Patented Jan. 12, 1937

2,067,772

UNITED STATES PATENT OFFICE

2,067,772

WATERPROOF CONCRETE

Harold L. Levin, Rutherford, N. J., assignor, by mesne assignments, to The Patent and Licensing Corporation, New York, N. Y., a corporation of Massachusetts

No Drawing. Application August 22, 1932, Serial No. 629,883

1 Claim. (Cl. 106—27)

added to Portland Cement

This invention relates to improvements in the production of bituminous dispersions and is concerned particularly with the production of such dispersions possessing novel properties which render them suitable for a wide variety of uses in the arts.

The product of my invention consists, generally stated, of a dispersion of bitumen in water, made with the aid of a hydrophylic, and, in a sense, water soluble dispersing agent such as soap, and is characterized in its novel aspect by the fact that the bitumen in the dispersion is of such character that the surface tension of the dispersed particles is such as to prevent coalescence of the dispersed particles so long as the water of the dispersing phase is present, despite the fact that the protective action of the dispersing agent has been either destroyed or eliminated or converted into a hydrophobic substance.

The commercial manufacture of dispersions of asphalt with soap as the dispersing or emulsifying agent, is well known, such emulsions being generally made of asphalt having a hardness range of from 40 to 120 penetration at 77° F. The use of soap as an emulsifying agent for this type of asphalt binder affords certain advantages, in that the dispersing operation may be carried out rapidly and the resulting product is characterized by a fine degree of dispersion, the dispersed particles generally ranging in size from an average of 2 up to 5 mu. Emulsions of this type, however, have limited application in the arts when the use of the emulsion necessitates its combination or admixture with mineral powders or with electrolytes such as alkaline earth salts. When electrolytes of the heavy metals are admixed with the emulsion, the soluble soap used as the emulsifying agent is converted into an insoluble heavy metal soap and thus its protective action is destroyed with the result that the emulsion becomes broken, the particles of asphalt coalescing to form clots or lumps.

I have found in accordance with the present invention, that the advantages of a soap emulsion as well as such manufacturing advantages as are incident to the use of soap as an emulsifying agent in the process of reducing asphalt or the like to the form of a dispersion, can be obtained, without however, entailing the disadvantages above pointed out.

To this end, my invention consists briefly stated, in producing, with the aid of soap or soap-like material, an aqueous emulsion of asphalt or the like, but using an asphalt of such physical characteristics that the dispersed particles in the presence of water, even upon destruction or elimination of the emulsifying agent, or upon its conversion into a hydrophobic substance, exhibit no tendency to coalesce and coagulate. Asphalts which will serve the purposes of the invention and afford the advantages thereof when in the form of an emulsion as herein described, are those which have a penetration not in excess of 20 at 77° F., and I prefer to use certain asphalts, such as the so called Stanolites or pressure tar asphalts, which possess melting points substantially lower than normal asphalts having equivalent penetrations. Asphalts within the range of hardness indicated are especially suitable for the manufacture of the particular type of emulsion herein contemplated, since they can be readily emulsified in the usual standard types of colloid mills, with soap as the emulsifying agent.

Specifically illustrating the invention, so-called hard Stanolite asphalt having a melting point of approximately 140° F., and a penetration of 10 at 77° F. may be dispersed in a Hurrell mill by feeding the asphalt to the mill in molten condition in a fluid stream simultaneously with the feed to the mill of a stream of rosin soap solution of such concentration as to produce an emulsion containing about 5% of soap on the aqueous phase. The particular mode of carrying on the operation is well known and needs no further explanation since my invention is concerned particularly with the novel results obtained by the use of a particular grade of asphalt for the production of emulsion possessing the special desirable properties herein described. Suffice it to say that the emulsification operation may be carried on for the production of emulsions which may contain 50 to 65% of asphalt of the nature specified, in particles not exceeding 5 mu in diameter, 3–5% soap, and 30–47% of water, by weight.

The resultant product, by virtue of the properties of the asphalt contained in the dispersion, possesses the advantage that it may be treated with acids, alkaline earth and heavy metal salts, or other electrolytes, without causing coalescence of the dispersed particles, so long as water is present. This unique property in a soap-type dispersion is due to the hardness of the asphalt used and its high surface tension in the presence of water. Hence, even though the protective film of the dispersing agent is destroyed as by admixing the dispersion with electrolytes which convert it into an insoluble or hydrophobic condition, the high surface tension of the dispersed particles in the presence of water, prevents coalescence from taking place and serves to retain the dispersed

particles in their original dispersed state. This property therefore, clearly distinguishes the product of my invention from the ordinary soap emulsions of commerce, since the latter readily become broken when mixed with electrolytes or with substances which yield heavy metal ions in solution.

