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BITUMINOUS ROAD SURFACING
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6 Claims. (Cl. 106—31)

- Mineral oil asphalt, that is the residue obtained from the distillation of mineral oil, and tar, especially that obtained from pit coal, with or without addition of pitch, separate or mixed, brought into liquid state by heating and applied as road surfacing material, are known. It has also been proposed to employ hydrocarbons and chlorohydrocarbons as solvents for tar, pitch and asphalt.
- 10 The invention relates to such a process for making cold-flowing material for bituminous road surfacing, which hardens after being applied, and indicates a way for carrying such a process out in a particularly reliable and economic manner, if the above mentioned substances
- 15 tar, pitch and asphalt singly or in mixture are to be brought into solution or liquefied in such a manner that also after cooling they remain liquid and homogeneous and in cold-flowing state can be employed as street surfacing medium.
- 20 In the production of such cold-flowing mixtures, of the above mentioned materials, it sometimes happens that the road surfacing material only remains homogeneous for a short time, but after standing for a comparatively long period forms more or less flaky deposits, which appear to consist chiefly of so called free carbon. If these deposits occur to a large extent, it may happen that difficulties arise in the employment
- 25 of the road surfacing material, for example, when spraying or atomizing.
- 30 Thus, experiments have shown that, for example a homogeneous mixture of certain tars and pitches with benzol homologues and trichlorine ethyls formed a deposit, if it was applied together with an also homogeneous mixture of certain asphalts with trichlorine ethylene.
- 35 The systematic investigations of the inventors has led to the result that in mixtures of tar and pitch with addition of asphalt with said solvents it is the so-called free carbon in the tar and pitch and suspended in the solution, which in conjunction with the constituents of the solid materials, which are most difficult to dissolve,
- 40 tends to separate in flakes.
- 45 The invention is based on the discovery, that the occurring of such deposits can be avoided in that the light volatile solvents with a boiling point below 150° C. together with the heavy volatile solvents with a boiling point above 150° C. are employed besides chlorohydrocarbons. The invention consists in the utilization of this discovery.
- 50 The employment of the invention has a particularly favourable effect when the proportion of the light volatile solvents to the heavy volatile solvents is 4:3, and the proportion of the solid substances to the solvents does not exceed 65:35, so that it is advisable as a rule to keep within these limits.
- 55 As light volatile solvents in the sense of the invention are to be understood those, which boil at temperatures up to and including 150° C. and as heavy volatile solvents those, which boil at a temperature above 150° C.; solid substances are pitch and asphalt; the tar is distributed according to its composition proportionally to the above mentioned material classes.
- 60 The invention renders it possible to produce in a simple manner homogeneous mixtures of tar with or without addition of pitch and asphalt, which remain liquid also after cooling and can be employed as road surfacing materials in cold condition, even at temperatures below 0° C.
- 65 The invention also relates to a particularly advantageous manner of carrying out the new process according to which tar and pitch if such exists, on the one hand, and asphalt, on the other hand, are dissolved separately by means of the solvents actually suitable for their dissolution, and only then are these part solutions mixed.
- 70 If this suggestion is followed, particularly small quantities of solvents will be sufficient.
- 75 The formations of deposits are prevented almost entirely, if, according to a further proposition of the invention, the part solutions are intermixed and the selection and the quantity proportions of the solvents are so chosen, that the separating of flakes and deposits is prevented in the mixture of the part solutions.
- 80 The base materials and solvents and the proportional quantities thereof required for obtaining the desired result in each individual instance can be ascertained by short series of experiments in each case. Thus for example the solving capability of the heavy volatile hydrocarbons for pitch can be regulated by changing the anthracene oil percentage.
- 85 The quality of the product is ensured according to the invention in that turbo-mixers or similar intensively acting mixing machines are employed.
- 90 In cases, where for some reason or other the choice of base material or of the solvents is limited so that the desired object of preventing the formation of deposits cannot be reliably obtained with the aid of the available materials, it is possible, according to the invention, to guarantee
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the full effect of the combined base materials in that the separately produced part solutions are brought together at the moment, when being used, for example shortly before or during the application on the road surface.

