United States Patent Office 3,332,799 Patented July 25, 1967

3,332,799

FLEXIBLE PROTECTIVE MATERIALS

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No Drawing. Filed July 14, 1964, Ser. No. 382,625
8 Claims. (Cl. 117—168)

This invention relates to protective materials. The materials of the invention contain compositions based upon plasticized coal tar pitch. This application is a continuation-in-part of my co-pending application Ser. No. 164,604, filed Jan. 5, 1962, now abandoned.

By plasticized coal tar pitch is to be understood a coal tar pitch such as one which has been subjected to a heat treatment in the presence of finely divided coal powder. Such processes are described in "Asphalts and Allied Substances" by Herbert Abraham, 5th ed., page 531, D. Van Nostrand and Co., and in U.S. Patents Nos. 2,124,843 to Anderton and 1,916,333 to Rose. Pitches which have been treated in this manner have been used for many years for the coating of metal surfaces, for example for the protection of buried pipes against corrosion, and they have proved to be a substantial improvement over untreated pitches particularly when used at freezing temperatures. Such plasticized coal tar pitches have been found satisfactory for use as pipe coatings applied hot in a fluid state to the metal surface under conditions where compositions based on untreated coal tar pitch have been found to suffer damage at the extremes of climatic temperatures.

However plasticized coal tar pitches generally have too great a temperature susceptibility to be suitable for use as the basis for coating compositions for protective tapes where a greater degree of flexibility is required than for the type of coating referred to above. Although such tapes are normally applied with the aid of heat to soften the coating composition sufficiently to make the tape mould to the profile to which it is applied and also to promote good adhesion to the metal, it is found that at low temperatures the coating is brittle and tends to crack and split on bending and a satisfactory result cannot be obtained.

The present invention provides compositions which overcome some of the difficulties which have been experienced in using plasticized coal tar pitch compositions particularly for the manufacture of coated tapes.

According to the present invention there is provided a flexible protective material comprising a flexible fibrous supporting fabric carrying a permanently pliable coal tar pitch composition which composition comprises a coal tar pitch modified by heat treatment in the presence of coal powder, said pitch having dispersed therein from 0.5 to 5 percent by weight, based on the weight of the composition, of polyvinyl butyral, from 0 to 40 percent by weight of a high boiling hydrocarbon liquid and from 0 to 30 percent by weight of a finely divided mineral filler.

The compositions according to the invention may be produced by a process which comprises melting the plasticized coal tar pitch, maintaining it in the molten state, adding at least ½ but not more than 5 percent of polyvinyl butyral and mixing thoroughly until the polyvinyl butyral has been substantially uniformly dispersed. If necessary the temperature of the mixture may be raised substantially above that necessary to maintain the coal tar pitch in the molten state in order to facilitate the dispersion of the polymer. The physical properties of the product can be adjusted by mixing the plasticized coal tar pitch with a high boiling hydrocarbon liquid such as a high boiling tar distillate. The function of the tar oil or hydrocarbon liquid is to adjust the consistency of the final composition to that desired. In order to avoid excess fuming during

mixing and application, and loss of volatile matter on weathering, the hydrocarbon liquid or tar oil should have a high boiling point. A particularly suitable hydrocarbon liquid is a coke oven anthracene oil with not more than 5% distilling below 300° C.

The amount of hydrocarbon oil employed depends upon the hardness of the plasticized coal tar pitch used. For the high boiling anthracene oil mentioned above a proportion of up to 40% by weight of the weight of the composition may be employed.

The polyvinyl butyral is preferably present in the composition in an amount of from 1 to 4% and more preferably from 1 to 3% by weight on the weight of the composition.

A mineral filler which may be of a fibrous nature may be incorporated in the mixture. Talc and slate powder are examples of mineral fillers which may be employed and the composition may contain up to 30% of either or both. Fibrous fillers such as asbestos may also be used.

The flexible protective material of this invention may be produced by a process which comprises applying the plasticized coal tar pitch composition according to the invention in the molten state to a web of reinforcing fabric by drawing the web through a bath of the molten composition to coat the web, and controlling the thickness of the coating obtained on the web by passing between heated knives, rollers or other heated devices adapted to control the thickness of the coating on the web.

A protective strip or ribbon of the plasticized coal tar composition may be prepared by extruding or calendering the composition into a strip or ribbon. Such a strip or ribbon may, be applied to a supporting web to form a protective tape. The calendered or extruded strip or ribbon may contain up to 30% by weight of the composition of asbestos as a filler.

The reinforcing fabric may be a woven fibrous web, or an unwoven mat or felt. The fabric may be formed from cotton or glass fibres or synthetic resin fibres for example, fibres of polyamide, polyester and acrylic polymers, or regnerated cellulose fibres.

The protective tape is suitable for application with the aid of heat, to pipes and other metallic surfaces.

Following is a description by way of example of a composition according to the invention and method of producing it. Percentages are percentages by weight.

Example

	Percent
Plasticized coal tar pitch	61
Polyvinyl butyral	2
Tar oil	37

The plasticized coal tar pitch had a softening point of 115° C. when determined by the ring and ball method and a penetration, when measured by I.P. 49/56 (100 gm./5 secs./25° C.) of 5.

