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PROCESS FOR PREPARING PETROLEUM PLASTICS

David R. Merrill, Long Beach, Calif., assignor to Union Oil Company of California, Los Angeles, Calif., a corporation of California

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This application relates to a process for the production of petroleum plastics and is a division of my application Serial No. 559,349, filed August 25, 1931.

I have discovered that crude oil contains certain plastic bodies not heretofore suspected to exist in petroleum. These valuable plastic bodies are present in all crude oils but are found to be most prevalent in the crude oils which are most naphthenic in character. These plastics are characterized by being very light in color and possessing all of the advantageous properties of asphalt and being superior to asphalt in a number of respects. Their properties differentiate them sharply from asphalt.

I have discovered that crude oils, and especially those crude petroleum oils that are naphthenic in character, have fractions which on isolation prove to be plastic compounds having remarkable properties. These plastic bodies are found associated with the more aromatic fractions of the naphthenic oil.

As is well known to those skilled in the art crude oils are in the main composed of a large number of complex hydrocarbons which are chiefly of the paraffin, naphthene and aromatic series. Owing to their complexity little is known at the present time of the true chemical structure of the individual members of the foregoing series. This is especially true of the higher members which are non-volatile in character. However, certain physical characteristics are possessed by these groups which render them distinguishable from each other. Thus the hydrocarbons which are most paraffinic in character are the least susceptible to a change in viscosity with change in temperature and possess a lower specific gravity for a given viscosity than the other groups. The naphthenes have a susceptibility to change in viscosity with a change in temperature intermediate between the paraffins and the aromatics and also with respect to these groups have an intermediate position as regards viscosity for a given specific gravity. The aromatics are the most susceptible of the three groups to a change in viscosity with a change in temperature and exhibit the least viscosity for a given specific gravity.

Recent investigations have shown that the fractions present in petroleum which have a high viscosity temperature susceptibility and resemble the aromatic hydrocarbons may be separated from the hydrocarbons present which are paraffinic in nature and exhibit a low temperature viscosity susceptibility by the use of certain solvents, such as, for example, liquid sulphur dioxide. The hydrocarbons present in petroleum which are soluble in the liquid sulphur dioxide possess physical characteristics similar to the aromatic hydrocarbons, whereas those hydrocarbons present which are insoluble in the liquid sulphur dioxide exhibit physical characteristics approaching in characteristics those of the paraffinic hydrocarbons. While I am aware of the fact that a sharp separation between the aromatic and paraffinic cannot be made by the use of liquid sulphur dioxide, nevertheless there is a tendency towards concentration of the more aromatic fractions of the petroleum in the sulphur dioxide soluble portion and a tendency towards concentration of the more paraffinic fractions in the sulphur dioxide insoluble portion. It is, therefore, to be hereafter understood that when I refer to aromatic fractions I mean those hydrocarbons present in petroleum which are soluble in liquid sulphur dioxide; furthermore, when I refer to non-aromatic or paraffinic hydrocarbons, it will be understood that I means those hydrocarbons which are insoluble in liquid sulphur dioxide. Also when I refer to the viscosity temperature susceptibility of a petroleum fraction I mean the change in viscosity which such a fraction undergoes with a change in temperature.

By the use of liquid sulphur dioxide, kerosene distillates are deprived of their aromatic hydrocarbon content and are rendered non-smoking. Recently a process has been invented for the production of lubricating oils by Bray and Swift, Serial Number 555,016, who have shown that lubricating oil fractions can be separated into their paraffinic and non-paraffinic constituents by the use of liquid sulphur dioxide. By the process disclosed in the foregoing application, lubricating oil fractions containing a mixture of paraffin and non-paraffin oils are subjected to the solvent action of liquid sulphur dioxide. The sulphur dioxide removes from the lubricating oil fractions those aromatic hydrocarbons present which exhibit a high viscosity temperature susceptibility and are of poor lubricating quality. Furthermore in the treatment of petroleum with liquid sulphur dioxide according to the process set forth in the patent to Lazar Edeleanu, U. S. #911,553, the oil is separated into two fractions, one of which is insoluble in the liquid sulphur dioxide, and another portion which is soluble in liquid sulphur dioxide and oftentimes referred to as liquid sulphur dioxide extract. The extract dissolved in the liquid sulphur dioxide is recovered by distilling out the sulphur dioxide. Heretofore, this portion of the oil has been considered

