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BITUMEN TREATING AGENT

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Nostrip Inc., a corporation of DelawareNo Drawing. Application December 8, 1942,
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11 Claims. (Cl. 106—269)

This invention relates to a bitumen treating agent.

The invention is particularly useful in making bituminous paving compositions and will be illustrated by detailed description in connection with such compositions.

There is need of improving the coating of difficultly coatable aggregate when mixed in wet condition with asphalt or like flowable bituminous material, improving the holding of the bituminous material on the aggregate, and in some cases decreasing loss of ductility of the material on aging. The present invention provides a treating agent that, when incorporated into asphalt or the like, meets these needs.

Briefly stated, the invention comprises a treating agent for bituminous compositions comprising an amine soap and an acylamide that is preferably a soap of an acylamidoamine. In the preferred embodiment, the treating agent includes a substantial proportion of a higher fatty acid in uncombined, free condition. The invention comprises also, bituminous compositions including a blend of a small proportion of the treating agent and a major proportion of flowable bituminous material and the method of making the treating agent herein described.

In general, there is first made the mixture of materials constituting the treating agent. This in selected proportion is then thoroughly blended with the bituminous material. The resulting composition is suitable for use as an aggregate coating material for paving.

As the bituminous material, there is used any of those that are flowable, that is, at least difficultly flowable at ordinary or moderately elevated temperatures, and are commonly employed in making bituminous paving compositions as, for example, natural asphalt, petroleum still residues, heavy tar, or the like. They are preferably used in cut-back condition.

In making the treating agent, there is formed an acylamide, an amine polysoap, and free soap acid in such manner that there is assurance that the mixture contains all of these ingredients. Thus, there is first formed a disoap or other polysoap of the selected surface active amine, a portion only of this soap is heated, so as to cause loss of water and the formation of a soap of an acylamidoamine or an acylamide, the heating being continued until there is substantially no further bubbling (escape of volatile decomposition product) at the maximum temperature of heating. In this heating, the polysoap is heated gradually to the selected temperature. Temperatures of approximately 140° to 200° C. are satisfactory, a temperature of about 145° to 155° C. being particularly suitable in giving a maximum proportion of the acylamidoamine soap. The material is preferably heated in the absence of air, so as to prevent oxidation to any substantial extent. After this heating to cause the formation of amidoamine or diacylamide or both, the mass is cooled to below the decomposition point of the polysoap and the remainder of the polysoap is then introduced.

Reactions involved in the heating step may be written as follows, oleic acid and ethylene diamine being used as representative soap acid and amine.

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$$C_{17}H_{33}COO.NH_2.C_2H_4.NH_2.OOCC_{17}H_{33} \xrightarrow{\text{heating}}$$

ethylene diamine dioleate

$$C_{17}H_{33}CO.NH.C_2H_4.NH_2.OOCC_{17}H_{33} + H_2O$$

oleylamido ethylamine oleate.

From the original disoap, there may be lost 2 mols of water, to given the diacylamide,

$$C_{17}H_{33}CO.NH.C_2H_4.NH_2.OC.C_{17}H_{33}$$

To make the polysoap of the amine and also the amide, there is first selected a suitable amine and fatty acid.

As the amine serving as a raw material, there is used a surface active amine (one which has the property of lowering the surface tension of water) containing at last 2 amino groups to the molecule. Examples of such amines that are satisfactory for the purpose are ethylene diamine, propylene diamine, diethylene triamine, and triethylene tetramine. As the acid there is used one that may be referred to as a soap acid by which is meant an acid that in the form of salts with alkali metals or an amine gives a soap. Such acid should contain about 8 to 20 carbon atoms to the molecule. Examples of acids that are used to advantage in the present invention are tall oil, peanut oil acids, oleic acid, resin acids (rosin), and naphthenic acid, the acid mixture composing tall oil being particularly satisfactory.

The ethylene diamine dioleate of formula shown above may be considered as an acylated polyamine in which both of the amino groups have been reacted with a high molecular weight carboxylic acid to form amine soap, more particularly a disoap of the amine. Those of the soaps of this type that are derived from diamines may be represented by the general formula

$$R_1COO.NH_2.(CH_2)_n.NH_2.OOC.R_2$$

in which R_1COO and R_2COO represent the acid

tween the second and third vehicle can then operate. It will be seen that the signaling current is sequentially switched on all the vehicles which simultaneously travel along the same line. This permits operation of all the announcing stations which thus always announce the arrival of the nearest oncoming vehicle without being influenced by any of the outgoing vehicles.

