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ASPHALTIC COMPOUND

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This invention relates to the treatment of bituminous materials such as asphalt. It relates more particularly to the preparation therefrom of improved coating, impregnating, binding or adhesive material useful in the manufacture of roofing paper, shingles, paving, flooring and the like. The invention includes the resulting asphaltic material having improved penetration-softening point relationship and weathering properties.

The terms "asphalt" or "asphaltic" material as used herein are intended to mean a normally solid or semi-solid residual material of petroleum or coal tar origin.

One of the primary problems in the manufacture of this type of material for the purposes stated is the control of the penetration and softening point relationship of the product. This relationship to a considerable extent determines the serviceability of the product for a particular purpose.

The penetration value of asphaltic materials is a measure of its hardness under approximately normal temperature conditions. Its softening point is the temperature at which the material loses its solid characteristics and becomes relatively fluid.

It is to be understood that the term "softening point," and values with respect thereto given herein, have reference to the standard "ball and ring" method for determining the softening point of asphaltic material prescribed by the American Society of Testing Materials. Also "penetration" values appearing herein are as determined by the standard method prescribed by the American Society of Testing Materials for determining the hardness of asphalt and the like, the temperature used in the penetration tests being 77° F. (25° C.).

For some purposes it is desirable that the asphalt have a relatively high softening point so that it is not greatly affected by moderate temperature changes. For these same purposes it is frequently desirable that the material not be hard and brittle at such moderate temperatures; in other words, that its penetration value be relatively high.

The establishing of the desired relationship between softening point and penetration has been a major difficulty in the manufacture of such materials and this difficulty has usually been met by a compromise. The fact that the penetration-softening point relationship has been more or less fixed has prevented wider use of these materials in the manufacture of finished articles of commerce.

Prior to the present invention attempts have been made to control the penetration-softening point relationship by oxidation, dry or steam distillation, the addition of inert fillers or a combination of these devices.

By prolonged air blowing the penetration-softening point relationship has been somewhat improved. However, the weathering quality of the materials is influenced to a great extent by the severity of oxidation and such prolonged air blowing has had an adverse effect upon the useful life of the product. Likewise, neither distillation nor the addition of inert fillers has produced wholly satisfactory results.

I have discovered that asphaltic materials having greatly improved penetration-softening point relationship may be prepared by incorporating therein a relatively sm^ll proportion of boric acid. In addition to the improved penetration-softening point relationship, the resulting asphaltic material has superior weathering properties.

While I cannot state with certainty the reason for these improved results, it is my present belief that the boric acid reacts chemically with the asphaltic material. This belief is based upon the following observations:

1. The effect of the addition of the boric acid on the asphalt product is much greater than that where an equivalent amount of inert filler such as clay is added;

2. The proportion of insolubles in the asphaltic material to which the boric acid has been added is not greater than that of the asphaltic material not so treated; and

3. The boric acid is not recoverable from the asphalt by leaching.

The optimum amount of boric acid to be added to the asphalt in accordance with my invention will vary somewhat depending upon the characteristics of the particular asphalt used and of the desired characteristics of the resulting product. Beneficial results have been obtained by the addition of an amount of boric acid as small as 0.25% by weight. Proportions up to and even in excess of 3% may be used with advantage. Usually about 1% is sufficient for satisfactory results.

It is frequently desirable, though not essential to the present invention, to partially oxidize the asphalt, for instance by limited air blowing, before adding the boric acid. The boric acid is preferably added to the asphalt while the latter is in a highly heated fluid condition, for instance at a temperature of about 350° F., and thoroughly dispersed therein by agitation.

The invention will be further described and

illustrated by the following specific examples of the method employed in the preparation of the product using as a base material an asphalt from a heavy West Coast crude known as "Gato crude." Asphalt obtained from this crude is normally readily oxidized by air blowing and makes a high-grade material for roofing shingles or other products where oxidized asphalt is used.

The crude petroleum is first distilled until the residue therefrom has a Saybolt Furol viscosity of approximately 450 seconds at 210° F. The residue from this distillation may then be blended with a flux oil consisting of a crude lubricating oil distillate having a Saybolt Universal viscosity of approximately 200 seconds at 100° F. in such proportions that the resulting blend will have a Saybolt Furol viscosity of about 65 seconds at 210° F. This blend is then partially oxidized by blowing with air or a mixture of air and steam until a softening point of about 200° F., by the "ball and ring" method is obtained. The temperature of the blend is then adjusted to about 360° F. and the boric acid added and thoroughly admixed therewith.

As previously stated, the proportion of boric acid to be added may vary over a considerable range. The results obtained by adding to the particular asphalt just identified various proportions of boric acid ranging from 0.25% to 3.0% by weight are recorded in the following table. For comparison, the pentrations and softening points of the identical asphalt without the addition of boric acid are also included.

Boric acid added	Penetrations	Softening point
None	16	219
0.25%	15+	233
0.50%	15	244
1.00%	14	253
2.00%	13+	273
3.00%	13	290

Still larger proportions of boric acid may be added with advantage, where desirable. It will be observed that as the softening point increases the penetration decreases somewhat. However, the relationship of penetration to softening point is much more favorable than is obtainable by oxidation alone. Also, the product of this invention has the added advantage of superior resistance to weathering.

By a favorable choice of asphalt and the addition of an optimum proportion of boric acid, asphalt products have been prepared in accordance with the present invention having softening points in excess of 450° F. and with superior resistance to oxidation in a standard weatherometer apparatus. The resistance of such products to weathering has been found in some cases to be over twice that of the unborated product. For example, one such product was found to show a life of 130 cycles as compared to a life of 63 cycles for the unborated product under identical conditions. The softening point of coating asphalts, normally about 215° F., may readily be raised to as high as 300° F., in accordance with this invention. Furthermore, this increase in softening point is effected with a much smaller decrease in penetration than has heretofore been obtainable to my knowledge by distillation or oxidation alone. The product has the added advantage of superior weathering properties.

It has heretofore been known that the softening point of asphalts could be increased within limits by incorporating therewith relatively large proportions of inert fillers. However, such increase in softening point has been accompanied by a decided decrease in penetration value. The resulting product has therefore been unsuitable for many purposes. The penetration-softening point relationship of asphaltic materials of this character is illustrated by the following tabulated results of tests wherein various proportions of a 200 mesh bleaching clay obtained from Death Valley, California, was incorporated in the identical asphalt used in the foregoing specific example.

Asphalt	Clay	Penetration	Softening point
Per cent	*Per cent*		°F.
100	None	16	219
99	1	16	219
98	2	16	220
90	10	12	239
75	25	9	255

From the results of these tests herein related, it appears that, whereas the compounded asphalt of the present invention to which 1% boric acid had been added had a softening point of 253° F., and a penetration of 14, the asphalt compounded with 25% inert filler, which had a comparable softening point, had a penetration of only 9.

I claim:

1. An asphaltic composition in which the normal penetration-softening point relationship of the asphalt constituent has been altered without adversely affecting its weathering characteristics comprising an asphalt with which there has been admixed, at a temperature at which the asphalt is substantially fluid, about 0.25% to about 3% by weight of boric acid without material subsequent oxidation of the composition.

2. An asphaltic composition in which the normal penetration-softening point relationship of the asphalt constituent has been altered without adversely affecting its weathering characteristics comprising an asphalt with which there has been admixed, at a temperature at which the asphalt is substantially fluid, about 1% by weight of boric acid without material subsequent oxidation of the composition.

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