relatively valueless and has been used for such purposes as fuel oil and cracking stock. This portion of the oil is characterized by being of a more aromatic and unsaturated nature than that portion of the oil insoluble in the liquid sulphur dioxide. In addition to sulphur dioxide to effect separation of the oil into fractions of an aromatic and non-aromatic character, I may use such solvents as nitrobenzene, methyl acetate, mono methyl ether of ethylene glycol, phenyl acetate, mono methyl ether of ethylene glycol acetate, furfural, acetone, aniline and phenol. All of these have the property of separating the more aromatic oils from the less aromatic oils found in naphthene base crudes.

Most fractions of petroleum contain certain quantities of my valuable petroleum plastic, but I have found that they are most prevalent in the heavy fractions. Furthermore, these petroleum plastics are present in the asphalt or mixed base crudes as these crudes are those more aromatic in character. Therefore, in producing my petroleum plastic, I prefer to use the heavier fractions of an asphalt base crude.

It is, therefore, an object of my invention to produce a light colored plastic from petroleum.

It is another object of my invention to separate a plastic from a hydrocarbon oil substantially soluble in liquid sulphur dioxide.

It is an object of my invention to separate plastics from petroleum.

It is a further object of my invention to separate plastics from petroleum by separating the aromatic fractions from petroleum and separating the plastic therefrom by using a solvent which has a selective solubility for the aromatic fractions carrying said plastic.

It is an object of my invention to produce a petroleum plastic from that portion of crude oil which is more soluble in liquid sulphur dioxide, nitrobenzene, methyl acetate, mono methyl ether of ethylene glycol, phenyl acetate, mono methyl ether of ethylene glycol acetate, furfural, acetone, aniline or phenol, all of which have the property of separating the petroleum into a more aromatic and a less aromatic fraction.

It is an object of my invention to produce a petroleum plastic from that portion of heavy asphaltic base crude which is soluble in the aforementioned solvents.

It is an object of my invention to produce a petroleum plastic from that portion of acid treated heavy asphalt base crude which is soluble in the aforementioned solvents.

It is a further object of my invention to separate the heavy oil fractions of asphalt base crude from its asphalt content by such chemicals as sulphuric acid, metallic halides, or by such solvents as liquid ethane, propane or butane or mixtures thereof or by distillation, separate the treated oil with such solvents as sulphur dioxide, furfural, aniline, methyl acetate, nitrobenzene, mono methyl ether of ethylene glycol, phenyl acetate, mono methyl ether of ethylene glycol acetate, acetone or phenol, remove the solvent from the extract and separate the extract into a portion oily in character and a portion composed of the new petroleum plastic.

It is still another object of my invention to separate the heavy oil fractions of asphalt base crude from their asphalt content by the use of metallic halides, acid treat the separated oil and then separate the oily portion of the acid treated fraction from the plastic constituents by distillation.

It is a further object of my invention to prepare a colored plastic material obtained by the foregoing treatment of petroleum by mixing the plastic obtained with colored pigments or colored aggregate.

In the production of my petroleum plastic from petroleum distillates the more aromatic portion of the oil is separated from the oil less aromatic in character by the use of liquid sulphur dioxide or other solvents as previously described. This extract is freed of the solvent by distilling the solvent from the extracted oil. The latter extract is then concentrated to the desired consistency and separated into a distillate portion containing the oily constituents and a residual undistilled portion constituting the petroleum plastic by the use of steam and fire distillation.