The invention also relates to the suggestion of submitting the available base materials to a preliminary treatment in such a manner that the desired advantageous properties coming within the scope of the new method are imparted thereto to an increased extent.

Thus, it is proposed to subject the base materials (tar, pitch, asphalt) to an oxidizing, sulphurating or polymerizing treatment before their solution in the hydrocarbons or chlorohydrocarbons.

In this manner it is possible to improve the solubility of the one or the other base material and to regulate the consistency and adhesive property of the finished product to the extent desired for the individual case. It is also possible in this manner to effectively influence the point of brittleness and the elasticity of the finished product.

By following the above suggestion it is even possible under certain circumstances to transform base substances, which are themselves not suitable for the new process, for example lignite tars, pitches, and other residues from the lignite industry, so that they are suitable for the process and can thus be rendered utilisable for the production of tarred roads.

Further it is also possible in this manner under certain circumstances to substitute for the percentage of asphalt prescribed in the new process, either entirely or partially base materials of tarry or pitchy origin, transformed according to the above suggestions.

Thus for example it is possible according to the new process to proceed as follows:

Tar with or without the addition of pitch is first converted in the following manner in a boiler constructed for over pressure (autoclave) into a cold-flowing mass, that is a homogeneous mass, which flows sufficiently easily at ordinary temperatures.

Tar is heated in the autoclave until it can be stirred, or preferably preliminarily heated to about 50° C. until it has become stirrable, then placed in the autoclave and mixed or liquefied with suitable light volatile and heavy volatile solvents. The mass is mixed by a stirring mechanism built in the autoclave until it becomes homogeneous. As solvents chiefly benzol first running, benzol, solvent naphtha, heavy benzol and the like come into question.

If pitch is to be added to the tar, the temperature of the tar is preferably increased to about 90° C. and the mixture stirred until the pitch has entirely dissolved.

Whilst continuing to stir, the tar mixture or tar-pitch mixture is allowed to cool or the temperature of the mixture is decreased by suitable measures, and during the cooling process a light volatile chlorohydrocarbon having a boiling point up to 100° C., for example trichlor-ethylene, is added to the mass, preferably when the mass has already cooled below the boiling point of the corresponding chlorohydrocarbon.

It is advisable to provide the autoclave with a back-flow condenser, which returns into liquid state any evaporating solvent particles, especially chloro-hydrocarbon particles so that they are again mixed with the mass by the continual stirring.

When the mass has cooled, being at the same time continually stirred, it forms a cold flowing homogeneous tar or tar-pitch solution, which as a rule can be described as practically noninflammable.

At the same time asphalt is heated in a similar boiler (autoclave) constructed for overpressure with a light volatile chloro-hydrocarbon, for example trichlorine ethylene, with or without the addition of light volatile and heavy volatile solvents, until the mass can be stirred, when the stirring mechanism is brought into operation. After the asphalt mixture or solution has been homogeneously mixed or liquefied by continual stirring, it is allowed to cool, whilst continuing to stir, or the temperature of the asphalt mixture or solution is reduced by suitable means. The mass is then a cold-flowing, homogeneous non-combustible asphalt solution.

The two part solutions (tar or tar-pitch solution and the asphalt solution) are brought together into strongly acting mixing machines (turbo mixers, colloid mills, percussive mills and other similarly acting machines) and mixed until the two solutions have united to form a homogeneous mass. Already after a very short treatment in the mixing machine an absolutely homogeneous mass is obtained, which is noninflammable and remains cold-flowing and homogeneous for months.

