibers.

The following paragraphs are given by way of disclosure to be helpful to one skilled in the art to more fully understand and to better apply the invention for concepts herein set forth.

The asphalts employed are spraying or dipping or other application to the fibrous materials can be in the form of emulsions which can be cationic, anionic or nonionic or mixtures thereof. These emulsions can be prepared by any method suitable and known to those skilled in the art.

The asphalts used in the system include any of those bituminous materials used heretofore and known in the prior art, such as natural asphalts or those derived from petroleum refining, for example, by vacuum distillation, steam refining and/or air blowing, and the like. Asphalts characterized by penetrations (ASTM D-5-51) from 0 to about 300 or even higher and preferably from about 40 to 300 and having softening points (ASTM D-36-26) in the range of 90° to 250° F. and preferably 100° to 150° F., represent suitable asphalts that can be employed. These asphalts can be cut back with various hydrocarbon solvents to make the known rapid-curing, medium-curing, and slow-curing road oils which can be used for treating the fabric.

The asphalts used in the preparation of the emulsion include any of those bituminous materials used heretofore and known in the prior art, such as natural asphalts or those derived from petroleum refining for example, by vacuum distillation, steam refining and/or air blowing, and the like. Asphalts characterized by penetrations (ASTM D-5-51) from 0 to about 300 or even higher and preferably from about 40 to 300 and having softening points (ASTM D-36-26) in the range of 90° to 250° F., and preferably 100° to 150° F., represent suitable asphalts that can be employed.

The relative amounts of the various components of the asphalt emulsions can vary but in general the asphalt is present in an amount in the range of 50–70, preferably 60–65 weight percent; the emulsifier is present in an amount in the range of 0.1 to 4, preferably 0.25 to 1; and water is present in the amount between 50 and 25, preferably 32–39 weight percent based on the total blend.

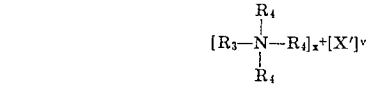
The asphalt emulsions employed can be prepared by any method known to those skilled in the art, for example, by preparing a soap solution comprising water, either soft or hard, and an emulsifying agent, either cationic, anionic, or nonionic. The soap solution is then mixed in a colloid mill or the like with the asphalt phase, the latter being preferably heated to reduce the viscosity. 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 of 90°

to 200° F., preferably 90° to 125° F. The asphalt can be heated to a temperature in the range of 150° to 350° F., preferably 250° to 300° F. The warm soap solution and hot 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° to 210° F., preferably 150° to 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.

A polyolefin material such as Loktuft has already been mentioned. Generally, there can be used fibers of polyolefins, particularly finely divided fibers of polymers of mono-1-olefins having from two to eight carbon atoms per molecule, preferably polymers of ethylene or propylene including both homopolymers and copolymers, which can be mixed with asbestos as described and/or impregnated with or coated with an asphalt or an asphalt emulsion such as hereinbefore described. In addition, the asphalt emulsion or blend of emulsion and asbestos fibers can be applied to a cloth or mat made from fibers that have been previously woven or matted into a cloth or a structure resembling same to form a (waterproof) structure. The water in the emulsion is then removed by any suitable method such as air drying or drying in an oven or by the heat employed in the molding operation.

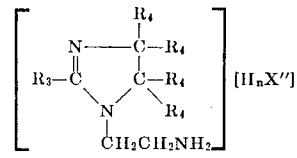
Clearly, the polyolefin fabrics which can be used are various. However, presently preferred is a fabric or mat made of polypropylene, especially polypropylene produced by the so-called low-pressure process. "Locktuft," a nonwoven fabric of polypropylene fiber available from Revonah Spinning Mills, Trenton and Castor Avenue, Philadelphia, Pennsylvania, **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 4 times as much asphalt material as will burlap mats, cotton fibers, woven cloth, etc. Other forms of polypropylene or polyolefin can be used according to the invention. For example, various length fibers composing a nonwoven mat or woven fabric 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.

A particularly useful class of cationical emulsifying agents 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 quaternary 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 emulsifying 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, and x is an integer equal to said valence. Another particularly useful subclass of 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 1 to 4 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 1 to 3. 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 and 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-dimethyldecyl)-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, octylphenoxyethoxyethyl-dimethylbenzylammonium 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 nonotallowtrimethylammoni-

um chloride; Alamine 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:

$$R-O-(C_2H_4O)_x-(CH(CH_3)-CH_2-O)_y-(C_2H_4O)_z-H \quad (3)$$

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.