As an example of the manner of carrying out the process described, heavy lubricating oil distillate produced from California crude oil having a Saybolt Universal viscosity of 1200 seconds at 100° F. is treated with 20 pounds of 98% sulphuric acid. The acid treated distillate is then extracted with liquid sulphur dioxide at 30° F. The extract obtained is then separated into a plastic portion and an oily portion by fire and steam distillation. After 80% of the extract charged to the still has been distilled over, the distillation is discontinued, the still bottoms constituting the valuable plastic are cooled and withdrawn. The characteristics of this plastic are shown in the following table:

Sp. gr. 60° F.	Penetration at 77° F. 100 g. 5 sec.	Melting pt. of ball and ring	Ductility at 77° F.	Solubility (percent by weight) in—			
				CS_2	CCl_4	86° naphtha	Acetone
1.069	88	105° F.	+100	99.98	99.98	99.94	Soluble in equal parts.

I have further found that these plastics may be materially improved by acid treating the petroleum fractions prior to separation into a portion more aromatic in character and a portion less or non-aromatic in character. In the acid treatment of these petroleum fractions it has been found desirable to use only a moderate amount of acid, as heavy acid treatment tends to remove from the petroleum fractions certain constituents which I desire to have present in the plastic. In the treatment of lubricating oil distillates produced from asphalt base oils with sulphuric acid, it is common practice to use about 40 lbs. of 98% sulphuric acid per barrel of oil. Such quantities of acid are preferably not used in my process as it would tend to remove from the oil a material amount of those constituents which I desire to have present in the plastic. I have found that about 20 lbs. of 98% sulphuric acid per barrel of oil is an ample quantity to use on the oils on which, as previously stated, it is now customary to use 40 pounds of acid per barrel. Of course, the above figures are merely by way of illustration to point out the importance of limiting the amount of acid to add. Any person skilled in the

art will be able to determine the quantity of acid required.

By treating the petroleum fraction with sulphuric acid prior to separation into two fractions, one of which is aromatic and the other is relatively non-aromatic in nature, and then separating the aromatic fractions into their oily constituents and my new plastic, it is possible to obtain a product which is light in color, is translucent and which does not darken readily when exposed to light. Although it has been found desirable to acid treat the petroleum fractions prior to separation into their oily constituents and plastic compounds, I find that the acid treatment may be made upon the aromatic fraction or on the separated plastic, itself, by dissolving it in a solvent, such as naphtha or gasoline, prior to the addition of the acid.

In oils containing asphalts or bituminous bodies I have found it desirable to first remove the asphalt or bitumens from the oil before separating the plastics from the rest of the oil. This may be accomplished in the usual manner by distilling the oil from the asphalt or residual fractions and then treating the distillate as described above, to separate it into its fractions by solvents and separating the oily part of the more aromatic fraction from the plastics contained therein.

Since these plastics possess high boiling points, the separation of the asphalt by distillation entails some loss of these fractions in the asphalt or bitumen fraction. Bray, Serial No. 466,189, has shown a process of separating substantially pure bitumens from residual oil by the use of certain solvents for example, a solvent which consists of 6.72% ethane, 72.20% propane, 19.91% isobutane and 1.17% normal butane. In the process set forth in the foregoing application crude oils are distilled to remove the light fractions present, such as gasoline, kerosene and gas-oil. The residual oil containing the asphalt is then extracted with the aforementioned light hydrocarbon solvent in a container under pressure in the proportion of one part of residuum to six parts of solvent. The bitumens, being insoluble, precipitate out as a dry powdery mass free from oily constituents and are removed from the solvent solution of oil. The oils present are recovered in the form of a solution dissolved in light hydrocarbon solvent.