The period of engagement of the contactor 23 at the announcing station is adapted to permit a sequential operation of all the relays belonging to vehicles which travel simultaneously on the same line. Whenever the contactor is disengaged, all relays move back to their inoperative position and re-engage the short-circuiting means, thereby preparing the circuit for a new operation, as above stated.

A filter 31 is provided for preventing alternating current of any frequency from passing through the feeding circuits of the propelling means on the vehicles.

The announcing stations of this second constructional form or plant are similar to those described above in connection with the first constructional form.

Obviously the foregoing description given in connection with a direct current network feeding electrically driven omnibuses and comprising a two lead contact line still holds true where said contact line only comprises one lead and the return of the current takes place through the earth or, alternatively, where traction is performed by any form of alternating current. The same signaling system can, moreover, be adapted to any other form of traction other than electric traction such for example as steam engine or Diesel engine traction, owing to the arrangement of a special lead such as a wire or third rail properly insulated for conducting the signaling current impulses.

It will be also understood that, without departing from the general scope of the invention, the source of current such as 1* in Figure 1 may be, instead of being an alternator as stated by way of example, any suitable generator of alternating currents such as oscillating circuits, vibrating devices, switches, etc. Moreover, while the signaling current has been stated to be alternating current, it may as well be pulsatory current or in other words current obtained by rectifying alternating current.

Numerous minor constructional details might be varied without sacrificing the aforesaid advantages and departing from the ambit of the subjoined claims.

What I claim is:

1. An electric signaling system for electrically operated vehicles comprising a source of driving current, a contact line extending along the path of said vehicles for feeding driving current from said source to each of a sequence of vehicles travelling along said line, and means for indicating the approach of its next oncoming vehicle at one at least of a plurality of stations spaced along and electrically connected with said line, said means comprising a source of alternating signaling current having an electrical feeder connection with said contact line at a fixed point along said line whereby said signaling current is superimposed upon said driving current and is also fed to each of said vehicles, a driving circuit and a signaling circuit on each vehicle, each including means to permit current from its respective source only to flow therethrough, means on each vehicle for short-circuiting said signaling current

and thereby establishing a signaling circuit between each vehicle and said feeder connection, the voltage of said last-named signaling circuit decreasing at said station between said next oncoming vehicle and said feeder connection as the vehicle approaches said feeder connection, switch means for periodically interrupting the short-circuits, and voltage responsive means at said station and connected to said line through means preventing flow of driving current but permitting flow of signaling current, whereby said voltage responsive means indicates the distance from its station of the vehicle nearest thereto on the side of the line away from said feeder connection.

2. An electric signaling system for electrically operated vehicles comprising a source of driving current, a contact line extending along the path of said vehicles for feeding driving current from said source to each of a sequence of vehicles travelling along said line, and means for indicating the approach of its next oncoming vehicle at each of a plurality of stations spaced along and electrically connected with said line, said means comprising a source of alternating signaling current having an electrical feeder connection with said contact line at a fixed point along said line whereby said signaling current is superimposed upon said driving current and is also fed to each of said vehicles, a driving circuit and a signaling circuit on each vehicle, each including means to permit current from its respective source only to flow therethrough, means on each vehicle for short-circuiting said signaling current and thereby establishing a signaling circuit between each vehicle and said feeder connection, the voltage of said last-named signaling circuit decreasing at each said station between said next oncoming vehicle and said feeder connection as the vehicle approaches said feeder connection, switch means for periodically interrupting the short-circuits, said switch means including an automatic commutator at the feeder connection and a relay on each vehicle, said relay normally closing said short-circuit and adapted, when energized, to open said short-circuit only after a predetermined time and to maintain said short-circuit open, and voltage responsive means at each station and connected to said line through means preventing flow of driving current but permitting flow of signaling current, whereby said voltage responsive means indicates the distance from its respective station of the vehicle nearest thereto on the side of the line away from said feeder connection.