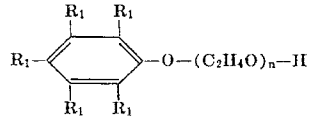
Representative examples of the nonionic emulsifying agents include: phenoxypenta(ethyleneoxy)ethanol, phenoxyocta(ethyleneoxy)ethanol, phenoxyennea(ethyleneoxy)ethanol, phenoxyennea(ethyleneoxy)ethanol, phenoxydeca(ethyleneoxy)ethanol, 4-methylphenoxypenta(ethyleneoxy)ethanol, 2,3,6-triethylphenoxyhepta(ethyleneoxy)ethanol, 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)phenoxyennea(ethyleneoxy)ethanol, 4-n-pentacosylphenoxypenta(ethyleneoxy)ethanol, 3,5-di-n-decyl-4-n-pentylphenoxydeca(ethyleneoxy)ethanol, beta-hydroxyethyleneoxytetraconta(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)pentatetracontа(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, y 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 in 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:

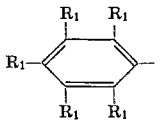


(5)

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.

A particularly suitable combination comprises a mixture of nonionic and cationic emulsifying agents, particularly when asphalt emulsions are employed which exhibit lack of stability in the presence of siliceous aggregates.

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 fibers of the synthetic organic material as well as the asbestos fibers can be pretreated as by chopping, carding or other physical handling as may be desired to achieve an intended effect.

When desired, heating of the synthetic organic material or polymer within the composite to a temperature at which it will undergo heat sealing or combination with the fibrous material and/or asphalt adjacent to same can be practiced. By selecting desirable thickness of material and forming it into a desired shape and practicing the heat sealing, a molded article can be prepared. This is especially useful when molding roof capping shingles, such as are placed on ridges. The invention is not limited simply to the molding of roofing shingles as one skilled in the art will understand. Other objects or articles can be similarly molded.

Usually the mat made of asbestos fiber incorporated with synthetic organic fiber is not treated with the asphalt material when used as filter cloth. However, when the material to be filtered is not a solvent for the asphalt, the mat can be treated with asphalt in an amount to not completely close off the openings in the mat so that a stronger cloth is produced which can filter solids from the liquid containing them.

The mat made of asbestos fiber incorporated with synthetic organic fiber can have the inclusion of filter aids such as diatomaceous earth, cellulose, and the like. These materials can be used in a fabric or felted form as well as mass filter media.

The mat made of asbestos fiber incorporated with synthetic organic fiber can be stabilized with epoxy or other hydrocarbon-resistant compounds by spraying, dipping, or the like.

Various methods can be used for preparation of the mat or fabric. The asbestos fibers and the synthetic organic fibers are intermixed such as by air agitation, tumbling in a container or drum, or other conventional apparatus. The mixture of fibers is then spread over a base such as cheese cloth, metal screen, or other conventional open texture fabric material. This spread out staple mix is conventionally needle tufted, matted, or felted. The mixture of staple can even be woven. The mat or fabrics can be prepared by causing the fibers to impinge against each other, such as in a Micronizer.

The asphalt material, e.g., melted asphalt, cutback asphalt (road oils), or various asphalt emulsions can be incorporated into the fabric or mat by such as rolling, brushing, spraying, dipping, or other conventional applicating methods. The fibers can be forced or shot into the asphalt emulsion.

Obviously one skilled in the art can determine optimum amounts of each fiber to use in a particular application after having studied this invention. Weight ratios of asbestos staple to synthetic organic staple can vary over a wide range, e.g., 1:100 to 100:1, preferably 1:50 to 50:1, and more preferably 1:10 to 10:1 whereby the effect of each fiber will be realized to the extent desired in the mat or fabric, depending upon the final use of the material.

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 have been provided composites of synthetic organic fibers and asbestos fibers and such composites impregnated with an asphaltic or other material as herein described, the composites of the invention as these may have been prepared being heat or otherwise sealable and with or without incorporation of said asphalt or other material, and with or without such sealing being useful as described.

We claim:

1. An asphalt impregnated composite consisting essentially of (a) synthetic organic fibrous material in the form of staple, split film, or fiber, selected from a polyolefin, nylon, polyvinylchloride, and a fluorocarbon, (b) asbestos fiber, and (c) asphalt in proportions sufficient to provide an impregnated material free from pinholes.

2. A composite according to claim 1 wherein the synthetic organic fiber is polypropylene.

3. A molded article made by molding a composite according to claim 1.

4. A composite according to claim 1 wherein the asbestos fiber is short asbestos fiber.

5. An asphalt impregnated filter cloth consisting essentially of (a) synthetic organic fibrous material in the form of staple, split film, or fiber, selected from a polyolefin, nylon, polyvinylchloride and a fluorocarbon, (b) asbestos fiber, and (c) asphalt, wherein the asphalt at least partially covers and to an extent seals together the respective fibers at their points of contact, thus partially filling the interstices of the thus-formed composite.

6. A composite according to claim 5 wherein the synthetic organic fiber is polypropylene.

7. A composite according to claim 5 wherein the asbestos fiber is short asbestos fiber.

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