I have found that by first removing the light fractions, such as gasoline, kerosene and gas-oil, from crude oil and then treating the residual oil in such a solvent as liquid ethane, propane or butane or mixtures thereof, as for example, in the proportion of about 4 volumes of solvent to 1 volume of residual oil, I am able to separate effectively the major portion of the oil present containing the plastic bodies from the asphalt. The solvent solution containing the plastic may then be treated with sulphuric acid in the proportion of about 30 pounds of 98% acid per barrel of oil, distilled to remove the solvent present and the oil free of the above solvent separated into aromatic and non-aromatic fractions by the use of such solvents as sulphur dioxide, aniline, nitrobenzene, methyl acetate, mono methyl ether of ethylene glycol, phenyl acetate, mono methyl ether of ethylene glycol acetate, acetate, furfural, acetone, phenol, after which the solvent free extract may be separted by the use of steam and fire distillation into an oily distillate fraction and a residual portion constituting the new petroleum plastic. Sometimes it may be found desirable to separate the asphalt from the residual oil by the use of liquid ethane, propane or butane or mixtures thereof, to separate the asphalt by decanting off the asphalt free oil from the precipitated asphalt, acid treating the relatively asphalt free oil in the presence of the light hydrocarbon solvent, separating the aromatic fractions from the less aromatic fractions by the use of sulphur dioxide, or other solvents previously described as being suitable for this purpose, in the presence of the light hydrocarbon solvent, removing the solvents from the extract and then separating the extract into an oily fraction and a fraction containing the new plastic by distilling the oily fraction from the plastic which remains behind as an undistilled residue.

As a further modification of my process and as a further method of recovering asphalt without material loss of plastic I may distill the oil to remove the light fractions present, such as gasoline, kerosene and gas-oil, acid treat the reiduum so produced with sulphuric acid to remove the asphalt present, extract the acid treated oil with the aforementioned solvents capable of separating the aromatic fractions from the less aromatic fractions and then distill the aromatic fraction with the aid of fire and steam to separate the oily portion of such fraction from the plastic compounds present. As an example of this mode of operation a non-wax bearing California crude oil is distilled until the distillate produced shows a viscosity on stream of 100 seconds (Saybolt Universal at 100° F.). The residual oil is cooled to a temperature of 125–175° F. and then treated with 50 pounds of 98% sulphuric acid per barrel of oil which may be added in one or more portions. After thorough agitation of the oil and acid, the sludge formed is allowed to settle out and is separated from the oil. At this point in the treatment of the oil I sometimes find it desirable to add a light petroleum hydrocarbon to the acid treated oil, such as naphtha, gasoline or kerosene, to aid in settling out the sludge and neutralization. If I use such a diluent it is removed from the acid treated oil subsequent to the removal of the sludge present by distilling the diluent from the acid treated oil. The treated oil is then extracted with such solvents as described which are capable of separating the more aromatic fractions from the less aromatic fractions. The solvent solution of the extract is then distilled to remove the solvent from the extract and the latter is steam and fire distilled to remove the oily portions of the extract from the plastic compounds present which are left as an undistilled fraction of the extract. As stated previously, the extent of distillation will depend upon the final consistency desired in the plastic. The greater the extent of distillation, the lower will be the penetration and the higher will be the melting point which will be obtained.

In some instances it may be desirable to dilute the residual asphaltic oil prior to acid treatment in order to effect a clean separation between the asphaltic constituents of the residuum and the oil present. For example, an oil which has been distilled to remove all of the light and intermediate fractions present and which has a stream viscosity of about 100 seconds (Saybolt Universal at 100° F.) may be diluted with such solvents as naphtha, gasoline or kerosene in the proportion of 1 volume of topped crude oil to 1 volume of the light petroleum hydrocarbon solvent. I may use more or less of the light petroleum hydrocarbon solvent with the topped residuum but in general I find that the foregoing stated amount is satisfactory. To the diluted oil I then add about 50 pounds of 98% sulphuric acid per barrel of oil in one or more portions. The oil and the

acid are then thoroughly agitated, settled and the sludge formed is removed from the acid treated solvent solution of oil and the oil neutralized. This solution may then be extracted with such solvents as have already been described which are suitable for the separation of the more aromatic from the less aromatic fractions of oil present or the light petroleum hydrocarbon solvent may be distilled off prior to the separation of the aromatic from the non-aromatic fractions. The aromatic fraction obtained is then distilled to remove the oily constituents present from the plastic which remains behind as an undistilled fraction.

