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SOUND DEADENING COMPOSITION AND THE PROCESS OF PREPARING SAME

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The present invention relates to products primarily useful in insulating automobile bodies and the like against the transmission of sound and heat or cold, and for damping out vibrations which produce resonance and sound audible to the ear.

At the present time, asphalt, the residue of refined petroleum, is blended with solvents such as gasolene, naphtha or benzol and the blend of the asphalt and solvent is mixed with the aggregate material such as sand, pulverized coke, asbestos fibre, etc., and this mixture is sprayed on to the panel of the body through a nozzle operated by compressed air. This coating is built up to suitable thickness and the panel is then placed in a baking oven (used primarily for the setting of enamel, paint or lacquer on the outer surface of the panel) where it is subjected to a temperature varying according to practice from approximately 250° F. upwardly.

The panel is held at such temperature until the volatile solvent of the bituminous pitch has been evaporated and the enamel or lacquer on the exterior surface of the panel has been set. Because of the evaporation of the solvent there is a shrinking of the bituminous matter surrounding the aggregate filler and a reduction in weight corresponding in amount to the quantity of solvent sprayed on the body. A part of the sound absorbing or deadening effect is lost because of the reduction in thickness of the layer due to shrinkage of the bituminous material and the coefficient and the amount of internal friction is measurably reduced and only partial reaction is obtained in the phenomena of retarding the vibration of the panel and the consequent sound resulting from this vibration.

It has been discovered that this deficiency of the prior art can be obviated by the employment of sound deadening material, of an oil phase emulsion of bituminous material, such as cutback asphalt composed of asphalt, naptha, gasolene, benzene or like solvents and preferably prepared as an oil phase water emulsion by the method of producing such emulsions as disclosed in United States Patents Nos. 2,059,535 and 2,059,536 of the Gas Fuel Corporation, employing water but no emulsifying agencies.

I have found that this emulsified base has the capacity of combining with aggregate and/or filler to such amount that the ratio of the latter (i. e. aggregate and/or filler) to bituminous material is extremely high as compared with the ratio attainable when employing the unemulsified material according to the prior art. It has further been discovered that, due to the presence of water in the admixture, the shrinkage of the coating on the sprayed panel as experienced by the prior art, above outlined, is eliminated and is instead replaced by an expansion effect (especially when light fillers, such as ground cork and fibrous materials, are used) due to the action of the water as it vaporizes in the baking oven, leaving a cellular or porous structure of substantially increased thickness. These results, flowing directly from the use of the emulsified material according to this invention, endow the product with remarkable sound absorbing and deadening properties.

The emulsified material used in the present invention is admixed, in accordance with one preferred embodiment, with a relatively high proportion of heavy aggregate, such as sand, finely subdivided iron ore, iron filings, quartz, granular barium silicates, a porous calcine clay known as "Haydite," crushed cinders and the like, and with a relatively small proportion of fibrous aggregate, such as mineral wool, asbestos fibers, cork or wood fiber, wood flour, hair, cotton linters or the like. According to a second embodiment of the invention, use may be made solely of a suitable fibrous aggregate as filler, the emulsion used as base being admixed with a relatively large quantity of the latter, as will hereinafter more specifically appear. It is, of course, necessary to determine particle size of the fillers so that the admixture is assured of a fluidity and mobility of a character enabling it to be nozzle-sprayed.

In reference to the particle size of the heavy aggregate, I prefer to employ materials which will pass through a 20 or 25 mesh screen and which will be stopped by a 30 or 35 mesh screen. A range of 10 is essential to obtain a sufficient recovery of aggregate. In practice, however, I prefer to employ ungraded sand. Of course, the particles vary in size and shape and so far as shape is concerned, they, roughly speaking, approximate the contour of a sphere, cube or elongated rectangle.

The ability to damp out vibrations and consequent sound is dependent upon the absorption of these vibrations by inertia as well as by the internal friction that is built up within the mass of deadening material which results in the resistance of the flow of vibration through the cushion represented by the emulsified bituminous matter surrounding the aggregate.

Comparative tests to determine the relative quality and value of products of the type of those made by this invention have been developed at

the University of Michigan, and these tests are being used by the automotive industry today in conjunction with their sound proofing work. Use is made of a test panel of predetermined specifications which is coated and treated the same as it would be in the body manufacturing plant. This panel is then attached to the test apparatus where, by means of a blow or otherwise, vibration is set up and the volume of sound and the period of audibility is measured by an oscillograph. An indicator number is assigned to panels of known sound resisting characteristics and, for the purpose of comparison, the factor 15 is considered very good, the value of the product increasing as the factor decreases. Tests according to the University of Michigan method indicated a factor of 8.5 to 15 panels treated according to the present invention.

It has been found that when carbon dioxide, air or any other suitable gas, under pressure (115 pounds per square inch or over) is present during the mechanical combination of the emulsion ingredients and water, an unusual degree of stability is obtained.

