Patented May 23, 1939 2,159,487

UNITED STATES PATENT OFFICE

2,159,487

VIBRATION-DAMPING MATERIAL

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No Drawing. Application March 13, 1935, Serial No. 10,959

4 Claims. (Cl. 134—1)

This invention relates to a material adapted for use in damping vibrations of vibratile objects, such as sheet metal automobile bodies or the like.

The need of vibration-damping for such objects is evident. As a result, a number of materials have been developed for this purpose. Thus, at one time, there was sprayed upon the metal sheet, the vibration of which was to be damped, a mixture comprising asphalt, a vegetable oil, a lightweight filler, such as cork flour, and a small proportion of graphite, the graphite serving to promote smoothness during application. The mixture was made at an elevated temperature, and was kept well stirred before use, to prevent settling of the lightweight filler and graphite.

With such a spraying composition, it has been necessary to apply a thick layer, say a layer of thickness of the order of one-tenth inch. With such a thick layer applied, for example, to a vertical surface of the door of an automobile, the force of gravity tending to cause flowing has considerable moment, because of the distance between the center of gravity of such a thick layer and the point of support upon the vertical surface. Also, the cost of such a treatment increases with the thickness of layer required. Furthermore, it is not always feasible to keep a composition well stirred between the time of original manufacture and final use, or even for the short period immediately preceding or during the spraying process.

Recently, spraying compositions have been largely replaced, therefore, by partially saturated felts which overcome difficulties inherent in the spraying compositions and which are adhered to the vibratile object.

It is an object of the present invention to provide a vibration-damping material of the spray-on type that is more effective in thin layers, of lower cost per square foot of surface damped, of greater toughness and tenacity, and/or of lesser tendency to settling of a filler material therefrom than is the conventional spray material.

A preferred embodiment of the invention comprises a plastic composition including a large proportion of fine particles of mass-adding material of high specific gravity, dispersed predominantly in non-contacting relationship. Another embodiment comprises such a dispersion in a medium that has been specially treated to minimize settling of the heavy particles from the medium, particularly during the period of time from the making of the mixture or dispersion to its application and hardening upon the article the vibration of which is to be damped.

The invention is illustrated by the following specific example showing a typical composition and the method of making the same in accordance with the invention.

There is first provided a yieldable plastic medium of the type of a viscous fluid. There is provided, for example, a medium of asphalt-like material blown by air at an elevated temperature and for a substantial period of time, adapting the resulting material to give a livered or somewhat gelatinnous mixture or solution in a volatile thinner therefor, such as a straight-run high test gasoline. Thus, there may be used, as the plastic medium, a highly blown petroleum still residue.

The plastic medium so made is mixed thoroughly with a thinner or extender such as the high test (H. T.) gasoline, this gasoline being preferably of substantially lower boiling range than U. S. motor gasoline.

To increase the toughness of the film is to be produced ultimately, to make possible the use of a more highly blown or more viscous medium, and to lower the requirement of volatile solvent at the time of application to the vibratile object, there is suitably incorporated a drying oil, such as linseed or China-wood oil. Preferably, the drying oil is made into a mixture with the asphalt-like material after the latter has been blown, as previously described. The mixture is extended with thinner. The resulting composition, including a plastic medium dissolved or extended by a volatile thinner, is suitably of the consistency of a light gel.

Into the composition there is then admixed fine particles of solid material of high specific gravity and, suitably also, fibrous reenforcing material.

Finally, the whole composition is thinned, by additional volatile extender for the said medium, to the consistency desired, after which the composition is ready for being sprayed or otherwise applied to the object the vibration of which is to be damped.

The proportion of granular filling material, in the form of particles of solid of high specific gravity, such as the grains of sand mentioned, should be large, to give a maximum vibration-damping effect. On the other hand, the proportion should be not so large as to prevent "floating" of the particles in the plastic medium, as will be described. A proportion of such particles comprising more than 200 per cent and not substantially more than 600 per cent by weight of the said medium is preferred.