Furthermore, it may be found desirable to acid treat the crude oil directly without removing the light fractions present and then separate the acid treated crude oil into a fraction containing the more aromatic constituents and a fraction containing the less aromatic fractions and then distill the aromatic fraction to remove the oily constituents present from the plastic. As an example of this method of treatment, the crude oil is directly treated with about 50 pounds of 98% sulphuric acid in one or more portions and the sludge formed is separated from the acid treated oil in the same manner as was described above in the case of the topped crude oil. In case the crude oil is too viscous for acid treatment it may be diluted prior to acid treatment with such solvents as gasoline, or kerosene. The acid treated oil substantially free of asphalt may then be extracted with such solvents as have been previously recommended to separate the more aromatic from the less aromatic fractions and the aromatic fractions obtained may then be distilled to remove the oily constituents from the plastic. In some instances it may be found desirable to remove the light petroleum fractions from the acid treated oil prior to extraction with liquid sulphur dioxide, nitrobenzene, methyl acetate, mono methyl ether of ethylene glycol, phenyl acetate, mono methyl ether of ethylene glycol acetate, furfural, acetone, aniline or phenol for the separation of the more aromatic from the less aromatic fractions.

In acid treating crude oil or crude oil residues for the removal of asphalt and color bodies it becomes necessary to use a greater quantity of acid than is required to treat oils which have been freed from their asphalt content by solvent extraction or distillation, a large portion of the acid being consumed in precipitating the asphalt present in the oil.

As a further modification of my process, crude oil or oil from which the light fraction has been removed may be heated with such catalysts as aluminum chloride, ferric chloride or stannic chloride to temperatures below cracking to cause coagulation of the asphalt from the oil. The oil may then be treated if desired with sulphuric acid and the acid treated oil separated from the sludge which is formed. The treated oil may then be treated with a solvent capable of separating the more aromatic from the less aromatic fractions present, as has been previously pointed out, by the use of the aforementioned solvents. The more aromatic fraction obtained may then be distilled to remove the oily constituents from the plastic. As an example of this method of treatment, crude oil or residuum distilled to a stream viscosity of 100 seconds (Saybolt Universal at 100° F.) is agitated at a temperature of approximately 400° F. with 10 to 15 pounds of metallic halide, such as aluminum chloride, for a period of one hour. The treated mass is then allowed to settle in order to remove the sludge from the treated oil. The halide treated oil is then agitated at a temperature of 100–150° F. with about 10 pounds of 98% sulphuric acid added to the oil in one or more portions. The sludge formed by such acid treatment is separated from the oil and the latter is then treated with such solvents as liquid sulphur dioxide, nitrobenzene, methy acetate, mono methyl ether of ethylene glycol, phenyl acetate, mono methyl ether of ethylene glycol acetate, furfural, acetone, aniline or phenol to separate the more aromatic from the less aromatic fractions present. The aromatic fraction is then fire and steam distilled to remove the oily portions present in the fraction from the plastic.

While I have shown several methods for the production of the petroleum plastic the preferred method of preparation is as follows:

The crude oil is first distilled to separate the oil from the asphalt. The oil, substantially free of asphalt, is treated with about 20 pounds of 98% sulphuric acid to remove unstable color forming bodies present. The sludge is removed from the acid treated oil. The acid treated oil is then extracted with liquid sulphur dioxide to separate the more aromatic constituents from the less aromatic constituents. The extract containing the more aromatic constituents dissolved in liquid sulphur dioxide is distilled to remove the sulphur dioxide from the oil which is aromatic in character. The extract, free of sulphur dioxide is then distilled to remove the oily portion of the extract from the plastic which is recovered as a still residue. The consistency of the plastic will, of course, depend upon the extent of distillation made upon the sulphur dioxide free extract. The greater the extent of distillation the lower will be the penetration and the higher will be the melting point of the final product. In many instances a product will be preferred which is substantially solid at ordinary temperatures. By substantially solid, I mean sufficiently solid to be plastic in character at ordinary temperature.