The plasticized coal tar pitch was melted. The oil (which was a high boiling anthracene oil, giving as little fuming as possible at the processing temperature) was added and the polyvinyl butyral resin was dispersed in the mixture at a temperature of the order of 180–200° C. The mixture was stirred continuously until the polyvinyl butyral had completely dispersed.

The coating composition was maintained in molten state and a web of an open weave nylon cloth was drawn through the molten composition and then between heated steel knives to reduce the thickness to 1.5 mm. The coated tape was passed up a cooling shaft and after dusting the surface of one side to prevent adhesion it was wound on a mandrel and subsequently slit to the required width.

The addition of the polyvinyl butyral in the example reduces the temperature susceptibility of the composi-

tion sufficiently to render it pliable at low temperatures without it being unduly soft at higher temperatures.

The invention is not limited to the details of the foregoing example, for example the compositions according to the invention can be prepared without employing a tar oil.

Plasticized coal tar pitch is available commercially at this time only in those grades suitable for hot applied pipe coating and usually has a softening point of 80° C. or more. A plasticized coal tar pitch of lower softening point can be used in the present invention without the addition of a hydrocarbon oil.

The following is a comparative example of a composition which does not fall within the scope of the present invention.

	Percent
Plasticized coal tar pitch	77.5
Polyvinyl chloride resin (general purpose grade)	2.5
Tar oil (as in the previous example)	20.0

The plasticized coal tar pitch had a softening point of 80° C. when determined by the ring and ball method and a penetration when measured by I.P. 49/56 (100 gm./5 secs./25° C.) of 30.

The plasticized coal tar pitch was melted, the oil added and the polyvinyl chloride dispersed in the mixture at a temperature of about 100° C. The mixture was stirred continuously at about 140° C. until the polyvinyl chloride had completely dispersed. A coated tape was prepared in the same manner as in the previous example.

The superiority of the composition based on polyvinyl butyral over that based on polyvinyl chloride is clearly demonstrated by the following experiments.

Approximately 300 gms. of the coating composition made in the comparative example was placed in a metal container with a lid and left for six hours in an oven with its temperature at 200° C. During this heat stability test hydrochloric acid fumes were given off indicating decomposition of the polyvinyl chloride and at the end of the test the penetration had dropped from 30 to 5, indicating that the physical properties had been greatly changed by the heat treatment. A similar test carried out with the composition containing polyvinyl butyral as in the specific example according to the invention led to no significant change in the penetration of the composition at the end of the heating period thus indicating its comparative stability under these conditions.

Specimens of tape prepared as described in the specific example according to the invention and the comparative example were suspended in a vertical position and heated at the bottom with a flame until the coal tar pitch composition caught fire. The molten composition was collected in a receptacle and its penetration measure. In the case of the polyvinyl chloride composition from the comparative example, the penetration had dropped from 30 to 15 indicating that considerable hardening had occurred whereas the penetration of the composition as made in the example according to the invention was unchanged after the heat treatment.

These experiments demonstrate that compositions based on polyvinyl butyral have a much greater thermal stability than those based on polyvinyl chloride and this is of importance in the manufacturing process and also in use when the tape is applied to a metal surface with the aid of a propane or similar heating torch, which is used to soften the coating compound as it comes in contact with the metal.

I claim:

1. A flexible protective material comprising a flexible fibrous supporting fabric carrying a permanently pliable coal tar pitch composition which composition consists essentially of a coal tar pitch modified by heat treatment in the presence of coal powder, said pitch having dispersed therein from 0.5 to 5 percent by weight, based on the weight of the composition, of polyvinyl butyral, from 0 to 40 percent by weight of a high boiling hydrocarbon liquid and from 0 to 30 percent by weight of a finely divided mineral filler.

2. A flexible protective material as claimed in claim 1 in the form of a tape.

3. A flexible protective material as claimed in claim 1, wherein the high boiling hydrocarbon liquid is a tar distillate.

4. A flexible protective material as claimed in claim 3, wherein the tar distillate is a coke oven anthracene oil not more than 5 percent of which distills over below 300° C.

5. A flexible protective material as claimed in claim 1, wherein the finely-divided mineral filler is selected from the group consisting of talc, slate powder, asbestos and mixtures thereof.

6. A flexible protective material as claimed in claim 1, wherein the amount of polyvinyl butyral is from 1 to 4 percent by weight based on the weight of the composition.

7. A composition according to claim 1 in which the coal tar pitch is preplasticized by said heat treatment in the presence of finely divided coal powder.

8. A flexible protective tape comprising a flexible fibrous supporting fabric carrying a permanently pliable coal tar pitch composition which composition consists essentially of a plasticized coal tar pitch modified by heat treatment in the presence of coal powder, said pitch having dispersed therein from 1 to 3 percent by weight, based on the weight of tthe composition, of polyvinyl butyral, from 0 to 40 percent by weight of a high boiling hydrocarbon liquid and from 0 to 30 percent by weight of a finely-divided mineral filler.

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