Example I

6.3 kgs. of tar at about 50° C. (taken from a heated storage vessel) are introduced with 1 kg. of mixture composed of 40% products of distillation passing over during the fractional distillation up to 80° C., 30% impure benzol of the fraction C₆H₆ for example toluol xylol, that is the so-called benzol homologs and 30% an impure benzol solvent into a boiler (autoclave) indirectly heated by an oil bath, constructed for overpressure and provided with a stirring mechanism and backflow condenser and continually agitated by the stirring mechanism. After adding 2.2 kgs. of pit coal tar-pitch the boiler is heated to 90° C. so that the pitch is entirely dissolved. The hot oil is then removed from the oil bath by a pump and replaced by cold oil, after which the mass is allowed to cool to about 30 to 35° C., whilst it is being continually stirred. During the cooling process 0.5 kgs. of trichlorine ethylene are added at about 75° C. The solution obtained is a cold-flowing tar-pitch solution. In a similar boiler 6.67 kgs. of asphalt are heated to 85 to 90° C. with 3.33 kgs. of trichlorine ethylene. The stirring mechanism is engaged at about 70 to 80° C., as soon as the mass has become stirrable. The hot oil is then removed from the oil bath and replaced by cold oil by means of a pump, and the mass, whilst being continually stirred, is allowed to cool to 30 to 35° C. The solution is a cold-flowing asphalt solution. 8.5 kgs. of tar-pitch solution are then homogenized for a few minutes with 1.5 kgs. of asphalt solution in a turbo mixer. The finished material is discharged from the turbo mixer and allowed to cool completely.

Example II

As indicated under Example I, a pitch-tar solution composed of 3.8 kgs. of tar, 4.4 kgs. of pitch and 0.9 kg. of benzol mixture as in Example I, and 0.9 kg. of trichlorine ethylene and also an asphalt solution are produced, as above described, and then the two solutions, namely 8.5 kgs. of

the pitch-tar solution and 1.5 kgs. of the asphalt solution, are homogenized for a few minutes in a turbo mixer.

Example III

In a similar manner to that indicated under Example I, a tar-pitch solution of 8 kgs. of tar, 1.1 kgs. of pitch and 0.9 kgs. of a benzol mixture as indicated in Example I, an asphalt solution as indicated under Example I, of 6.5 kgs. of asphalt, 1.8 kgs. of trichlor-ethylene and 1.7 kgs. of a benzol mixture are produced as in Example I, and the two solutions are then homogenized in a proportion of 2:2 in the turbo mixer,

By observing the instructions given for carrying out the process and keeping within the limits indicated for the proportion of the solid substances employed, relative to the solvents and those for the proportion of the light volatile solvents relative to the heavy volatile solvents, it is possible to vary the composition of the mixtures to such a great extent that all requirements for a serviceable road surfacing material can be taken into consideration.

We claim:—

1. A process for producing a cold-flowing bituminous road covering which hardens after being applied, consisting in dissolving tar in a mixture of chlorohydrocarbons, light volatile hydrocarbons with a boiling point below 150° C. and heavy hydrocarbons with a boiling point above 150° C.

2. A process for producing a cold-flowing bituminous road covering which hardens after being applied, consisting in dissolving tar and pitch in a mixture of chlorohydrocarbons, light volatile hydrocarbons with a boiling point below 150° C.

and heavy hydrocarbons with a boiling point above 150° C.

3. A process for producing a cold-flowing bituminous road covering which hardens after being applied, consisting in dissolving tar and asphalt in a mixture of chlorohydrocarbons, light volatile hydrocarbons with a boiling point below 150° C. and heavy hydrocarbons with a boiling point above 150° C.

4. A process for producing a cold-flowing bituminous road covering which hardens after being applied, consisting in dissolving tar, pitch and asphalt in a mixture of chlorohydrocarbons, light volatile hydrocarbons with a boiling point below 150° C. and heavy hydrocarbons with a boiling point above 150° C.

5. A process for producing a cold-flowing material for bituminous road surfacing which hardens after being applied, consisting in mixing chlorohydrocarbons, light hydrocarbons with a boiling point below 150° C. and heavy volatile hydrocarbons with a boiling point above 150° C., in dissolving tar in a portion of this mixture, in dissolving asphalt in the remainder of the mixture and in subsequently uniting the two solutions.

6. A process for producing a cold-flowing material for bituminous road surfacing which hardens after being applied, consisting in mixing chlorohydrocarbons, light hydrocarbons with a boiling point below 150° C. and heavy volatile hydrocarbons with a boiling point above 150° C., in dissolving tar and pitch in a portion of this mixture, in dissolving asphalt in the remainder of the mixture and in subsequently uniting the two solutions.

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