This new plastic which I have discovered has a slight green fluorescence, is of a brownish color, translucent, and is substantially completely soluble in such solvents as carbon tetrachloride, carbon bisulphide and 86° A. P. I. naphtha. In contrast to asphalt it contains substantially no combined oxygen. Asphalt is black, or brown even in thin films, while the present plastic is brown in masses, translucent, and possesses a light yellow color when in a thin film thus having a less tendency than ordinary asphalt to mask the color of pigments or colored stone when added thereto. Furthermore the high solubility of the new plastic in 86° A. P. I. naphtha distinguishes it from asphalt. As is well known to those skilled in the art asphalts contain considerable quantities of asphaltenes which can be separated therefrom by the use of low boiling point petroleum ether such as 86° A. P. I. naphtha. By adding a substantial quantity of petroleum ether to asphalt the asphaltenes are precipitated usually as black solids. The new petroleum plastic being substantially completely soluble in 86° A. P. I. naphtha contains substantially no asphaltenes. When employed with colored pigment or stone for the production of sidewalk or paving or roofing material, the plastic acts as a binder in a similar manner to asphalt but permits a tremendously greater

transmission of the color of the pigment or stone to the surface than it is possible to obtain when ordinary asphalt is employed as a binder.

In contrast to asphaltic resins the new petroleum plastic is highly soluble in acetone. Asphaltic resins are only sparingly soluble in hot or cold acetone whereas the new petroleum plastic is highly soluble in cold acetone; equal portions of acetone and the new plastic being miscible with each other.

	Percent fixed carbon	Melting point °F.	Penetration at 77° F.	Ductility at 77° F.	Solubility in 86° A. P. I. nap.	Solubility in Acetone	Lustre
New petroleum plastic:							
Sample 1	0.44	105	88	100+	99.94	Soluble in equal parts	Resinous and vitreous
Sample 2		108	68	100+			
Sample 3		111	30	100+			
Sample 4		121	24	100+			
Sample 5		122	22	100+			
Sample 6		129	11	100+			
Sample 7		132	6	0			
Wax[a] tailings	2-8	98	100	3.9	95-100		Dull
Asphaltic[b] resins						Sparingly Soluble	
Asphalt					70-95%		
1. Steam refined or steam blown:							
Sample 1		113	88	100+			
Sample 2		128	38	100+			
Sample 3		132	30	100+			
Sample 4		138	24	100+			
Sample 5		140	22	100+			
Sample 6		160	11				
Sample 7		179	6	0			
2. Air blown:							
Sample 1		140 to 155	30 to 40	5 to 10			
Sample 2		300	6	1			

[a] See Abraham's Asphalt and Allied Substances, 3d edition, pp. 358-9, 1929.
[b] See Abraham's Asphalt and Allied Substances, 3d edition, p. 757, 1929.

In contrast to wax tailings the new petroleum plastic has a lower fixed carbon value. (See test 19, page 711, "Asphalts and Allied Substances" by Herbert Abraham, third edition, 1929.) The fixed carbon value of the new plastic is usually about 0.44% whereas the fixed carbon content of wax tailings ranges from 2 to 8%. Furthermore the sulphur content of the new plastic is usually greater than 1.0% whereas wax tailings have only a trace of sulphur. Furthermore the lustre exhibited by the new petroleum plastic is resinous vitreous or brilliant whereas the lustre of wax tailings is waxy or dull.

Another striking difference is the high ductility possessed by the new petroleum plastic for a given melting point or penetration as compared to the low ductility possessed by the wax tailings for the same melting point or penetration. The accompanying table shows some of the more important differences of the new petroleum plastic as compared to wax tailings (sometimes called still wax), asphaltic resins and asphalt.

As will be noted from the figures given in the table, sample 1 of the new petroleum plastic has a melting point of 105° F., a penetration of 88 at 77° F. and a ductility of 100+ cm. whereas the wax tailings shown in the same table have a melting point of 98° F., a penetration of 100 at 77° F. and a ductility of only 3.9 cm. In other words, although the new petroleum plastic possesses a lower penetration and a higher melting point than wax tailings yet it is vastly more ductile in character.

Furthermore the new petroleum plastic is distinguished from asphalt by its lower melting point for a given penetration. As for example the petroleum plastic which has a melting point of 111° F. and a penetration of 30 is distinguished from steam refined asphalt which exhibits a melting point of 132° F. for the same penetration. Since air blown or oxidized asphalt possesses a higher melting point than steam refined asphalt for the same penetration in like manner it is distinguished from the new petroleum plastic.