A typical composition that has been used satisfactorily is the following:

Ingredients	Parts by weight
Petroleum still residue, in highly blown condition	10
Boiled linseed oil	3
H. T. gasoline, to thin above ingredients before addition of remainder of the composition	11
Asbestos fibres, short	11
Sand, banding	58
Additional H. T. gasoline	7
Total	100

After the composition has been applied to the vibratile object, the volatile thinner therein is allowed to evaporate, if desired, at an elevated temperature, whereby there is obtained a tough film of vibration-damping material of high overall density.

As a result of the high density, the composition is so effective in damping vibrations that there may be used a film of much lesser thickness than previously required for comparable results with compositions of lesser overall density. This gives an economy in the amounts of plastic medium and volatile thinner required. Furthermore, the film of lesser thickness minimizes the moment of the force tending to cause flowing on other than horizontal surfaces.

Settling is minimized, even in the presence of the particles of dense filler material, since the blowing of the asphalt-like material causes it to liver, when later mixed with the gasoline, to form a gel of viscosity far above the range of viscosity of ordinary fluids; from such a gelatinous composition the particles of filler settle either very slowly or not at all.

In such a composition the particles of sand filler are preferably rounded, as in banding sand. In place of sand, as filler, there may be used other finely divided particles of high specific gravity, as, for example, over 2, such as particles of slate, lead, iron or the like. The particles of heavy filler in the finished vibration-damping film "float" in the plastic medium, that is, are discrete or predominantly in non-contacting relationship to each other. In this manner, there is obtained the effect of a composition that is very dense but that preserves, on the other hand, largely the yieldability of the plastic medium selected, in distinction from the rigidity that would result from bonding together firm or hard particles in skeletonizing contact with each other. The particles of filler used are non-colloidal and non-fluffing, in distinction from colloidal clays and the like, and are adapted to cause a large increase in the overall density of the vibration-damping material.

As a plastic medium there may be used other bituminous material, such as natural or artificial asphalts, stearin pitch, plastic resinous bodies or the like.

While short fibres of asbestos are preferred as the reenforcing material, rag fibres may also be used. The reenforcing material reduces the tendency of the plastic medium to flow from preestablished position on the vibratile object. The reenforcement permits the use of a medium originally of such degree of yieldability as would otherwise cause flowing. At the same time, the reenforcement, being yieldable, does not destroy the overall plasticity and vibration-damping property of the mass.

The volatile thinner, represented in the tabulation above by high test gasoline, should be one adapted to preserve the desired viscous nature of the spraying composition, as by giving a livered or gelatinous composition on being mixed with the plastic medium, such as the blown asphalt, unless the function of prevention of settling of the filler particles is not desired. To make such a gel, the thinner used for the plastic medium should be an imperfect solvent. Thus, for highly blown asphalt-like material, the solvent may be gasoline, naphtha, or the like of low aromatic content. A perfect solvent, if used, would lower the viscosity to an extent that is undesirable for best results.

It will be understood that an element of my composition or a step in the preparation may be omitted if the function served thereby is not desired.

It will be understood, also, that the details that have been given are for the purpose of illustration, not restriction, and that variations within the spirit of the invention are intended to be included within the scope of the appended claims.

What I claim is:

1. A vibration-damping material of a sprayable consistency comprising blown asphalt, filler particles of sand, and a volatile extender that is an imperfect solvent for the asphalt and forms therewith a livered mixture, the proportion by weight of the filler particles being between 2 and 6 times that of the asphalt and the said particles being discretely dispersed in the asphalt in such a manner as to preserve the plastic character of the asphalt.

2. A vibration-damping material of a sprayable consistency comprising an intimate mixture of blown asphalt, reinforcing fibres, and sand filler particles of high specific gravity relative to the asphalt, the proportion by weight of the filler particles being between 2 and 6 times that of the asphalt and the said particles being discretely dispersed in the asphalt in such manner as to preserve the plastic character of the asphalt.

3. A vibration-damping material as described in claim 2 and including a drying oil intimately mixed with the asphalt.

4. A vibration-damping material of a sprayable consistency comprising blown asphalt, sand filler particles, and a volatile extender that is an imperfect solvent for the asphalt and forms therewith a livered mixture, the proportion by weight of the filler being between 2 and 6 times that of the asphalt and the said particles being discretely dispersed in the asphalt in such a manner as to preserve the plastic character of the asphalt.

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