The following illustrative examples of the invention show typical embodiments of the composition.

Example I

A non-colloidal emulsion made in the Gas Fuel Corporation apparatus by the method described in the United States Patents Nos. 2,059,535 and 2,059,536 and comprising as ingredients asphalt or residual bituminous material, a solvent such as gasolene, naptha or benzol and water. This emulsion is mixed intimately with sand and asbestos fibre. The asphalt emulsion, which constitutes the base of the final composition, includes at least 50% by weight of water. In making the final composition, use is made of about 38% by weight of asphalt emulsion base, 58% by weight of sand and 4% by weight of asbestos fibre. The final composition is of a consistency such that it may be applied to the panel to be treated by means of a spray nozzle. The coated panel is then heat-treated in the conventional manner as hereinbefore set forth.

An outstanding characteristic of the emulsion base, and one which makes the latter particularly suitable for use in the production of a sound deadening composition, is its capacity to take up large amounts of aggregate filler. Thus, according to this example, 38% by weight of the base takes up 58% by weight of filler. As the water evaporates when the deadener sets during the heat treatment of the coated panel (as in passing through ovens in automotive body plants or the like), the ratio of aggregate to asphalt is increased, since the quantity of base present is reduced by three quarters. Since, generally speaking, the higher the percentage of aggregate to base, the greater the sound-deadening efficiency, it is apparent that the resultant composition is an excellent sound deadener. Moreover, the evaporation of the water produces a porous product and obviates shrinking thereof.

The ratio of aggregate to base attainable in the final product according to the present invention cannot even be approached when use is made of conventional unemulsified bituminous material.

The quantity of water in the emulsified base may be varied. Thus, a satisfactory product may be obtained by using an asphalt emulsion with a 50% by weight content of water.

Example II

A non-colloidal emulsion of bituminous material containing 50% by weight of water is mixed with one half the quantity of the bituminous material and water composing the emulsion by weight of mineral wool and the resultant mixture is found to pass readily through the spray gun. As the water evaporates in the oven, while the sprayed material passes through the latter, the ratio of filler to bituminous base is doubled with a resultant increase in sound deadening efficiency. Furthermore, whereas conventional sound deadeners shrink substantially on passing through the enamel drying ovens with very little loss of weight, the composition described herein actually expands, accompanied by a very substantial reduction in weight with consequent porous structure providing definite thermal insulating and sound deadening properties.

Obviously sound deadeners in accordance with the present invention may be used wherever they are applicable, and as additional examples I propose to use them in refrigerators for household use, refrigerators for railway cars, refrigerating auto-truck bodies, pre-formed insulating and sound deadening slabs for ceilings or walls of rooms, such as public buildings, theatres, moving picture houses, etc.

While I have disclosed the principle of my invention, as well as specific embodiments thereof, in such manner that they may be readily understood by those skilled in the art, I am aware that changes may be made in the details disclosed without departing from the spirit of the invention as expressed in the claims.

What I claim and desire to secure by Letters Patent is:

1. In the manufacture of a bituminous sound deadening composition capable of withstanding a temperature from approximately 250° F. upwardly without shrinkage, producing a non-colloidal aqueous oil phase emulsion of pitchy bituminous material containing at least 50% by weight of water and a volatile solvent for cutting back the bituminous material, and free of any emulsifying agent, mixing said emulsion with a large proportion of a heavy aggregate, the quantity of which is of materially greater weight than the emulsion and consisting of solid non-fibrous particles of a size to pass through a 20 mesh screen but incapable of passing through a 35 mesh screen, and also mixing with the emulsion a small percentage of a fibrous aggregate.

2. A bituminous sound deadening composition capable of withstanding a temperature from approximately 250° F. upwardly without shrinkage, comprising a base of a non-colloidal aqueous oil phase emulsion of pitchy bituminous material containing at least 50% by weight of water, the emulsion being free of any emulsifying agent but containing a volatile solvent for cutting back the bituminous material, a heavy aggregate of materially greater weight than the emulsion in intimate admixture therewith and consisting of solid non-fibrous particles of a size to pass through a 20 mesh screen but incapable of passing through a 35 mesh screen, and a small percentage of a fibrous aggregate in intimate admixture with the emulsion and heavy aggregate.

3. A bituminous sound deadening composition capable of withstanding a temperature of approximately 250° F. upwardly without shrinkage, comprising approximately 38% by weight a base

consisting of a non-colloidal aqueous oil phase emulsion of a pitchy bituminous material containing at least 50% by weight of water and a volatile solvent for cutting back the bituminous material, said emulsion being free of any emulsifying agent, approximately 58% of a heavy aggregate in intimate admixture with the emulsion and consisting of solid non-fibrous particles of a size to pass through a 20 mesh screen but incapable of passing through a 35 mesh screen, and about 4% of a fibrous aggregate in intimate admixture with the emulsion and heavy aggregate.

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