Therefore, it may be said, that this invention covers petroleum plastics in that class having melting points of 105° F., 108° F., 111° F., 122° F. and 129° F. with penetrations at 77° F. of 88, 68, 30, 20 and 11, respectively, all having ductilities greater than 100 cm. In this class there are also found very low ductility plastics such as one melting at 132° F. and having a penetration of 6 at 77° F. and a ductility of zero. This class of plastics thus presents a breaking point in the ductility curve somewhere in the lower ranges of ductilities, but it is distinguished from other plastics, such as the asphalts, in that the melting points are much lower as above pointed out.

In carrying out the production of colored plastics I add to my new plastic compound in a melted state, such pigments as ferric oxide to produce a final product having a red or chocolate brown color. If I desire a yellow cream colored plastic, I add to my new compound in a melted state a white pigment, such as zinc oxide or titanium oxide, which with the natural yellow color of the plastic gives various shades of yellow. Because of the yellow color given by the use of a white pigment with the plastic, the further addition of a blue pigment, such as ultra-marine, will give a pleasing green color. Other colored plastics may be produced in the same manner by adding to my new compound in a melted state such compounds as orange mineral, red lead (Pb_3O_4), with or without white pigments, or powdered aluminum by which I am able to produce colored plastics in various shades of orange, red and silver, respectively. Further-

more, natural colored slates, limestone or porphyry, or other silicate rocks may be mixed with my new compound and a product may be obtained which has essentially the same color possessed by the original colored rock or filler.

I may also employ my new plastic in the preparation of emulsions for use as roof coating or for paving purposes. As for example, emulsions may be prepared between my new plastic, colored pigments and water with the aid of such dispersing media as inorganic hydroxides, colloidal clays, soaps, gums, proteins, albuminoids, alginates, sulphite liquors, organic bases, tannins, or sulphonated vegetable or mineral oils. These emulsions may be used as roof coatings with or without mineral granules or they may be used in the production of pavement by applying the emulsion to the mineral aggregate-covered road bed or by mixing the emulsion with suitable mineral aggregate and applying it to the surface of the road.

As an example of such colored emulsions, I may prepare an intimate mixture of 75 parts by weight of melted plastic and 25 parts of red iron oxide pigment, I then add this mixture with vigorous agitation to 100 parts of warm water containing in suspension 10 parts of colloidal clay. The agitation is continued for 15 minutes until the colored plastic is thoroughly dispersed. The red colored emulsion is then ready for use.

Furthermore, I may also employ my new petroleum plastic in the production of colored sidewalk or pavements by applying it above its melting point to road beds composed of colored mineral aggregate. By heating the petroleum plastic sufficiently a fluid mass is obtained which upon application to the road bed composed of colored mineral aggregate or stone spreads evenly over the surface and penetrates throughout the rock or aggregate voids. Upon cooling the plastic stiffens and functions as a binder for the individual aggregate particles and at the same time produces a tough and elastic wearing surface. Hot mixes of colored aggregate and the plastic may also be prepared and used for surfacing roads or sidewalks. A mixture of colored mineral aggregate and hot fluid petroleum plastic, is prepared and spread evenly upon the road bed or walk-way. Upon cooling, the plastic congeals and binds the aggregate into a solid mass.

Furthermore, the new petroleum plastic may be employed with white or colored aggregate as a marker to indicate pedestrian crossings or parking spaces, or to form inlaid lettering, lines and other traffic guides. However, when a greater contrast is desired it may be employed with such pigments as titanium oxide, ferric oxide, ultramarine, chrome yellow, lead oxide and other pigments or mixtures of pigments.