3. An electric signaling system for electrically operated vehicles comprising a source of driving current, a contact line extending along the path of said vehicles for feeding driving current from said source to each of a sequence of vehicles traveling along said line, and means for indicating the approach of its next oncoming vehicle at each of a plurality of stations spaced along and electrically connected with said line, said means comprising a source of alternating signaling current having an electrical feeder connection with said contact line at a fixed point along said line whereby said signaling current is superimposed upon said driving current and is also fed to each of said vehicles, a driving circuit and a signaling circuit on each vehicle, each including electrical filter means to permit current from its respective source only to flow therethrough, thereby preventing mutual interference between driving current and signaling current, means on each vehicle for short-circuiting said signaling current

This is a great improvement over bituminous compositions formerly used in road construction, in the certainty and thoroughness of coating and bonding to wet aggregate or wet road surfaces.

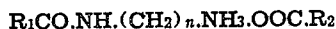
Reference is made to my copending application Serial No. 457,099 filed September 2, 1942 and entitled "Bitumen treating composition" of which the present application is a continuation in part.

It will be understood that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of illustration which do not constitute departures from the spirit and scope of the invention.

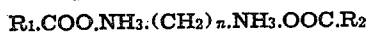
What is claimed is:

1. A bitumen treating agent comprising (1) an acylated polyamine in which at least one amino nitrogen has been converted into an amide group by reaction with a high molecular weight carboxylic acid and in which at least one amino nitrogen has been reacted with a high molecular weight carboxylic acid to form an amine soap and (2) an acylated polyamine in which at least two amino nitrogens have been reacted with high molecular weight carboxylic acid to form amine soap.

2. A bitumen treating agent comprising (1) an amido amine soap of the formula



in which $R_1.CO$ and $R_2.COO$ represent, respectively, the acyl group and the acid radical of a carboxylic acid containing 8 to 20 carbon atoms and n represents an integral number and (2) an amine soap of the general formula



in which n represents an integral number and $R_1.COO$ and $R_2.COO$ represent each an acid radical of a carboxylic acid containing 8 to 20 carbon atoms to the molecule.

3. A bitumen treating agent comprising (1) an acylated polyamine in which at least two amino nitrogens have been converted into amide groups by reaction with a high molecular weight carboxylic acid and (2) an acylated polyamine in which at least two amino nitrogens have been reacted with high molecular weight carboxylic acid to form amine soap.

4. A bitumen treating agent comprising (1) a diamide of the general formula



in which $R_1.CO$ and $R_2.CO$ represent acyl groups derived each from a carboxylic acid containing 8 to 20 carbon atoms to the molecule and n represents an integral number and (2) an amine soap of the general formula



in which n represents an integral number and $R_1.COO$ and $R_2.COO$ represents each an acid radical of a carboxylic acid containing 8 to 20 carbon atoms.

5. A bitumen treating agent as described in claim 1 including a substantial proportion of free higher fatty acid.

6. A bitumen treating agent as described in claim 3 including a substantial proportion of free higher fatty acid.

7. A composition of matter comprising a blend of a flowable bituminous material and the bitumen treating agent described in claim 1.

8. A paving composition comprising a blend of asphalt, the bitumen treating agent described in claim 3, and a substantial proportion of free higher fatty acid.

9. A paving composition comprising a blend of asphalt, the bitumen treating agent described in claim 1, and a substantial proportion of free higher fatty acid, the free fatty acid and said treating agent together constituting approximately 0.5 to 2.5 parts for 100 parts of the asphalt.

10. The method of making a bitumen treating agent which comprises mixing a surface active polyamine with an excess of a fatty acid containing not substantially less than 8 or more than 20 carbon atoms to the molecule, warming the resulting mixture so as to form a soap of the polyamine in which at least two amine nitrogens have been reacted with the fatty acid to form an amine soap, heating a portion only of the polysoap so formed, to cause loss of water and the formation of a soap of an acylamidoamine in which at least one amino group has been converted into an amide group including the acyl radical of the said fatty acid and another amino group is reacted with the said fatty acid to form an amine soap, cooling the product and then incorporating the remainder of the soap.

11. The method described in claim 10, the temperature of heating of the polysoap to form the soap of the amidoamine being approximately 140° to 155° C.

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