The product is further distinguishable from aqueous suspensions of mechanically ground asphalts by the fact that it is impossible to obtain mechanically ground particles of a size approaching those of a soap emulsion even with prolonged grinding. Furthermore, the particles produced by mechanical grinding are fragmentarily and widely irregular in size, whereas the particles of the soap emulsion as produced by my invention are spherical and quite uniform as to size. Indeed at the upper range of hardness, which I have specified, it would be impossible to grind asphalts such as I employ in my invention. It has not been possible to use the ordinary soap-type asphalt emulsion for admixture with hydraulic cement such as Portland cement or with gypsum cement and sand to form cementitious structures. Accordingly, it has been necessary in making cement structures of this character as for example, for use as flooring compositions, to employ emulsions made with mineral powder colloids, such as bentonite, which latter type of emulsions are not destroyed by electrolytes, such as the alkaline-earth salts normally present in cement. These mineral powder types of colloids however, have the limitation that an extremely fine degree of dispersion of the asphalt or other binder cannot practicably be obtained by their use. On the other hand, the product of my invention possesses the advantage of extremely fine subdivision of the asphalt particles and at the same time remains unaffected by electrolytes, due to the high surface tension of the dispersed particles in the presence of water. Due to the fine subdivision of the particles, the surface areas of the sand and cement are more completely covered. Further, due to the more rapid sintering effect of the fine particles, and their increased adsorption on the aggregate surfaces, a corresponding increase in rate of fluxing and "wetting" of the aggregate results and hence the setting of the composition and its attainment of required hardness and coherence for use is more rapid than if a mineral colloid emulsion of the same asphalt were employed.

Emulsions made according to my invention may be applied to the production of floor mastics in the following manner: one volume of Standard Portland cement is mixed with three and one-half volumes of clean, sharp sand, one volume of water and one and one-half volumes of Stanolite-soap emulsion to give an asphaltic mortar capable of being spread by means of a trowel. This mixture may then be applied to a floor surface which has previously been primed with the straight emulsion. Upon setting of the cement content, and the subsequent dehydration of the structure, there is produced a hard, waterproof floor possessing some degree of masticity, due to its asphaltic content.

Again, the ordinary type of soap emulsions of asphalt are unsuitable for the production of waterproof paper wherein the emulsion is mixed with the fibrous stock and run off on a paper machine. In the manufacture of these waterproof papers it is customary to fix the dispersed particles on the fibre by adding alum to the mixture of the emulsion and the stock, thus preventing the dispersed particles from being washed away during the paper forming operation. This alum treatment causes a flocculation of the asphalt particles and binds them superficially to the paper fiber. However, with the ordinary soap-type of asphalt emulsion it is impossible to obtain proper setting or fixing of the dispersed particles upon the fiber without breaking the emulsion, since upon the addition of alum or similar fixing agent, the emulsion is broken and the particles of asphalt coalesce to form agglomerates, the presence of which makes it impossible to carry on the subsequent felting operation. On the other hand, the product of my invention, being unaffected by electrolytes, may be used in such paper making operations, since the addition of alum or similar fixing agent to the mixture of the emulsion and the fibrous stock to cause setting or fixing of the dispersed particles upon the fibers will transform the soap into an insoluble condition, but nevertheless, will not affect the colloidal stability of the particles which are prevented from coalescing by the high surface tension of the dispersed particles in the presence of water.

Owing to the fact that the asphalts which I employ, and particularly those having melting points of from 140° F. to 200° F. and within the range of penetration specified, are capable of flowing at normal temperatures, the emulsions thereof as herein described, are capable of forming impervious bituminous films when the water is removed as by evaporation.

Still further, the product of my invention may be admixed with dusty aggregates for the formation of road building compositions without lumping or clotting, despite the fact that the dust adsorbs the soap content of the emulsion, as contradistinguished from the ordinary soap type emulsions with asphalt which, when mixed with dusty mineral aggregates, are readily broken.

It will be seen therefore that by my invention I provide a type of bituminous emulsion which can be manufactured with the facility and ease of the ordinary type of soap emulsion and which possesses the fine particle size characteristics of soap emulsion, but which nevertheless may be employed for a wide variety of uses which have heretofore required the use of emulsions made with mineral powder type of colloid as the emulsifying agent, which latter cannot generally be produced with such fine particle size as the ordinary soap emulsion, and which when in the form of a dry film, require a long period of time to become water impermeable.

For uses that do not require admixture of the emulsion with electrolytes or similar agents which I have described, such for example, as a protective coating for various surfaces, and particularly where the emulsion of my invention is made with such relatively high quantities of the soap as to be susceptible to re-emulsification, this tendency may be eliminated by combining with the finished emulsion a small quantity of electrolyte such as aluminum chloride or calcium chloride, which will convert the soap in the emulsion into a hydrophobic character, but nevertheless, leave the dispersion in its original state without showing any tendency of the dispersed particles to coalesce, by virtue of the high surface tension of the dispersed particles in the presence of water. The dispersion thus treated may then be painted out or otherwise conveniently applied to the surface which it is desired to protect, and upon reaching a substantially dry condition the particles will coalesce and form a film highly resistant to water action and devoid of any tendency to re-emulsify

106. COMPOSITIONS,
COATING OR PLASTIC.

95

Exami

owing to the solubility of the heavy metal reaction product of the soap in the asphalt.

I claim as my invention:

A composition of the character described comprising hydraulic cement, aggregate and a dispersion of asphalt in water with soap as the sole dispersing and stabilizing agent, said dispersion being unaffected colloidally by said cement, said asphalt being of a type which is coalescible at normal temperatures in the absence of water but is of sufficient hardness as to be non-coalescible in the presence of water and hydraulic cement.

HAROLD L. LEVIN.