While the grades of my plastic which have a very low ductility are not as satisfactory for paving purposes as the more ductile grades, yet they have been found to be useful in the production of paints and coatings. As has been pointed out, the high translucence of the petroleum plastic permits its use with colored pigments or aggregate where it is desired to produce a highly colored product. Furthermore, the high solubility of the plastic in such solvents as acetone and gasoline permits its use in the production of pigment carriers for paints. By dissolving sufficient of the plastic in acetone or gasoline to produce a viscous mass and then adding a suitable pigment, a product is obtained which may be later thinned down with acetone or gasoline and utilized as a paint; or if desired the vehicle composed of the plastic and solvent may be mixed with the pigment in such proportions as to produce a finished paint ready for use without any additional thinning with solvent. For this purpose the grade having a ductility in the range of 0 to 5 is highly satisfactory.

For coating purposes it is desirable to use a product having a high melting point but it is not necessary that it possess a high ductility. I have found that a grade of my new plastic having a ductility of about 5 and a penetration of about 6 to 10 is highly satisfactory for this purpose. By using my new plastic as a coating in combination with colored pigments or aggregate it is possible to obtain a highly durable colored surface which is not obtainable with ordinary black asphalt.

The penetrations, ductilities and melting points given in this specification have been obtained by the following American Society of Testing Material Methods of test:

Penetration	D—5—25
Ductility	D—113—26T
Melting point	D—36—26

It is to be understood that the foregoing examples are merely illustrative of my discovery and are not to be construed as limiting the scope of my invention.

I claim:

1. A method for the production of a plastic from mineral oil which is substantially free from bituminous material which comprises commingling said oil with a selective solvent for the aromatic fractions of said oil and thereby forming a raffinate phase containing the non-aromatic fractions of the oil and an extract phase containing aromatic oil fractions dissolved in the selective solvent, separating said phases, removing the selective solvent from the extract phase and distilling the lower boiling fractions away from the extract until a bottom fraction is obtained which is solid at ordinary atmospheric temperature.

2. A method as claimed in claim 1 in which the selective solvent is liquid sulfur dioxide.

3. A process for the production of a petroleum plastic from mineral oil containing the same, which comprises extracting said oil with a selective solvent in which the aromatic fractions of said mineral oil are soluble and the paraffinic oil fractions are insoluble and thereby forming a raffinate phase comprising paraffinic oil fractions and an extract phase comprising the selective solvent and aromatic oil fractions, separating said phases, removing the selective solvent from the extract phase, distilling the extract and separating the low boiling oil fractions from the plastic fractions present in said extract and thereby forming a plastic which is solid at ordinary atmospheric temperatures.

4. A process according to claim 3 in which the distillation of the extract fraction is discontinued when the plastic attains a penetration between 6 and 88 at 77° F.

5. A process according to claim 3 in which the selective solvent is sulphur dioxide.

6. A process for the production of a petroleum plastic from mineral oil containing dark colored bituminous materials which comprises removing the bituminous materials from the oil, extracting the oil from which the bituminous materials have been removed with a selective solvent in which the aromatic fractions of the oil are solu-

ble and the paraffinic fractions are insoluble and thereby forming a raffinate phase comprising the non-paraffinic fractions, and an extract phase comprising the bulk of the selective solvent and the aromatic fractions, separating said phases, removing the selective solvent from the extract phase, distilling the extract and removing the low boiling oil fractions from the plastic contained in said extract, and thereby forming a plastic which is solid at ordinary temperature.

7. A process according to claim 6 in which the distillation of the extract is discontinued when the plastic attains a melting point between 105° F. and 132° F.

8. A process according to claim 3 in which the mineral oil is treated with sulphuric acid prior to the extraction with the selective solvent.

9. A method for the production of petroleum plastics from asphaltic mineral oil which comprises removing the asphalt from the oil, extracting the oil with a selective solvent in which the aromatic constituents of said oil are soluble and in which the paraffinic constituents of the oil are insoluble and thereby forming a raffinate phase comprising the paraffinic oil fractions and an extract phase comprising the bulk of the selective solvent and the aromatic oil fractions, separating said phases, removing the selective solvent from the extract phase, removing the oil fractions from the plastic contained in the extract by distillation, and thereby forming a plastic which is solid at ordinary atmospheric temperature.

DAVID R. MERRILL.